

APPENDIX B: Inventory and Site Assessment Reports

Site Identification	<p><i>Site #</i> 7 <i>Site Name</i> Latham Island Rock South <i>District #</i> D3 <i>District Name</i> Old Town North <i>Land Area (m²)</i> 710,596 <i>Site Type</i> Local <i>Zoning</i> NP <i>Authority</i> municipal</p>	
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Landscape Information	<i>Description</i>							
	<i>Total Area (ha)</i>		2.44					
	% area by Landcover Classification and Slope							
	<i>water</i>	<i>exposed rock</i>	<i>deciduous trees</i>	<i>coniferous trees</i>	<i>wetland and tall grass</i>	<i>short vegetation & grass</i>		<i>slope over 15%</i>
	0%	52%	23%	16%	7%	1%		60%
<i>pavement</i>	<i>buildings & disturbance</i>	<i>gravel and disturbance</i>						
0%	1%	0%						

Protection	<i>Recommended Zoning</i> NP/SS							
	High Level of Protection when 100% in any one condition							
	<i>lake, wetland or shoreline</i>	<i>site within environmental setback</i>	<i>steep slopes</i>	<i>combination of previous</i>	<i>only site in District AND less than 10%</i>	<i>needed to provide access or area target</i>	<i>not available to City for development</i>	<i>marginal development potential</i>
							90	

Development Potential	site capacity (housing units)				development conditions		
	<i>% developable</i>	<i>area useable (ha)</i>	<i>10 units/ha</i>	<i>37 units/ha</i>	<i>74 units/ha</i>	<i>cultural heritage</i>	<i>connections</i>
	10%	0	2	9	18		

Qualities	The extreme slope at the south end of this rock outcrop is a prominent landmark of Latham Island when viewed from the McMeekan Causeway.
Distribution	This site does not need to be preserved in its natural state to meet local natural area targets.
Connections	Natural access to this site is limited but connections between the Latham Island park and the Yellowknife Bay shoreline are possible.
Quantities	This site does not need to be preserved in its natural state to meet local natural area targets.

Site Identification	<p><i>Site #</i> 11 <i>Site Name</i> Old Ski Club <i>District #</i> D4 <i>District Name</i> Niven Lake <i>Land Area (m²)</i> 262,042 <i>Site Type</i> Local <i>Zoning</i> GM, <i>Authority</i> interim land withdrawal</p>	
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Landscape Information	<i>Description</i>							
	<i>Total Area (ha)</i>		26.20					
	% area by Landcover Classification and Slope							
	<i>water</i>	<i>exposed rock</i>	<i>deciduous trees</i>	<i>coniferous trees</i>	<i>wetland and tall grass</i>	<i>short vegetation & grass</i>		<i>slope over 15%</i>
	0%	44%	20%	27%	8%	0%		47%
<i>pavement</i>	<i>buildings & disturbance</i>	<i>gravel and disturbance</i>						
0%	0%	0%						

Protection	<i>Recommended Zoning</i> NP/SS							
	High Level of Protection when 100% in any one condition							
	<i>lake, wetland or shoreline</i>	<i>site within environmental setback</i>	<i>steep slopes</i>	<i>combination of previous</i>	<i>only site in District AND less than 10%</i>	<i>needed to provide access or area target</i>	<i>not available to City for development</i>	<i>marginal development potential</i>
		50						

Development Potential	site capacity (housing units)				development conditions		
	<i>% developable</i>	<i>area useable (ha)</i>	<i>10 units/ha</i>	<i>37 units/ha</i>	<i>74 units/ha</i>	<i>cultural heritage</i>	<i>connections</i>
	50%	13	131	485	970		

Qualities	A large portion of this site is steeply sloping rock.
Distributions	This site does not need to be preserved in its natural state to meet local natural area targets. When development of a portion of this site is complete, District delineation should be modified.
Connections	Several well used trails traverse the site connecting Back Bay with Frame Lake and Niven Lake. The trails follow the toe of the slope in most instances, and the major trail is one used as a snowmobile route and in the spring for the Canadian Championship Dog Derby.
Quantities	A portion of this site has been designated for the expansion of the Niven Lake subdivision.

Site Identification	<p><i>Site #</i> 12 <i>Site Name</i> Joliffe Island <i>District #</i> NA12 <i>District Name</i> n/a Major Site <i>Land Area (m²)</i> 101,098 <i>Site Type</i> Major <i>Zoning</i> PR <i>Authority</i> interim land withdrawal</p>	
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Landscape Information	<i>Description</i>							
	<i>Total Area (ha)</i>		10.11					
	% area by Landcover Classification and Slope							
	<i>water</i>	<i>exposed rock</i>	<i>deciduous trees</i>	<i>coniferous trees</i>	<i>wetland and tall grass</i>	<i>short vegetation & grass</i>		<i>slope over 15%</i>
	0%	28%	42%	21%	8%	0%		39%
<i>pavement</i>	<i>buildings & disturbance</i>	<i>gravel and disturbance</i>						
0%	0%	0%						

Protection	<i>Recommended Zoning</i>							
	NP/SS							
	High Level of Protection when 100% in any one condition							
	<i>lake, wetland or shoreline</i>	<i>site within environmental setback</i>	<i>steep slopes</i>	<i>combination of previous</i>	<i>only site in District AND less than 10%</i>	<i>needed to provide access or area target</i>	<i>not available to City for development</i>	<i>marginal development potential</i>

Development Potential	site capacity (housing units)				development conditions		
	<i>% developable</i>	<i>area useable (ha)</i>	<i>10 units/ha</i>	<i>37 units/ha</i>	<i>74 units/ha</i>	<i>cultural heritage</i>	<i>connections</i>
	20%	2	20	75	150		

Qualities	Areas of the island formerly occupied by residences and industrial uses have become renaturalized since the 1950's. Several small residential dwellings remain and are currently occupied or semi-occupied.
Distribution	This area is not required to meeting natural area targets.
Connections	A network of trails on the island is used year round.
Quantities	This site does not need to be preserved in its natural state to meet local natural area targets.

Site Identification	<p>Site # 15 Site Name Latham Island Rock North District # D3 District Name Old Town North Land Area (m²) 11,612 Site Type Local Zoning NP Authority municipal</p>	
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Landscape Information	<i>Description</i>							
	<i>Total Area (ha)</i>		1.16					
	% area by Landcover Classification and Slope							
	<i>water</i>	<i>exposed rock</i>	<i>deciduous trees</i>	<i>coniferous trees</i>	<i>wetland and tall grass</i>	<i>short vegetation & grass</i>		<i>slope over 15%</i>
	0%	48%	18%	13%	14%	0%		38%
<i>pavement</i>	<i>buildings & disturbance</i>	<i>gravel and disturbance</i>						
0%	6%	0%						

Protection	<i>Recommended Zoning</i>							
	NP/SS							
	High Level of Protection when 100% in any one condition							
<i>lake, wetland or shoreline</i>	<i>site within environmental setback</i>	<i>steep slopes</i>	<i>combination of previous</i>	<i>only site in District AND less than 10%</i>	<i>needed to provide access or area target</i>	<i>not available to City for development</i>	<i>marginal development potential</i>	

Development Potential			site capacity (housing units)			development conditions		
	<i>% developable</i>	<i>area useable (ha)</i>	<i>10 units/ha</i>	<i>37 units/ha</i>	<i>74 units/ha</i>	<i>cultural heritage</i>	<i>connections</i>	
	0%	0	0	0	0			

Qualities	
Distribution	
Connections	
Quantities	

Site Identification	<p>Site # 16 Site Name Twin Pine Hill District # NA16 District Name Old Town South Land Area (m²) 126,991 Site Type Major Zoning NP & SS Authority municipal</p>	
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Landscape Information	<i>Description</i>							
	<i>Total Area (ha)</i>		12.70					
	% area by Landcover Classification and Slope							
	<i>water</i>	<i>exposed rock</i>	<i>deciduous trees</i>	<i>coniferous trees</i>	<i>wetland and tall grass</i>	<i>short vegetation & grass</i>		<i>slope over 15%</i>
	0%	61%	12%	21%	5%	0%		62%
<i>pavement</i>	<i>buildings & disturbance</i>	<i>gravel and disturbance</i>						
1%	0%	0%						

Protection	<i>Recommended Zoning</i>							
	NP/SS							
	High Level of Protection when 100% in any one condition							
<i>lake, wetland or shoreline</i>	<i>site within environmental setback</i>	<i>steep slopes</i>	<i>combination of previous</i>	<i>only site in District AND less than 10%</i>	<i>needed to provide access or area target</i>	<i>not available to City for development</i>	<i>marginal development potential</i>	
		75						

Development Potential	site capacity (housing units)				development conditions		
	<i>% developable</i>	<i>area useable (ha)</i>	<i>10 units/ha</i>	<i>37 units/ha</i>	<i>74 units/ha</i>	<i>cultural heritage</i>	<i>connections</i>
	25%	3	32	117	235		

Qualities	A prominent landmark, this site lies between the Old Town, School Draw, and the 'new town'. The name is derived from the name of the hotel located on Franklin Avenue, which has since changed. The cost of conventional development has prohibited previous planned development. Biophysical information can be found in the City's Environmental Resource Inventory.
Distribution	
Connections	A network of trails is used year round. Trail development has been previously recommended and included in Zoning Bylaw 4024 and 4044.
Quantities	A portion of the site was zoned for Site Specific development. Development of this area would not reduce natural area preservation below targets.

Site Identification	<p><i>Site #</i> 19 <i>Site Name</i> NCC Lands <i>District #</i> NA19 <i>District Name</i> n/a Major Site <i>Land Area (m²)</i> 2,894,261 <i>Site Type</i> Major <i>Zoning</i> NP, PS, PR <i>Authority</i> municipal, territorial</p>									
Landscape Information	<i>Description</i>									
	<i>Total Area (ha)</i>		289.43							
	% area by Landcover Classification and Slope									
	<i>water</i>	<i>exposed rock</i>	<i>deciduous trees</i>	<i>coniferous trees</i>	<i>wetland and tall grass</i>	<i>short vegetation & grass</i>		<i>slope over 15%</i>		
	32%	30%	4%	11%	11%	n/a		17%		
<i>pavement</i>	<i>buildings & disturbance</i>	<i>gravel and disturbance</i>								
n/a	13%	0%								
Protection	<i>Recommended Zoning</i> NP/PS/PR									
	High Level of Protection when 100% in any one condition									
	<i>lake, wetland or shoreline</i>	<i>site within environmental setback</i>	<i>steep slopes</i>	<i>combination of previous</i>	<i>only site in District AND less than 10%</i>	<i>needed to provide access or area target</i>	<i>not available to City for development</i>	<i>marginal development potential</i>		
						95				
Development Potential	site capacity (housing units)				development conditions					
	<i>% developable</i>	<i>area useable (ha)</i>	<i>10 units/ha</i>	<i>37 units/ha</i>	<i>74 units/ha</i>	<i>cultural heritage</i>	<i>connections</i>			
	5%	14	145	535	1,071					
Qualities	<p>The Capital Site is jointly managed by the Government of the Northwest Territories and the City of Yellowknife. A Capital Site Development Scheme (adopted through Municipal Bylaw) is in place that identifies different classes of land with varying levels of protection or development allowed in each. A portion of the site parallel to the Old Airport Road lies within the 'Capital Site Vicinity' where some development is permitted. A large disturbed wetland, a steep rock face, and a former borrow pit are significant site features</p>									
Distribution										
Connections	<p>Well used trails are located in the area that connect to Frame Lake, Stock Lake, and Long Lake although these are not hydrological connections.</p>									
Quantities	<p>Because of the large land area of this NAS, it is possible to develop a portion without reducing the total area of Major Natural Area Sites below the targets identified in this Strategy.</p>									

Site Identification	<p><i>Site #</i> 20 <i>Site Name</i> Fred Henne Territorial Park/Prospectors Trail <i>District #</i> NA20 <i>District Name</i> n/a Major Site <i>Land Area (m²)</i> 4,893,248 <i>Site Type</i> Major <i>Zoning</i> PR <i>Authority</i> territorial</p>	
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Landscape Information	<i>Description</i>							
	<i>Total Area (ha)</i>		489.32					
	% area by Landcover Classification and Slope							
	<i>water</i>	<i>exposed rock</i>	<i>deciduous trees</i>	<i>coniferous trees</i>	<i>wetland and tall grass</i>	<i>short vegetation & grass</i>		<i>slope over 15%</i>
	24%	45%	12%	15%	10%	n/a		6%
<i>pavement</i>	<i>buildings & disturbance</i>	<i>gravel and disturbance</i>						
n/a	4%	0%						

Protection	<i>Recommended Zoning</i>							
	NP/SS							
	High Level of Protection when 100% in any one condition							
<i>lake, wetland or shoreline</i>	<i>site within environmental setback</i>	<i>steep slopes</i>	<i>combination of previous</i>	<i>only site in District AND less than 10%</i>	<i>needed to provide access or area target</i>	<i>not available to City for development</i>	<i>marginal development potential</i>	
						100		

Development Potential	site capacity (housing units)				development conditions		
	<i>% developable</i>	<i>area useable (ha)</i>	<i>10 units/ha</i>	<i>37 units/ha</i>	<i>74 units/ha</i>	<i>cultural heritage</i>	<i>connections</i>
	0%	0	0	0	0		

Qualities	This site is under the authority of the GNWT and has been extensively developed for outdoor recreational use and provides vehicular and pedestrian access to picnic and camping areas. An interpretive trail, the 'Prospector's Trail' is an important cultural heritage feature of the site.
Distribution	This site has been extensively developed for outdoor recreational use.
Connections	The Park is located at the edge of the wilderness, and provides controlled public access to Long Lake.
Quantities	This site does not need to be preserved in its natural state to meet local natural area targets.

Site Identification	<p><i>Site #</i> 22 <i>Site Name</i> Tin Can Hill <i>District #</i> NA22 <i>District Name</i> n/a Major Site <i>Land Area (m²)</i> 564,304 <i>Site Type</i> Major <i>Zoning</i> GM <i>Authority</i> territorial</p>	
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Landscape Information	<i>Description</i>							
	<i>Total Area (ha)</i>		56.43					
	% area by Landcover Classification and Slope							
	<i>water</i>	<i>exposed rock</i>	<i>deciduous trees</i>	<i>coniferous trees</i>	<i>wetland and tall grass</i>	<i>short vegetation & grass</i>		<i>slope over 15%</i>
	0%	52%	12%	29%	5%	0%		28%
<i>pavement</i>	<i>buildings & disturbance</i>	<i>gravel and disturbance</i>						
1%	1%	0%						

Protection	<i>Recommended Zoning</i>							
	NP/SS							
	High Level of Protection when 100% in any one condition							
<i>lake, wetland or shoreline</i>	<i>site within environmental setback</i>	<i>steep slopes</i>	<i>combination of previous</i>	<i>only site in District AND less than 10%</i>	<i>needed to provide access or area target</i>	<i>not available to City for development</i>	<i>marginal development potential</i>	
		20			60			

Development Potential	site capacity (housing units)				development conditions		
	<i>% developable</i>	<i>area useable (ha)</i>	<i>10 units/ha</i>	<i>37 units/ha</i>	<i>74 units/ha</i>	<i>cultural heritage</i>	<i>connections</i>
	20%	11	113	418	835		

Qualities	The name of the site is presumed to have been derived from its use as a refuse dumping site by the adjacent mining operation. The site is primarily exposed bedrock, with pockets of wetlands, and a very steep shoreline.
Distribution	A portion of this site should be preserved in a natural state to meet targets set for access to a major Natural Area Site. Development would impact access from the downtown core.
Connections	Numerous well used trails are evidence that this has been a popular passive recreation area for many years. Deteriorated roadways, originally constructed for the mining operation, are used as walking trails and connect the School Draw area to the Con Mine area.
Quantities	A 20% portion of the site could be developed without reducing Natural Area Site area below targets set in this Strategy.

Site Identification	<p><i>Site # 27</i> <i>Site Name</i> Con Mine (Con Mine infill) <i>District #</i> NA27 <i>District Name</i> n/a Major Site <i>Land Area (m²)</i> 249,643 <i>Site Type</i> Major <i>Zoning</i> GM & NP <i>Authority</i> municipal</p>	
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Landscape Information	<i>Description</i>							
	<i>Total Area (ha)</i>		24.96					
	% area by Landcover Classification and Slope							
	<i>water</i>	<i>exposed rock</i>	<i>deciduous trees</i>	<i>coniferous trees</i>	<i>wetland and tall grass</i>	<i>short vegetation & grass</i>		<i>slope over 15%</i>
	0%	50%	11%	32%	5%	0%		12%
<i>pavement</i>	<i>buildings & disturbance</i>	<i>gravel and disturbance</i>						
0%	1%	0%						

Protection	<i>Recommended Zoning</i> NP/SS							
	High Level of Protection when 100% in any one condition							
	<i>lake, wetland or shoreline</i>	<i>site within environmental setback</i>	<i>steep slopes</i>	<i>combination of previous</i>	<i>only site in District AND less than 10%</i>	<i>needed to provide access or area target</i>	<i>not available to City for development</i>	<i>marginal development potential</i>
	80							

Development Potential	site capacity (housing units)				development conditions		
	<i>% developable</i>	<i>area useable (ha)</i>	<i>10 units/ha</i>	<i>37 units/ha</i>	<i>74 units/ha</i>	<i>cultural heritage</i>	<i>connections</i>
	20%	5	50	185	369		

Qualities	A large portion of this site currently lies within an environmental reserve associated with a tailings pond from the former minesite. With the remediation of the minesite, this site may eventually be suitable for development, and become part of a District.
Distribution	The site is located at the boundary of Zone A and Zone B and as such is not yet an integral part of a developed District.
Connections	There are several informal trails used year round.
Quantities	A large portion of the site could be developed without reducing Natural Area Site area below targets set in this Strategy.

Site Identification	<p>Site # 33 Site Name Tommy Forrest Outcrop (infill) District # D9 District Name Sisson Court/ Taylor Road Land Area (m²) 36,618 Site Type Local Zoning PR Authority municipal</p>	
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Landscape Information	<i>Description</i>							
	<i>Total Area (ha)</i>		3.66					
	% area by Landcover Classification and Slope							
	<i>water</i>	<i>exposed rock</i>	<i>deciduous trees</i>	<i>coniferous trees</i>	<i>wetland and tall grass</i>	<i>short vegetation & grass</i>		<i>slope over 15%</i>
	0%	44%	27%	13%	7%	1%		
<i>pavement</i>	<i>buildings & disturbance</i>	<i>gravel and disturbance</i>					13%	
4%	1%	3%						

Protection	<i>Recommended Zoning</i>							
	NP							
	High Level of Protection when 100% in any one condition							
<i>lake, wetland or shoreline</i>	<i>site within environmental setback</i>	<i>steep slopes</i>	<i>combination of previous</i>	<i>only site in District AND less than 10%</i>	<i>needed to provide access or area target</i>	<i>not available to City for development</i>	<i>marginal development potential</i>	
					50			

Development Potential	site capacity (housing units)					development conditions		
	<i>% developable</i>	<i>area useable (ha)</i>	<i>10 units/ha</i>	<i>37 units/ha</i>	<i>74 units/ha</i>	<i>cultural heritage</i>	<i>connections</i>	
	50%	2	18	68	135			

Qualities	It is bounded on three sides by single detached dwellings, and provides them with a significant amenity.
Distribution	This site is one of four sites located in the same District.
Connections	A well used pedestrian route runs across the western edge of the site.
Quantities	A portion of this site could be developed without reducing the natural area within the district below the 10% target, if the other sites are left in a natural state

Site Identification	<p><i>Site #</i> 34 <i>Site Name</i> CBC Outcrop <i>District #</i> D9 <i>District Name</i> Sisson Court/ Taylor Road <i>Land Area (m²)</i> 23,301 <i>Site Type</i> Local <i>Zoning</i> NP <i>Authority</i> municipal</p>	
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Landscape Information	<i>Description</i>							
	<i>Total Area (ha)</i>		2.33					
	% area by Landcover Classification and Slope							
	<i>water</i>	<i>exposed rock</i>	<i>deciduous trees</i>	<i>coniferous trees</i>	<i>wetland and tall grass</i>	<i>short vegetation & grass</i>		<i>slope over 15%</i>
	0%	65%	6%	15%	8%	0%		
<i>pavement</i>	<i>buildings & disturbance</i>	<i>gravel and disturbance</i>					38%	
2%	1%	4%						

Protection	<i>Recommended Zoning</i> NP							
	High Level of Protection when 100% in any one condition							
	<i>lake, wetland or shoreline</i>	<i>site within environmental setback</i>	<i>steep slopes</i>	<i>combination of previous</i>	<i>only site in District AND less than 10%</i>	<i>needed to provide access or area target</i>	<i>not available to City for development</i>	<i>marginal development potential</i>
					50			

Development Potential	site capacity (housing units)				development conditions		
	<i>% developable</i>	<i>area useable (ha)</i>	<i>10 units/ha</i>	<i>37 units/ha</i>	<i>74 units/ha</i>	<i>cultural heritage</i>	<i>connections</i>
	50%	1	12	43	86		

Qualities	A City pumphouse is located on one corner of the site and it provides a significant amenity to a number of single detached dwellings along its border. The edge of the site along Reservoir Road is the steepest area of the site. The site provides a visually significant natural border along Franklin Avenue.
Distribution	This site is one of four sites located in the same District.
Connections	No significant trails providing alternative transportation routes.
Quantities	A portion of this site could be developed without reducing the natural area within the district below the 10% target, if the other sites are left in a natural state.

Site Identification	<p><i>Site #</i> 35 <i>Site Name</i> Taylor Road/Sissons Court <i>District #</i> D9 <i>District Name</i> Sisson Court/ Taylor Road <i>Land Area (m²)</i> 59,368 <i>Site Type</i> Local <i>Zoning</i> GM & NP <i>Authority</i> municipal</p>	
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Landscape Information	<i>Description</i>							
	<i>Total Area (ha)</i>		5.94					
	% area by Landcover Classification and Slope							
	<i>water</i>	<i>exposed rock</i>	<i>deciduous trees</i>	<i>coniferous trees</i>	<i>wetland and tall grass</i>	<i>short vegetation & grass</i>		<i>slope over 15%</i>
	0%	55%	20%	14%	10%	0%		
<i>pavement</i>	<i>buildings & disturbance</i>	<i>gravel and disturbance</i>					16%	
0%	0%	0%						

Protection	<i>Recommended Zoning</i> NP/SS							
	High Level of Protection when 100% in any one condition							
	<i>lake, wetland or shoreline</i>	<i>site within environmental setback</i>	<i>steep slopes</i>	<i>combination of previous</i>	<i>only site in District AND less than 10%</i>	<i>needed to provide access or area target</i>	<i>not available to City for development</i>	<i>marginal development potential</i>
							50	

Development Potential	site capacity (housing units)				development conditions		
	<i>% developable</i>	<i>area useable (ha)</i>	<i>10 units/ha</i>	<i>37 units/ha</i>	<i>74 units/ha</i>	<i>cultural heritage</i>	<i>connections</i>
	50%	3	30	110	220		

Qualities	Primarily exposed rock, the site currently separates a medium density housing development from a school site with limited access from Franklin Avenue
Distribution	This site is one of four sites located in the same District.
Connections	
Quantities	A portion of this site could be developed without reducing the natural area within the district below the 10% target, if the other sites are left in a natural state.

Site Identification	<p><i>Site #</i> 36 <i>Site Name</i> Fire Hall Outcrop (infill) <i>District #</i> D9 <i>District Name</i> Sisson Court/ Taylor Road <i>Land Area (m²)</i> 20,148 <i>Site Type</i> Local <i>Zoning</i> PS <i>Authority</i> municipal</p>	
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Landscape Information	<i>Description</i>							
	<i>Total Area (ha)</i>		2.01					
	% area by Landcover Classification and Slope							
	<i>water</i>	<i>exposed rock</i>	<i>deciduous trees</i>	<i>coniferous trees</i>	<i>wetland and tall grass</i>	<i>short vegetation & grass</i>		<i>slope over 15%</i>
0%	77%	5%	11%	6%	1%			
<i>pavement</i>	<i>buildings & disturbance</i>	<i>gravel and disturbance</i>					2%	
0%	0%	0%						

Protection	<i>Recommended Zoning</i>							
	NP/SS							
	High Level of Protection when 100% in any one condition							
<i>lake, wetland or shoreline</i>	<i>site within environmental setback</i>	<i>steep slopes</i>	<i>combination of previous</i>	<i>only site in District AND less than 10%</i>	<i>needed to provide access or area target</i>	<i>not available to City for development</i>	<i>marginal development potential</i>	

Development Potential	site capacity (housing units)				development conditions		
	<i>% developable</i>	<i>area useable (ha)</i>	<i>10 units/ha</i>	<i>37 units/ha</i>	<i>74 units/ha</i>	<i>cultural heritage</i>	<i>connections</i>
	100%	2	20	75	149		

Qualities	Located between a school site and the firehall, access to the site is limited. The site is primarily exposed rock
Distribution	This site is one of four sites located in the same District.
Connections	There is little evidence that it is used regularly as a pedestrian route.
Quantities	The majority of this site could be developed without reducing the natural area within the district below the 10% target, if the other sites are left in a natural state.

APPENDIX C: Public Consultation Summary

Yellowknife Smart Growth Plan Natural Area Preservation Strategy Public Consultation

Public participation and support is one of the key principles of Smart Growth. The City developed a public consultation plan setting up a sequence of events throughout the course of the Smart Growth project. Formats, venues and organization were determined by the City, and Dillon acted as one of the ‘co-hosts’ of each event alongside representatives of the City, EIDOS Consultants (Urban Design Initiative), and i-TRANS Consulting (Transportation Plan). Our team used these occasions to allow members of the public to provide information, consider information, test assumptions and react to proposals specific to Natural Area Preservation.

Project Start Up Consultation November, 2009

Stakeholder groups were identified by the City as part of the Terms of Reference for this study, and included a broad spectrum of community interest groups. Given the amount of consultation associated with previous studies and plans, our approach was to avoid duplication and build on previous work wherever possible. To begin, we contacted representatives of most of the identified groups in November 2009 to:

- Assess their knowledge about the scope and schedule of the Smart Growth project and ecological component of work
- Acknowledge any previous input into associated studies and reports
- Determine availability and interest in further specific consultation

Many people we contacted reported that their previous feedback on ecological preservation issues was still valid. Others preferred to wait to find out more about the Smart Growth Plan or did not have a specific interest in this study. Stakeholders contacted and their initial responses are summarized below:

Stakeholder Group	Contact Name	Interest in being consulted about Natural Area Preservation
Downtown Enhancement Committee	Jennifer Marchant	Not interested in specific areas at this committee level. Not within scope of their mandate.
Heritage Committee	Catherine Pellerin	Will have representative on Smart Growth Committee
Yellowknives Dene First Nations	Chief Fred Sangris	Not available.
Chamber of Commerce	Ellie Sasseville	Will have representative on Smart Growth Committee

GNWT Department of Transportation	Larry Purka	May be interested in the areas affected by the Hwy #4 alignment - Fred Henne Park and beyond.
Ecology North	Craig Scott or Doug Ritchie	Yes interested in consultation. For future prepare a memo to be sent to ecology north that can be sent to membership so they can contribute on their own basis. Will also have a representative on Smart Growth Committee
Canadian Wildlife Society	Magnus Bourque	Not within mandate to provide any comment on specific sites in the City
Ducks Unlimited	No contact made	
Canada Department of Fisheries and Oceans	Shelly Jepps (Habitat Management Biologist)	Not available
GNWT Environmental and Natural Resources	Ken Hall	Not at this time, will review the Jacques Whitford report and contact if anything comes to mind.
GNWT-Protected Areas Strategy	Michelle Swallow	PAS is interested in providing comments on areas.
Canadian Parks and Wilderness Society	Erika Janes	Not within their mandate. Focus is on larger wilderness conservation
Yellowknife Environmental Science Centre Committee	Gordon VanTighem	Yes- important to consult with group. As plan is being put together for Con Mine site adjacent to Imperial Oil
Transport Canada	Gregory Black Allen Williams	Joliffe Island, Back Bay - Involved in a committee that examined the Houseboats. Should the houseboats all attach to shore, Transport Canada would want to be consulted.
Back Bay Community Association	Dave Jones	Yes- would like to continue to be involved specific site of Back Bay Water front.

Our team then reviewed the available feedback from previous studies, and began to group and classify concerns. We also conducted a review of the local newspaper archives, and Citizen Satisfaction surveys conducted for the City to gain a more comprehensive understanding of public sentiments.

Yellowknife Smart Growth Plan December 4th 2008 Open House

On December 4th, 2008, the City of Yellowknife in collaboration with Dillon Consulting, EIDOS Consultants (Urban Design Initiative), and (i-TRANS Consulting Transportation Plan) held an Open House to present a framework for addressing Yellowknife's growth and development issues including ecological preservation, land-use and development density, urban design, and transportation. A primary objective of the Open House was to present community members with an opportunity to meet the Smart Growth project teams and to raise and discuss issues and concerns about urban growth and development in Yellowknife.



Members of the Dillon Consulting team facilitated discussions about ecological preservation and natural area planning using posters, a graffiti board, maps and individual discussions.

Graffiti Board

Comments compiled from consultation results from past projects and studies related to green space and development sponsored by the City were assembled and displayed as 'graffitti' to elicit further public commentary. Comments shown on the poster included:

- A City that strips away all its natural assets becomes very depressing
- Citizens need open space-especially in winter when darkness and cold already closes us in.
- Neighbourhood green spaces contribute immensely to our sense of place and to our well being
- Provides a balance between densely populated areas and green space
- Provides nature close to home
- City Planning done the "old way" doesn't incorporate the Smart Growth principles
- Not all green space is equal
- Sacrificing green space, especially land already zoned as parks or nature reserves, would be very short-sighted

- How much Greenspace do we need?
- Don't destroy my homeland just to accommodate people who will only live here for a few years.
- Tin Can Hill has exceptional benefit for recreation activities all year round.
- People using Tin Can Hill were always aware it was a possible development area.
- People are deeply attached to natural landscape conserved in green spaces
- Natural areas remind us of where we are and why we are different than other places
- A vision of the natural spaces should be one of our top priorities
- People can take in spectacular beauty as they walk or drive down Franklin
- Privately-owned vacant lots should be a priority for the infill
- Property values and quality of life are directly related to the character of their neighbourhood

Comments from the public in attendance

A selection of photos was placed on a banner just below the Graffiti and people were asked to write any comments that came to mind. As facilitators spoke with people, they also asked people about their reactions/ impressions/ concerns or comments and made note of them.

Comments elicited are grouped under common themes that surfaced that would then be considered in developing policies:

Importance of trails and connections

- Path needs to look inviting - also needs to be easily maintainable for winter use
- Should always have access to green space, but should be more scenic than this (access to Niven lake trail from 47th street)
- Keep trails and access clear
- The Frame Lake trail is one of the crown jewels, not a diamond, of the city!
- More resources invested into providing connectivity on Frame Lake trail
- Trails need to be made for everyone, not just rock climbers
- Make skiing to work a viable option.
- Pedestrian trails in the 'natural' places ie. The routes people walk.
- Trails need to be made for everyone, not just rock climbers
- Not every trail needs to be for everyone - a variety of terrains - variety of trails - diversity and connectivity is key
- Make trails around lake more useable for those who don't want to climb rocks or have accessibility problems
- Yes! Integrate with waterfront trail around Latham Island, and connect with trail along Willow Flats along waterfront of Tin Can hill right to Negus Point
- Exactly. And the bike trail disappears (trail along Old Airport Road)

qualities of natural lands and lakes that are appreciated

- Any view of the lake is good. At night with lights reflecting off the water is also great.

- We enjoy the variety of terrain
- The green and natural rock is beautiful
- Great! Amazing variety of flora and fauna
- Outdoor areas in town are important – you can see ptarmigan, foxes, ravens
- Daily walks through more protected environment – scenic
- The importance of just seeing natural areas – there are stunning view from on top of the hills or from high rise apartment windows
- Niven Lake is a good example/pilot project – some of the concerns with preservation being done properly – changes to user groups and water/drainage patterns can affect the natural areas
- You can preserve natural areas but need to know what for - Seeing Twin Pine Hill from a distance is beautiful, but up close its disgusting – broken glass, abandoned camps and garbage
- There are 3 things a city should do: preserve open space, preserve heritage

Desire to see new development integrated with the natural landscape

- Try and work with the natural topography, but it will require some blasting
- Work with the natural topography, not blast it away
- Would be sad to lose the natural terrain of the north. The unusual topography gives character
- Less blasting please!
- Rather than dominating should be 'building with rock . Developing and building are not the same thing
- Should not go flat please! Design contour utilizing structures
- All our future growth area looks like this (rocky terrain). Just ensure you keep natural pockets of it within each neighbourhood. Some large areas also need to be set aside
- Design for cars. Time for a new 'greener' design.
- Site sensitivity is important (hospital site)
- Parks and connecting trails need to be within each neighbourhood

Distribution and easy access to natural areas is important

- (Tin Can Hill) Must remain as is immediately and easily accessible
- My neighbourhood needs a space for my child to play (Niven area)
- Please keep the green spaces. Keep Twin Pines Hill green!
- I agree - please leave these natural green spaces
- Ensure/increase public access to Great Slave Lake
- Ensure shoreline remains accessible by all
- Keep/restore public access to waterfront. No private ownership of lake front property.
- Better trail required, but yes
- Need better signage
- I like small simple sign (at Back Bay boat launch)
- Outdoor areas in town are important – you can go a couple of blocks and be at a lake

- Parks and connecting trails need to be within each neighbourhood
- Snowmobile access
- Along the road
- Public access points to lakes

higher density and integration of outdoor public space

- I agree with compact; I agree with intensifying downtown density; therefore I agree this is one site ripe for building a nice med-high density, energy efficient apartment/condo building but the treed wild space at southwest end MUST remain untouched (comment about development around Tin Can Hill and Rat Lake)
- These are good examples of a mix (townhouse development around Rat Lake)
- Downtown infill saves tax dollars
- Managed/developed open so that a few users don't spoil it for the rest
- All high density must be interspersed if not surrounded in new subdivisions with open space
- Love this transition photo, especially where you see the green between the areas (new downtown apartment with landscaping including coniferous and deciduous trees)
- Access to outdoor spaces is more important if the city develops more compactly
- Even in low density areas need outdoor public areas
- Need something for everyone – can't have all high density
- If you don't provide open space as part of development you end up spending a lot more to provide it afterwards
- Need to learn from experience – when we build neighbourhoods need to have natural features preserved – we're blessed with a beautiful natural environment
- Should consider potential for increasing density in suburban areas within the 50 year time frame
- Lots of detailed planning is required – people aren't necessarily against development, but need to balance – don't consume all greenspace
- density and open space – easy access for everyday use go together

the existing landscape can be a constraint

- Lots need to be enjoyable and useable - outcrops and natural spaces should be designed first into the green space, not the home owners lot
- Brownfield development potential on Con Townsite

different kinds of open space, green space, natural areas

- Should be 'developed' - not built upon but used better for nature interpretation, trails, tourist info . . . As with Rat Lake (comment about pond in front of Visitor centre)
- Good stuff. (new Civic Plaza)
- Very innovative. (new Civic Plaza)
- More of this around Frame Lake (new Civic Plaza)
- This is spectacular(new Civic Plaza)

- I'm reserving judgement. I didn't like removal of the big trees and replacement with concrete. (new Civic Plaza)
- The usage of this should be studied before any further development. Looks nice though. (new Civic Plaza)
- Ski Club lease area is not being shown on plans

natural areas outside of the municipal boundary (Ranney Hill)

- This area is special (height of land). Also, please let's do compact first before we reach out that far
- Should be protected
- Ranney Hill should be protected as a natural area.
- Protect this with better trail - could be a tourist attraction
- A convention centre at the Yellowknife River would be a beautiful setting

Other general comments about development

- Try to re-instill individualism
- We still have lots of 'old' character. New buildings with character are also being built and should be encouraged
- Mix it up! Try to avoid cookie cutters
- Could be anywhere
- Could increase to encourage shared infrastructure
- Looks citified - could increase green spaces - very sad (photo of townhouse developments)
- Efficient and compact but very generic - nothing unique, appealing or northern (photo of new townhouse developments)
- Limited access due to blocked parking lot area, not very environmentally friendly
- Looks like any southern city
- This is typical development - not everyone will be able to afford extravagance, but this should definitely have to adhere to landscape provisions
- More landscaping would be appreciated
- Beautification bylaws to be created/enforced
- Residential streets should not be too wide - wide as a highway = driving fast
- Planning for seniors – this is a winter city
- Using the bus is important for seniors

Attendance at the Open House

People were asked to put a push pin into maps mounted on foamcore to indicate where they lived – this allowed us to see how many people attended and where they lived.

28 people put a pin in the map during the **daytime** open house session 11:00 to 2:30 compared to 36 people registered on the sign in sheet. People living in all areas of town attended.



20 people put a pin in the map during the **evening** open house session from 4:30 to 8:00 out of 27 people registered on the sign in sheet. The majority of these people lived in the downtown and Old Town areas.

**Yellowknife Smart Growth Plan
Design Charrette/Open House
April 27th-30th, 2009**

In April of 2009, the City held a four-day Design Charrette to provide the public with the opportunity to participate in developing design concepts for future growth and development in the city of Yellowknife.

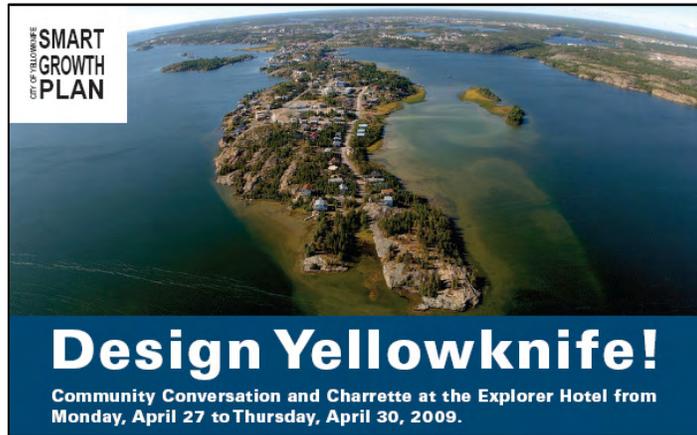
The Charrette was coordinated by EIDOS Consulting Ltd. with input from (i-TRANS Consulting Transportation Plan) and Dillon Consulting (Natural Area Preservation Strategy).

The charrette was organized as a series of workshop sessions over a four day period that focused on developing concepts and strategies for land use and intensification, and urban design, in four key study areas including:

- Old Town
- Downtown
- Old Airport Road
- Tin Can Hill/Con Mine

A range of community members participated in the Charrette including residents, local community representatives and leaders, politicians, specialists from various disciplines, City of Yellowknife staff, and other stakeholders. Participants were encouraged to think of both short term and long term actions and goals that could enhance the way the community grows and develops to accommodate a population of 50,000.

The results of these workshops were documented by EIDOS Consulting in their Report *Design Yellowknife Community Conversation and Charrette (2009)*.



The Charrette objectives are summarized below:

Charrette Objectives

The charrette was envisioned as a means to:

- to bring together a wide range of community members to engage in productive dialogue on the planning of their community;
- to develop community consensus on future development and redevelopment in compliance with the Smart Growth Development Plan;
- to explore issues relevant to the ongoing development of Yellowknife;
- to provide background information, ideas and concepts for productive community use with regard to the ongoing development of Yellowknife;
- to focus on the 4 areas - Old Town, Downtown, Old Airport Road and Miramar Con Mine/Tin Can Hill/Negus Point Area – and develop specific design concepts for each area.

Source: Design Yellowknife Community Conversation and Charrette; EIDOS, 2009

During an introductory session the role of natural areas was identified as one of several key issues for both short term and long term community growth and development.

Ann Peters from Dillon Consulting gave a presentation on Yellowknife’s urban ecology and natural environment. This presentation highlighted the integral role of the natural environment in Yellowknife and identified how it contributes to local well-being, heritage, culture, and identity. It also examined options for promoting sustainable growth, development, and natural area preservation in the community.

Members of the Dillon Team also assisted with group facilitation during the design workshops which commenced on Day Two. which generated public feedback and highlighted issues and concerns for natural area preservation in the four study areas.

Public Feedback

Policies and actions summarized in the EIDOS Report related to natural area preservation included:

- wilderness is integral to Yellowknife’s character and should be preserved and appropriately managed
- the pristine nature of Yellowknife should be actively promoted in the community’s image or brand
- reasonable access to green space should be provided to all residents
- green space should be integrated into both new and existing built-up neighbourhoods
- a range of opportunities for community access and enjoyment of the waterfront should be provided

Specific comments about natural area preservation that came out during the development of design comments for the four identified study areas included:

Study Area # 1: Old Airport Road

- Better linkages are needed from Frame Lake area across Old Airport road to Capital Area
- Preservation of areas adjacent to Stanton Hospital/Frame Lake
- Incorporate green infrastructure
- Encourage active transportation
- Encourage green space development
- Preserve wildlife habitat & corridors

Study Area # 2: Downtown

- Lack of outdoor public spaces that are accessible to all – outdoor spaces should have both summer and winter uses
- Lack of connection with Somba Ke Park – Connect Sombe-Ke Park to Tin Can Hill with green corridor

Study Area # 3: Old Town

- Lack of access, connection and interface with the water
- Lack of protection for sensitive ecosystems (i.e. wetlands at Back Bay and rock outcroppings)
- Develop Joliffe Island as a public park and amenity space, limited development
- Limited public park/amenity space along waterfront and on the lake in the winter
- Formalized boardwalk over wetland areas to protect sensitive ecosystems
- Develop waterfront boardwalk
- Need for protection of existing wetlands and natural areas

Study Area # 4: Con Mine/Tin Can Hill

- Due to reclamation constraints, there is a significant opportunity for green space development with opportunities ranging from a golf course to extensive passive space/active transportation connections
- Rat Lake trail potential
- Environmental protection – direct development densities to appropriate locations
- Tin Can Hill has cultural value to local First Nations and Metis populations
- Maintain access to water
- Transitional green space – the potential Marina
- Provide access to the water – public dock, public access
- Green space development opportunities with active transportation connections
- Improve lakeshore access for public with mix of residential and retain uses
- Recognize cultural significance of the area
- Identify and protect ecologically sensitive areas
- Integration of buildings and landscape with consideration of open space networks

Yellowknife Smart Growth Plan December 3rd 2009 Open House

On December 3rd, 2009 an Open House was held to present work developed following the Charrette by Dillon Consulting (Natural Area Preservation Strategy), EIDOS Consultants (Urban Design Initiative), and (i-TRANS Consulting Transportation Plan). The open house was informal, with poster displays showing the framework of each study, and presenting a hypothetical design concept for Robinson's pond that demonstrated an integrated approach to natural area preservation, urban design, and transportation planning.

CITY OF YELLOWKNIFE

SMART
GROWTH
PLAN



SMART GROWTH OPEN HOUSE

Join the City's Smart Growth Development Plan Committee at their Open House!

- Come see the ideas of Yellowknife residents in action as the results of the Design Yellowknife Community Charrette, held in April 2009, are shared!
- Learn about the strategic framework for the Transportation Plan, Urban Design Initiative, and Ecological Preservation Strategy!

Who: Dillon Consulting, EIDOS Consultants, i-Trans/HDR Consulting and the City of Yellowknife

When: Thursday, December 3, 2009
11:00am – 4:00pm and 6:00pm – 8:30pm

Where: Downstairs Boardroom of City Hall

The Open House will provide the opportunity to view progress to-date, ask questions of the project team, and to provide input on the concepts and strategies. Refreshments will be provided!

If you have any questions on the Open House or Smart Growth planning process please contact 920-5633 or email smartgrowth@yellowknife.ca

The Yellowknife Smart Growth Development Plan is funded by the City of Yellowknife, Federation of Canadian Municipalities, Indian and Northern Affairs Canada, and GNWT Department of Education Culture and Employment.



Indian and Northern Affairs Canada / Affaires Indiennes et du Nord Canada




Green Municipal Fund / Fonds municipal vert



Education, Culture and Employment

Members of each consultant team were available to answer questions.



Public Feedback

Comments related to natural area preservation or the integrated design concept made by members of the public included:

- Wouldn't the next phase of Niven Lake be a better demonstration project for smart growth, rather than a very hypothetical far-off development around Robinson's Pond? Why are we not doing smart growth at Niven Lake?
- We need some incentive for smart growth to happen – too many under-developed lots & buildings in downtown core (and too many large surface parking lots) – we need to change tax structure to promote downtown development instead of peripheral 'big boxes'. Tax land (or frontage), not development – otherwise we're just encourage the status quo.
- Yellowknife has a wonderful & extensive network of paths & trails that are 'off the map' – unofficial & ignored by planners, e.g., trails between Frame & Jackfish Lakes, plus old & well-used trails that have been destroyed by Niven Lake development. 'You don't know what you've got till it's gone'.
- A few trees are not to blame for high housing cost!
- There are lots of good examples of this stuff – let's make it happen.

Yellowknife Smart Growth Plan Final Public Forum

A final public forum is now planned for June 14, 2010 where final reports will be presented to members of the public along with the Smart Growth Plan Recommendations report prepared by the City.

APPENDIX D: Background Research and Precedents

Precedent Review

To help create the Yellowknife Natural Area Preservation Strategy, a review of precedents was undertaken to identify decision making frameworks in use in other communities. The following jurisdictions and approaches were identified for the precedent review:

- Burnaby, BC – Green Zone Lands
- Coquitlam, BC – Green Spaces (policy)
- Edmonton, AB – “Conserving Edmonton’s Natural Areas” (study)
- Guelph, ON – Natural Heritage Strategy
- High River, AB – Open Space Plan
- Ottawa, ON – Greenspace Master Plan
- Sudbury, ON – Parks, Open Space, and Leisure Report
- Toronto, ON – Ravine By-law
- Vernon , BC – Environmental Area Strategy
- Victoria (Capital Region), BC – Green and Blue Space
- Winnipeg, MB – Ecologically Significant Natural Lands Strategy & Policy
- Waterloo, ON – Environmental Strategic Plan

Burnaby, BC – Green Zone Lands

For many years, Burnaby has recognized the need to anticipate and prevent environmental problems, protect the integrity of ecological systems, and find a sustainable balance between the natural environment, the economy and community livability. The conservation and protection of green space is an important community value that is incorporated within the City's Official Community Plan.

The Environmental Framework is outlined in two frameworks: "Environmental Policy Framework" and "Environmental Regulatory Framework". These frameworks recognize that environmental stewardship cannot be created through City land use regulation alone. It will happen through a range of approaches that include an ecosystem and watershed planning perspective, investments in park and conservation areas and public works, partnerships and land use regulation.

The City's Environmentally Sensitive Areas (ESA) are included in the designated Green Zone lands. Planning and design principles for ESAs include: linking ESAs and green space into a network; maintaining larger continuous public open spaces; preserving ecological continuity; encouraging protective zoning of parklands; achieving a zero net increase in run-off and avoiding degradation of water flowing into the City's three major watersheds; controlling construction damage to sites; planting of native materials; protecting micro habitats; and, recognizing and preserving ecological functions.

The Environmental Regulatory Framework focuses on the role that the City and other agencies will assume reflecting legislation and Council adopted by-laws and policies. These will support environmental stewardship in areas such as aquatic habitat protection, erosion and sediment control, vegetative protection and management, air quality, noise, agricultural and contaminated sites management.

Coquitlam, BC – Green Spaces (policy)

Providing for a compact, complete community by nature involves maintaining the health of Coquitlam's natural environmental resources. These include forested lands, grasslands, rivers, streams, and a diversity of plant, fish and animal life. To provide for continued community sustainability, efforts to protect environmental health are intended to be comprehensive. They are also intended to be integrated with community, social and

economic values, and recognize that no one element is absolutely achievable at the expense of another.

Natural areas within Coquitlam form part of its character, while providing important habitat for fish, birds, wildlife, and a diversity of plant life. They also ensure human health and community livability. At times there are competing community expectations for how these lands will be used to meet different needs. Making appropriate choices poses both challenges and opportunities to the City, its residents, landowners, businesses and other government agencies.

Coquitlam has committed to help prevent regional urban sprawl by providing locally for compact, complete communities. This commitment is balanced with the desire to preserve selected green space nearby. In achieving this balance, Coquitlam has committed to protecting Green Zone lands, largely consisting of City and Regional parks. There are other lands that contribute to the City's open and natural character, and an opportunity exists for such assets to complement the Green Zone. The approach for managing such assets must recognize the competing needs of wildlife; birds and their respective habitats; private property ownership; legal commitments already made through land use designations; and community needs for additional institutional, employment, service, leisure facilities and recreational areas.

While Coquitlam has a key role in managing local areas of environmental significance, it recognizes that its activities and procedures must respect and complement those of neighbouring municipalities and senior levels of government.

Edmonton, AB – “Conserving Edmonton’s Natural Areas” (study)

The rapid pace of residential and industrial land development within the City of Edmonton over the past few decades has dramatically altered the City's natural landscape. Concern over the loss of remaining natural areas led Edmonton City Council and the Administration to begin taking steps in the early 1990s to conserve some of these sites. These steps included an inventory of environmentally sensitive and significant natural areas and the passing of Policy C-467 (Conservation of Natural Sites in Edmonton's Table Lands). Policy C-467 directed the Administration to conserve natural sites by encouraging voluntary conservation and corporate and private sponsorship of

natural sites, by facilitating natural site conservation through the planning and development process, and by promoting increased awareness about conserving natural areas.

Although these efforts have resulted in the conservation of a number of sites within the city, the loss of the Little Mountain Natural Area in the late 1990s highlighted deficiencies in the implementation of the existing policy framework and prompted City Council to direct the Administration to identify more proactive measures for implementing the Policy.

The Conserving Edmonton's Natural Areas Study was completed with a focus on developing an approach that could achieve tangible evidence of successful natural area conservation within the next two years. Both the City of Edmonton and the Alberta Environmental Network view this as an initial step in a longer-term process of conserving important components of Edmonton's natural heritage.

Elements of the Recommended Natural Areas Conservation Strategy:

- ❖ The Role of the City of Edmonton: Although Edmonton's environmental community is providing the impetus for change, it is recognized that the ultimate success of natural area conservation initiatives will depend on the City's willingness to implement a meaningful conservation program and to work with the development industry in overcoming current obstacles to natural area conservation.
- ❖ Partnerships and Community Participation: Although the City must take a leadership role, it understands that it cannot do the job on its own. Natural area conservation should be viewed as a collaborative effort within the community. Civic leadership should provide the catalyst for change with the development industry and the environmental community becoming 'partners in conservation'.
- ❖ The Need for a Green Spaces Master Plan: A need exists for an overall plan that would translate the City's goals and policies for natural areas into a clear vision that balances future development and conservation needs. It is recognized that this type of

plan may be essential if the goal is to develop an interconnected network of sustainable natural areas rather than to simply conserve a handful of sites scattered across the city.

- ❖ The Role of a Conservation Land Trust¹: It has been recognized that a need exists for a mechanism that would provide flexible options for persons or organizations that wish to sell or donate land for conservation purposes, that would enable a quick response to conservation opportunities, and that would provide a vehicle for generating funds through various partners. Holding conserved natural areas in a land trust was viewed as a viable possibility because conservation land trusts are created expressly to hold and manage conserved natural lands. As a result, they may provide a more effective vehicle for stewardship of retained natural areas. They may also be viewed by some as providing greater long-term security for conserved sites, since they are less likely to be influenced by political changes.

Guelph, ON – Natural Heritage Strategy

As a first step towards implementing the City of Guelph's Environmental Action Plan (2003), Guelph initiated a process for developing a City-Wide Natural Heritage Strategy (NHS). The first phase of this process involved determining what makes local natural areas significant and identifying priority terrestrial features (i.e., dryland as opposed to wetland and aquatic features). The City sought input from the Guelph community in the early stage of the process and during the Smart Guelph consultations (2002-2003); a greener, non-polluted environment with connected natural areas was identified as the highest priority in the community's vision for Guelph.

Guelph's NHS intends to:

1. Ensure the protection of Guelph's natural areas and identify opportunities for enhancement of these areas while still accommodating development within the City;

¹ Conservation land trusts are private, charitable organizations whose primary role is to protect land under their stewardship from undesirable change.

2. Protect and enhance Guelph's natural areas to benefits everyone (among other benefits, Guelph identified that natural areas provide habitat for native flora and fauna, help maintain and improve air, soil and water quality, replenish aquifers that supply drinking water and feed Guelph's lakes and rivers, help protect properties from flooding, help moderate extreme temperatures, and provide passive recreation opportunities);
3. Lead to a better understanding and assessment of the City's remaining natural areas, in order to help determine priorities and management needs, and continue to improve development guidelines.

The NHS builds on past and current initiatives to protect and enhance Guelph's natural areas, such as: areas designated as provincially significant by the Ontario Ministry of Natural Resources; areas under the jurisdiction of the Grand River Conservation Authority; Greenlands designation and other policies as outlined in the City of Guelph Official Plan (2001/June 2002); the City's naturalization program; and, the many voluntary initiatives undertaken by organizations and individuals within the City.

The NHS consists of seven interrelated components:

1. Mapping and inventories of existing natural features;
2. Mapping of potential expansion and linkage areas;
3. Determining priority areas for protection and enhancement;
4. Education and other resources to support protection, enhancement and management/stewardship;
5. Improved guidelines for development;
6. Policies and by-laws as needed; and,
7. Monitoring of natural areas.

High River, AB – Open Space Plan

In order to preserve the character and quality of the town and town life in the face of future changes in High River’s urban structure and new development, a study was commissioned to provide principles and guidelines for town development that would recognize the importance of parks, streets and open spaces. A comprehensive plan was developed that considered the river corridor and its associated open spaces as the generating element of ‘green infrastructure’ around which a network of streets, parks and plazas would be conceived.

Green space – streets, parks and other open spaces – constitute the first level of town infrastructure in High River: it provides the setting for social and civic life, helps define the character of High River, and contributes to its quality way of life. The plan indicates that green space should not be created by default or from leftover land, or simply be a by-product of development.

The plan is also a comprehensive source of policy on open space, as well as a guide for its acquisition, development and use. Public education and stewardship are important aspects of the plan in High River, which will help to ensure that the open space resources are managed well in perpetuity.

Ottawa, ON – Greenspace Master Plan

With a population projected to increase by almost 50 per cent by 2021, the City of Ottawa believes that it will be hard-pressed to maintain the high standards of the past as new neighbourhoods are built and established ones redevelop.

The purpose of the Greenspace Master Plan is to express City Council’s vision for greenspace in the urban area and set policies for how this vision can be pursued over the next three years and beyond. That vision is firmly rooted in the principles that Ottawa residents expressed in 2001 when they developed the Ottawa 20/20 plans to manage the city’s future growth: as the city grows, there is to be an adequate supply of greenspace, accessible to all residents; it will be linked, to allow for movement through green corridors, and it will be high quality and sustainable, minimizing the need for human intervention and public spending.

The vision in the Ottawa Greenspace Master Plan Council’s is broad and takes in a continuum of lands, ranging from waterways and remnant woodlands to manicured downtown pocket parks. It also includes lands that are not usually considered as greenspace, such as stormwater management ponds and other infrastructure lands, plus the landscaped lands around major institutions and business parks. One of the major accomplishments of the Greenspace Master Plan is that it inventories all the greenspaces in the urban area and shows which spaces are the most valuable in terms of their contribution to natural lands or open space and leisure uses.

Building on the land inventory, the Urban Greenspace Network is a continuum of natural lands and open space and leisure lands that in time could connect every home in Ottawa to a larger network of greenspace that spans the urban area.

The Greenspace Master Plan proposes that the City conduct many of its day-to-day municipal functions with a view to expanding the amount of greenspace, increasing its quality, and enhancing residents’ access to it. For example, it proposes that in fulfilling its responsibilities for land use planning, the City pursue its greenspace objectives through official plan policies and the zoning by-law, and by setting targets for greenspace and ensuring these are met through plans for new and redeveloping communities.

Through the development review process, the City believes that it can pursue landscaping and open space features that support a high quality of urban design. As a builder of public works and infrastructure, the City believes that it can ensure that projects such as stormwater management ponds and other infrastructure contribute to greenspaces by incorporating pathways or providing natural habitat. Furthermore, the city can manage its own natural land wisely and evaluate whether surplus land has a greenspace contribution before releasing it for sale.

The Greenspace Master Plan suggests that the City can partner with local communities to prepare management plans for natural areas and with the federal government and others to achieve common goals. It can commit to acquiring greenspace using established criteria and a public process, and it can explore alternatives to acquisition.

Sudbury, ON – Parks, Open Space, and Leisure Report

Residents of Greater Sudbury show great pride in the natural environment and their love of an active lifestyle. Parks, open space, and leisure facilities contribute to the social, cultural, and economic well being of Greater Sudbury residents and enhance their overall quality of life. The primary objective of the Parks, Open Space, and Leisure Report is to ensure that these elements are protected and enhanced through Official Plan policy.

Sudbury believes that its natural environment presents tremendous opportunities for new parks and trail development and as more and more land is restored to its natural state (the impact of forestry and mining activities on Sudbury’s natural environment are being remediated by “re-greening” efforts undertaken by various levels of government resulting in approximately 8 million trees planted since 1978). The strategic directions for parks, open space and leisure policies that will be incorporated into an updated Official Plan include:

- a) Environmental stewardship and the development of healthy communities should be reflected as top priorities and appropriately supported in policy;
- b) Strong policies should be developed for the restoration, protection, and enhancement of natural areas;
- c) Policies should be developed that encourage the integration of open spaces into the City’s parks system, especially those that provide connections to other parks, trails, water bodies and scenic vistas. The development of a framework for the systematic evaluation of open space should be recommended;
- d) The Official Plan should recognize the role that lakes such as Ramsey, Nephawin, Whitewater, Vermilion, Fairbank, Wanapitei and other lakes play in the environmental, recreational, social, and economic health of the City. Public access to shorelines of major lakes should be maintained and/or secured;
- e) Encourage the protection of privately-owned open space. The “Private Open Space” designation should be preserved, with the caveat that this designation does not necessarily mean that such lands are public-accessible;
- f) Public and private “Open space” should be defined terms and should be separate from the “Parks” designation; and,
- g) There is a need to link parks and open space policies to the Natural Heritage policies.

Toronto, ON – Ravine By-law

The many rivers, streams and creeks that form the network of ravines throughout Toronto are woven into the City's landscape. They are the foundation of the city's natural heritage, a preserve where the majority of native plants and animals reside. Ravines also incorporate important ecological, geological and hydrological functions.

The Ravine Protection By-law, passed by Toronto City Council on October 3, 2002, is a tool to protect features (trees and landform) and functions (ecology and hydrology) of the ravine system by encouraging environmentally responsible management. The Ravine By-law replaces previous ravine by-laws and expands the area of protection to the entire city. The city sees the Ravine Protection By-law as emblematic of its interest in promoting good stewardship.

The city defined the ravines firstly by all areas previously protected by a ravine by-law and all areas regulated for flooding purposes by the Toronto and Region Conservation Authority (TRCA). The smaller ravines have been added where there was a discernible slope with a grade change of two metres or greater. In addition Environmentally Sensitive Areas, Areas of Natural and Scientific Interest, woodlands and public golf courses that are beside ravines were included. The ravine boundary line identifies the edge of the ravine feature, which is not necessarily the same line as the stable top of bank, which indicates (or defines) the limit of flooding or erosion hazard.

If the property of a private landowner is located within or partially within the ravine protection area, the landowner must apply to the City for a permit when undertaking any work that may injure or destroy a tree, or involves placing or dumping fill or refuse, or altering the grade of land. If the property of a private landowner is located in an area regulated by the Toronto Region Conservation Authority, the landowner may also need to obtain a permit from the TRCA, called a fill regulation permit (this would be in addition to a permit from the City). Toronto has dedicated its Urban Forestry Services staff will work with landowners to help identify natural features to protect and, if appropriate, suggest alternative solutions. The city also suggests that private landowners seek expert advice from a forester or landscape architect to improve the natural habitat on their property. If a permit is not obtained from the City before injuring or destroying a tree, or

placing fill or changing the grade, landowners may be convicted of an offence and potentially fined \$10,000 to \$20,000.

It should be noted that the Ravine Protection By-law does not restrict development rights or alter the Official Plan designation or zoning permissions.

Victoria (Capital Region), BC – Green/Blue Space Strategy

In 1998, the Capital Regional District Board of British Columbia adopted the “Framework for Our Future Agreement,” that set out a regional vision derived from the goals of local Official Community Plans and the Regional Green Blue Spaces Strategy. The Framework Agreement’s vision and guiding principles together expressed a desire for a region that would be economically vital, where communities are livable, where the environment and natural resources are stewarded with care, and where residents enjoy a healthy and rewarding quality of life.

One of the eight integrated strategic initiatives of the Regional Growth Strategy included the Regional Green/Blue Spaces Strategy. Key elements of the Regional Green/Blue Spaces Strategy include the protection of a Sea to Sea Green/Blue Belt running from Saanich Inlet south to Juan de Fuca Strait, and the development of an integrated system of parks and trails linking urban areas to rural green space areas.

The Regional Growth Strategy proposes that the CRD, member municipalities and the Province aim to protect a minimum of 100% of the Sea to Sea Green/Blue Belt by 2011, and complete 100% of the Regional Trail network by 2016. A significant part of the proposed Green/Blue Space System is comprised of lands with ecological value of regional significance either in public and private ownership, that are identified as currently unprotected by the Regional Green/ Blue Spaces Strategy. The Regional Growth Strategy proposes that the CRD and member municipalities work together to protect from development, as much as possible, the lands identified as Unprotected Green Space Policy Area.

The Capital Region’s rich marine water and foreshore environments are an equally important part of the proposed Green/Blue Space System. The Regional Green/Blue Spaces Strategy identifies many of these waters and tidal zones as having ecological

value of regional and indeed national significance. These marine areas fall under the jurisdiction of the federal government.

The Regional Growth Strategy proposes that the CRD, member municipalities, and the Provincial and Federal governments work together to protect the ecological integrity of the marine areas identified as Blue Space Core Policy Area.

Winnipeg, MB – Ecologically Significant Natural Lands Strategy & Policy

The City of Winnipeg is located in the heart of a unique natural ecosystem. Centered in the Red River valley on the east edge of the Prairies Ecozone, Winnipeg is home to a great diversity of naturally occurring plants and animals. It is this natural heritage that the character of Winnipeg was built upon and which helps to support the city's uniqueness and quality of life. The City of Winnipeg has committed itself to be a leader in protecting the environment and is reflected in a wide variety of ongoing environmental management activities. Winnipeg prepared the *Ecologically Significant Natural Lands Strategy and Policy* as one of its recent commitments to environmental leadership.

Ecologically Significant Natural Lands (ESNL) are natural heritage sites which the City of Winnipeg has identified as important to creating a vibrant and healthy city which places its highest priority on quality of life for all its citizens. Winnipeg recognizes that the term natural area (NA) is often a general term and is used interchangeably with terms such as natural habitat and natural heritage, and that there is an important to emphasis in the distinction between NA and ESNL: ESNL are natural lands that the City of Winnipeg has protected. Most commonly this protection is accomplished through acquisition and designation as parkland. However, other protection techniques such as Conservation Easements and Ecological Gifts have been utilized.

The inventory of sites was the foundation of the ESNL process as it was the mechanism for identifying the list of natural areas, which were then assessed for the need for protection and management actions. The inventory of natural areas is managed and updated by the Naturalist Services Branch of the City. Winnipeg makes the entire inventory available to the public by request only; however, information about inventoried sites found on city-owned land are made readily available.

The multi-criteria evaluation process employed the model shown on the next page. The process begins with the ESNL categorized as A, B, C or D. Each of these parcels is then assessed on the basis of rarity, quality and ecological services provided to place them in one of the four quadrants of the diagram - I, II, III or IV. This effectively provides a priority rating for the parcel.

CATEGORY OF CRITERIA	CRITERIA	FIT WITH REASONS FOR PROTECTION (pp 3,4 & 5)
Quality	<ul style="list-style-type: none"> • Habitat ranking • Size of area • Current condition • Presence of exotics or invasives • Existence of unique ecological features • Importance as staging area or migration corridor • Connectivity for plants; animal corridor • Riparian zone 	<ul style="list-style-type: none"> • Heritage remnants • Responsibility for sustainability • Promotes sustainability
Rarity	<ul style="list-style-type: none"> • Presence of S1 – S3 species • Amount that is already protected • Deficit or surplus in each area 	<ul style="list-style-type: none"> • Heritage remnants • Responsibility for sustainability • Promotes sustainability
Ecological Services	<ul style="list-style-type: none"> • Carbon sequestration potential • Oxygen production potential • Stormwater retention potential • Influence on micro-climate • Contribute to nutrient retention; contributes to water quality • Contribute to riverbank stability & erosion control 	<ul style="list-style-type: none"> • Environmental benefits • Responsibility for sustainability • Promotes sustainability
Human Interaction	<ul style="list-style-type: none"> • Difficulty of acquisition • Cost to improve or maintain • Effects on value of adjacent properties 	<ul style="list-style-type: none"> • Support economy
	<ul style="list-style-type: none"> • Value for passive recreation • Relative ease of access • Citizen organization to maintain • Buffer between competing land uses 	<ul style="list-style-type: none"> • Health, recreation and community • Human use connectivity
	<ul style="list-style-type: none"> • Size of individual tree • Who planted the tree • Value for passive recreation • Existence of cultural value • Sense of place • Relative ease of access 	<ul style="list-style-type: none"> • Heritage remnants • Defines character • Health, recreation and community • Human use connectivity

Any time a property under review in the planning process has the possibility of NA being present on it, there is a review of any current NA information for that property. If the property has not been assessed in the past and is not included in the inventory it should then be assessed through the natural heritage assessment process and determination of its importance as NA. The planning process will not be considered complete until the assessment has been completed and the determination of NA value made.

The City of Winnipeg, Parks and Open Spaces Division, makes management decisions for ESNL located on City-owned land. It will be the responsibility of the City of Winnipeg to ensure that these areas are managed according to practices stated in this ESNL Strategy. Community based stewardship groups may also take part in the management of these areas on the basis of agreement with the City of Winnipeg. ESNL on public land are inventoried and managed according to this Strategy. The City of Winnipeg hopes to lead by example by preserving and restoring ESNL. The majority of ESNL in Winnipeg is found on City owned lands and it is the responsibility of the City to ensure protection of its natural heritage.

Management of ESNL on private land remains the responsibility of the landowner unless a conservation agreement is in place allowing management by another organization. Conservation agreements for management of ESNL are expected to follow practices as stated in the ESNL Strategy or should be otherwise acceptable management practices for preserving or restoring natural lands. The City of Winnipeg does not designate NA as ESNL on private lands. Instead, it prefers to attempt to work in cooperation with landowners to protect NA using conservation tools.

Waterloo, ON – Environmental Strategic Plan

Since the adoption of “Environment First” strategies and philosophy in 1989, the City of Waterloo has made a concerted effort to ensure that environmental matters are assessed at the forefront of all of its business activities – Development Services, Parks and Works Services, Protective Services, Recreation and Leisure Services, as well as Corporate Services. To remain pro-active and to build upon existing environmental management capabilities, the City of Waterloo identified the need for an Environmental Strategic Plan.

The primary purpose of the Environmental Strategic Plan is to provide a resource to guide and prioritize strategic actions for the environment now and into the future. Air quality, water quality, and access to natural areas represent key quality of life indicators to citizens and are very much a part of the vision for Waterloo. Of the 24 strategic actions in the plan, there is a key strategic action focused on green space.

The City defines green space as woodlands, wetlands, meadows, other naturalized areas and parkland that provide many benefits to the environment, in addition to providing areas for citizens to exercise, play, and relax. The City realizes that in addition to environmental protection, recreation activities and human enjoyment of the environment should also be fostered, and a balance must be found between the two. Four key sub-actions describe potential options for greenspace enhancement and management. They are:

- 1) Create and increase healthy green spaces;
- 2) Enhance, restore, and protect existing green spaces;
- 3) Increase community partnerships; and,
- 4) Monitor terrestrial resources.

The following table summarizes the specific actions that Waterloo will undertake to increase green space health.

Goal: To embrace the Imagine! Waterloo vision about having a “green” city

Strategic Action	Desired Outcome
Create Healthy Greenspaces	<ul style="list-style-type: none"> ▪ Improved natural aesthetics and tree-lined streets ▪ Ecologically healthy buffers along all waterways, wetlands and forests ▪ Increased total greenspace area ▪ Perimeter lot plantings at additional sites (e.g. industrial, commercial)
Protect Existing Greenspaces	<ul style="list-style-type: none"> ▪ Protected woodlots, high quality meadow habitat, and other natural heritage features ▪ Increased linkage between natural areas
Increase Community Partnerships	<ul style="list-style-type: none"> ▪ Increased awareness and resources ▪ Networking between all stakeholders ▪ Increased environmental “mentoring” and stewardship
Monitor Terrestrial Resources	<ul style="list-style-type: none"> ▪ Expanded dataset of baseline data for terrestrial bio-indicators ▪ Greater understanding of point and non-point pollution sources ▪ Accurate knowledge of resources and health of natural areas

Comparison and Synthesis

The following table provides a comparison of the above precedents and a synthesis (recommendations for potential approaches) for the City of Yellowknife Natural Area Preservation Strategy.

		How the Environmental Strategy is Structured		
Jurisdiction	Name of Strategy	Official or General Plan	Comprehensive Strategy	Regulatory Framework
Burnaby, BC	Green Zone Lands	Policy that is established in city's plan		Exists through a variety of related by-laws and development controls
Coquitlam, BC	Green Spaces Policy	Policy that is established in city's plan		
Edmonton, AB	Conserving Edmonton's Natural Areas Study		There is an inherent strategy outlined in the study, although it has not been formally acted upon	
Guelph, ON	Natural Heritage Strategy		(Completion of the strategy is in progress; expected Dec 2008)	Currently offering a basic landowner-optional stewardship program

High River, AB	Open Space Plan		A full-fledged plan that also includes policy changes to be incorporated in the city's plan	Classifies all sites and provides guidelines for each class of site
Ottawa, ON	Greenspace Master Plan		Ultimately this a sub-plan that is implemented by incorporating it into the city's plan	Identifies possible regulatory tools; they have not been formally acted upon
Sudbury, ON	Parks, Open Space, and Leisure Report ²		There is an inherent strategy outlined in the report, although it has not been formally acted upon	
Toronto, ON	Ravine By-law			Standalone regulation with strict protection measures for trees and landforms
Victoria BC	Green and Blue Space	This is a sub-component within the overall regional growth strategy		

² Strategies focussed on 'recreation' were not considered relevant for this precedent review however, the Sudbury work includes a good discussion about stewardship that is relevant to the Yellowknife NAPS

Vernon, BC	Environmental Management Area Strategy			
Winnipeg, MB	Ecologically Significant Natural Lands Strategy & Policy		A standalone strategy that offers overall guidance for management of environmental lands	Identifies possible regulatory tools; they have not been formally acted upon
Waterloo, ON	Environmental Strategic Plan		A standalone strategy that offers overall guidance and specific action plans	Exists through a variety of by-laws and guidelines

APPENDIX E: Implementation Toolkit

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1 Introduction

This Appendix is provided as a supplement to the Natural Area Preservation Strategy to provide a description of tools and procedures that can be used by City Administration to carry out land use planning and development work in accordance with the policies and guidelines included in the strategy. Relevant work is expected to include:

- ❖ The preparation of administrative memos for City Council when requests come forward about the potential to develop a site included in the inventory
- ❖ Establishing the terms of reference for development on sites or portions of sites currently included in the inventory
- ❖ The identification and delineation of new districts for future development

1.1 Implementation Toolkit

A variety of tools have been developed as part of this study that can be used to conduct ongoing analysis in a way that is meaningful and consistent. Although the various components are inter-related, a general description of each tool is provided to clarify the purpose and role they can play in carrying out the Strategy.

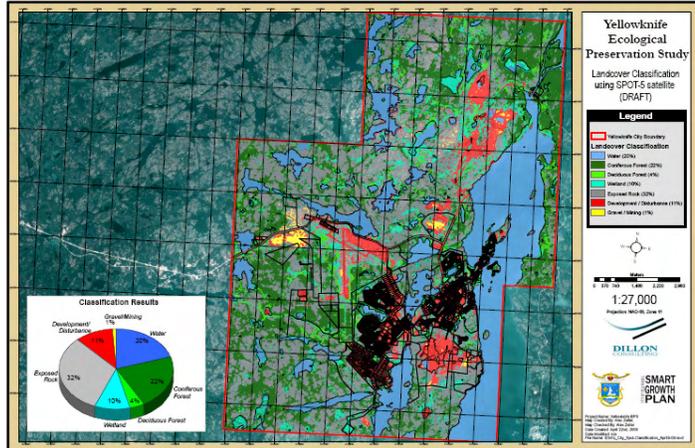
The tools discussed here are dynamic and have been transferred to the City separately on CD or through electronic transfer. Data will need to be updated over time, and protocols for updating information will need to be established and incorporated into the City's existing GIS and administrative information systems.

The value of the tools described here lies in how they can be used to look at the future implications of choices.

2 The Tools

2.1 Landcover Classification

Landcover can be interpreted and classified using satellite imagery allowing areas and ratios of each to be calculated and the information integrated with GIS mapping. Maps can be created to show for any given area the classification and ratios of water, rock, coniferous trees, deciduous trees, wetlands, tall grasses, gravel, buildings and disturbed grounds. Mapping has

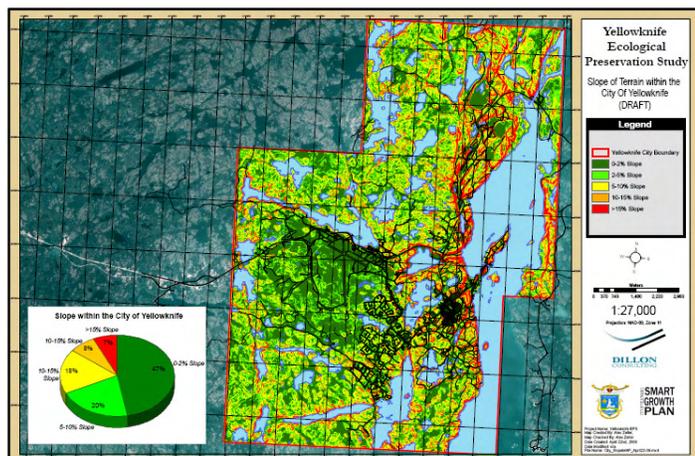


been completed for all lands within the municipal boundary. Because landcover is a good indicator of soil conditions, this information can also be used to understand hydrology and suitability of sites for development.

Note: See Section 5 of this Appendix for explanatory notes about satellite imagery and landcover classification interpretation.

2.2 Slope Information

Topography is critical to understanding the local landscape. Slope analysis can be used to understand what portions of a given site fall within different slope parameters, with 15% being a benchmark indicating slopes normally considered very difficult to develop.



Application of Tools

3.1 Reference Information

When assembling reports or preparing responses to inquiries, City Administration can draw on the data in the inventory and supplement that data with maps created from GIS data.

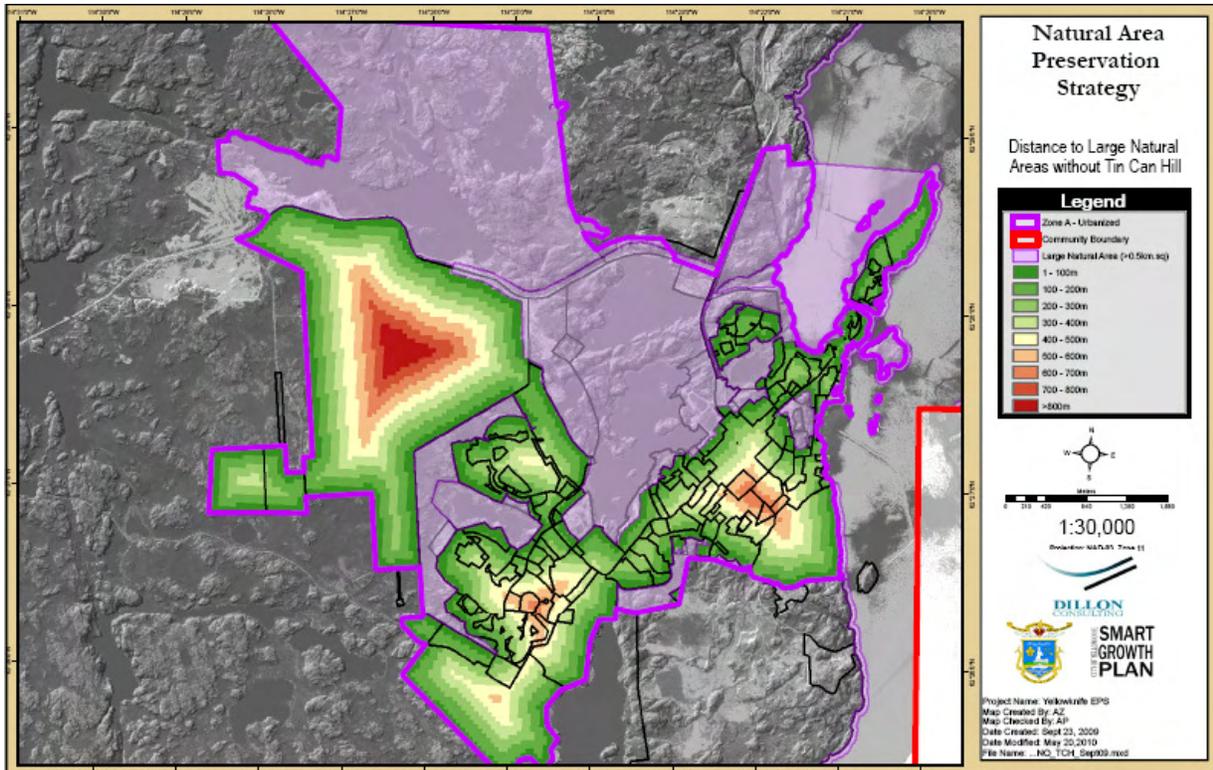
3.2 Site Queries

Information included in the Excel inventory can be used to help develop answers to more general questions about Natural Area Sites:

- What is the total area of NAS in the City?
- How many sites are larger than 50 hectares in size?
- What is the ratio of natural area per 1,000 people in ha?
- What would the ratio of natural area per 1,000 people be if a particular site were removed from the inventory?

GIS mapping can also be used as a means of analyzing conditions and answering questions.

Example: If Tin Can Hill were developed, how would access to major natural areas change?



3.3 Future Site Evaluations

The data displayed in the inventory and mapping provided as part of this study is current to conditions in 2009. By keeping information up to date, the evaluation process developed for this Strategy can be used to monitor and modify protection recommendations as required. Over time it should be anticipated there will be changes to ownership, land authority, environmental reserve status, or even District or site delineations that may affect the site protection recommendations.

3.4 Considering Trade-Offs

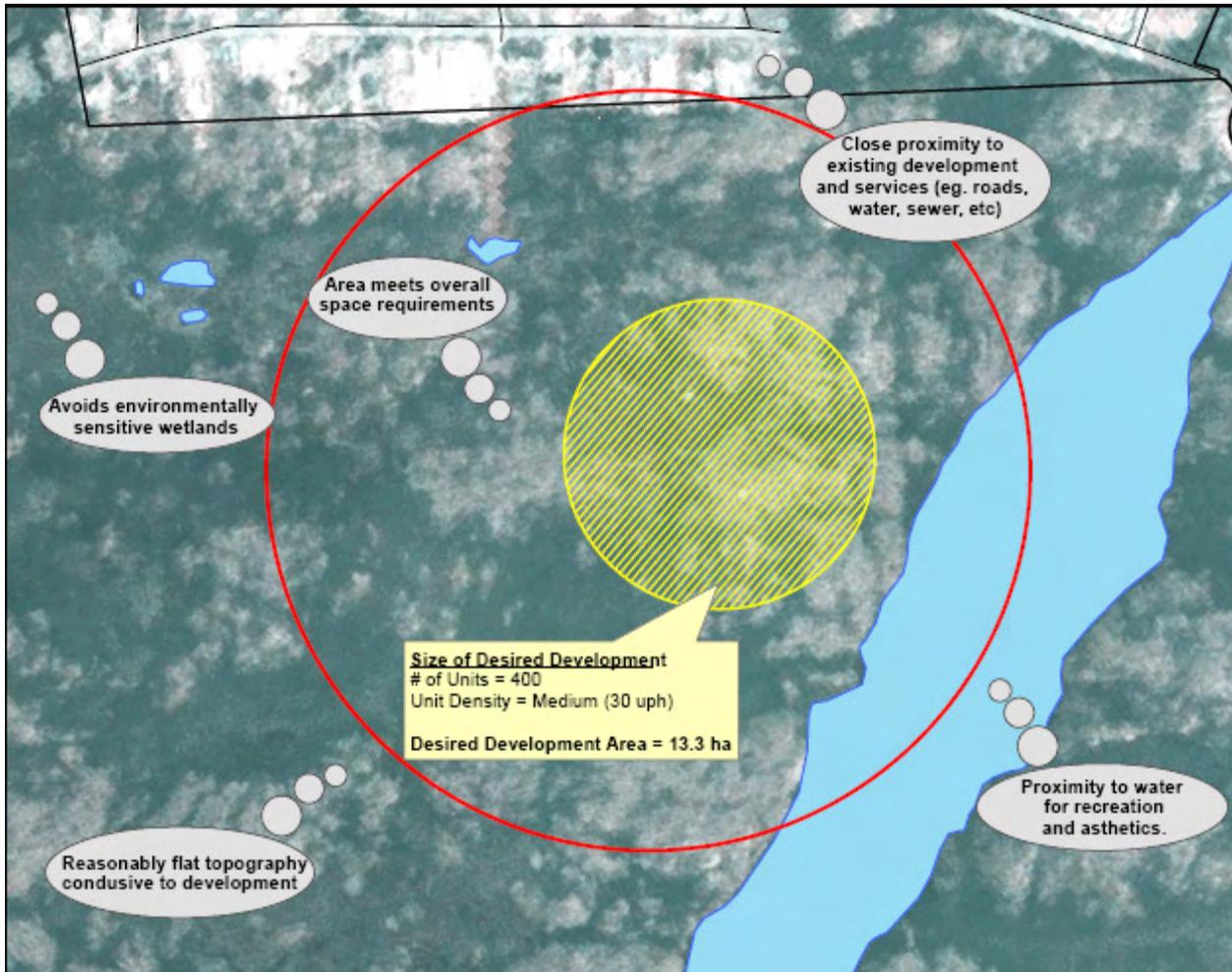
The Excel inventory provides rough calculations of the development potential of each site along with information about natural features that contribute to the urban environment. When considering trade-offs between preservation and development the capacity and potential contributions of each will need to be presented and analyzed. The number of housing units has been used as the indicator of potential using low, medium, and high densities. Although development proposals will not necessarily be residential, this is the largest land use requirement and allows for a common comparator. The table below shows an example of such a calculation.

Site #	Site Name	Area (Ha)	% useable based on slope, zoning, or sensitivity	Area useable (ha)	Example: Estimated Development Potential		
					10 units/ha	37 units/ha	74 units/ha
19	Capital Site	289.43	5%	14.47	145	535	1,071
22	Tin Can Hill	58.05	20%	11.61	116	430	859
37	Gitzel Rock Outcrop	2.69	40%	0.68	7	25	50

This Strategy will be used in conjunction with other components of the Smart Growth Plan, as well as other existing policies and strategies. The tools described here are not intended to be comprehensive, and will need to be used in conjunction with other development data and monitoring tools.

3.5 Assessing Undeveloped Lands

The GIS and landcover classification data will enhance the ability to analyze the natural conditions of potential development sites including growth areas outside of urbanized lands included in Zone A. In keeping with the policy direction of the Natural Area Preservation Strategy, understanding the potential contributions of the natural landscape should play a larger role in the delineation of development sites, and in determining any development conditions.



4 Development Guidelines

General development guidelines for Natural Area Sites, and Exemplary Projects have been provided as part of this Natural Area Preservation Strategy. These general guidelines can serve as an outline, but will need to be modified to suit specific development proposals so that any conditions are relevant to the type and scale of development, and can take into consideration current context.

4.1 Opportunity Assessments

Using Site Specific Zoning as a mechanism will involve determining the legal boundaries of the site as well as setting out development regulations. As a first step, a good understanding of the site opportunities should be developed by the City. Information is available in the tools provided with this Strategy that can be combined with other information sources to develop a site profile, and to identify opportunities as summarized in the table below:

Topic	Data Sources	Opportunities
Existing vegetation	landcover classification and ERI	<ul style="list-style-type: none"> • Provides resilient landscaping, maintains habitat • Indicator of geotechnical conditions.
Connections	site maps produced for this NAS Strategy, the Smart Growth Transportation Study, Ecology North, and found on City Explorer show locations of known trails and alternative transportation routes	<ul style="list-style-type: none"> • natural drainage patterns can be integrated with stormwater system. • Promotes alternative transportation by providing pedestrian access to development taking advantage of established routes • Contribution to value of development by providing easy access to other public spaces or natural features.
Topography	site maps produced by NAS strategy and available from City Explorer	<ul style="list-style-type: none"> • Building footprint can be located to reduce blasting required for servicing or foundations • Areas selected for buildings or surface parking can reduce costs of site preparation and roadways
Orientation and sun/shade	site specific study required	<ul style="list-style-type: none"> • passive heating, seasonal cooling affected by orientation to sun, winds and trees
Views of site	photographs and site visits	<ul style="list-style-type: none"> • Contribution to the urban environment from adjacent public roads or trails, and adjacent properties.
Views from site	photographs and site visits	<ul style="list-style-type: none"> • Contribution to the value of the development
Municipal servicing	Public Works and Services Life Cycle Cost analysis	<ul style="list-style-type: none"> • reduced water and sewer infrastructure costs for compact/clustered development • reduced roadway costs through siting

4.2 Development Conditions

In keeping with policy recommendations, the City may want to work more even more collaboratively with prospective developers than usual to develop a common understanding of how a development can best take advantage of site opportunities, prior to finalizing specific development conditions. Although measurable conditions will need to be in place so that Development Permits clearly set out expectations, innovative design responses will require this more flexible process.

The City may consider using LEED certification as a development condition for larger projects. The use of LEED has several benefits as it is becoming more widely accepted and marketed, and reduces the effort required by City staff to review and evaluate development proposals. The City should however specify that Sustainable Site credits be a prerequisite, rather than optional, to better match the goals of this Strategy.

4.3 Public Consultation

High profile public consultation will be an important part of any strategy to help achieve Smart Growth objectives. Where Natural Area Sites are being released for the development of exemplary projects it will likely be even more important to demonstrate how Natural Area Preservation policies are guiding the project. Copies of site evaluations and development guidelines, including analysis tools used to reach conclusions should be publicly available.

5 Satellite Image Classification and Interpretation

The field investigations and the production of Natural Area Site maps providing landcover classification data represented a substantial part of the work of this study. The information provided here describes the technology used.

The use of satellite imagery to view the earth's surface has become increasingly common with the advent of online image based mapping like Google Earth. This technology has enabled users to visualize the earth's surface and think about the spatial relationships of our landscape. This internet based mapping has enabled the general public to visualize the landscape and rely on our human intuition to understand relationships between objects in the image. And while this intuitive form of interpretation might be perfectly sufficient for most our needs it does not allow any form of quantitative description or analysis. In order to accurately quantify relationships between objects in an image the objects in the image must be refined. We do this by categorizing the image into fewer discrete classes. This was traditionally done by individuals trained in aerial photo interpretation. However with advent of digital imaging in the field of remote sensing, computers can be used to “recognize” similar objects and categorize them into like classes. This is commonly referred to as digital Image Classification.

5.1 Image Classification

Digital Image Classification is perhaps one of the most significant uses of remote sensing data; it has enabled classifying the myriad of individual features in an image into meaningful categories or classes. This classified image then becomes a “thematic map”. These maps can then be used to quantify relationship between classes and other spatial and non-spatial data.

The Yellowknife Natural Area Preservation Study used two different satellite images at two different spatial scales (resolution). The Spot-5 satellite imagery was used for the larger city wide scale, and the Quickbird satellite imagery was used for the smaller downtown core scale.

A maximum likelihood supervised classification was the method used to classify both Spot-5 and Quickbird images. Using this method a few representative samples of land were manually

identified around the city for each of the desired landcover classes. These areas were delineated over the raw satellite images and used to “train” the software on what each class “looks like” (aka training areas). The image was then automatically classified based on the training areas identified during ground truthing. The result is a classified landcover map for the entire study area for both Spot-5 and Quickbird images.

The computer uses a special program or algorithm (of which there are several variations), to determine the numerical "signatures" for each training class. Once the computer has determined the signatures for each class, each pixel in the image is compared to these signatures and labeled as the class it most closely "resembles" digitally. Thus, in a supervised classification we are first identifying the information classes which are then used to determine the spectral classes which represent them.

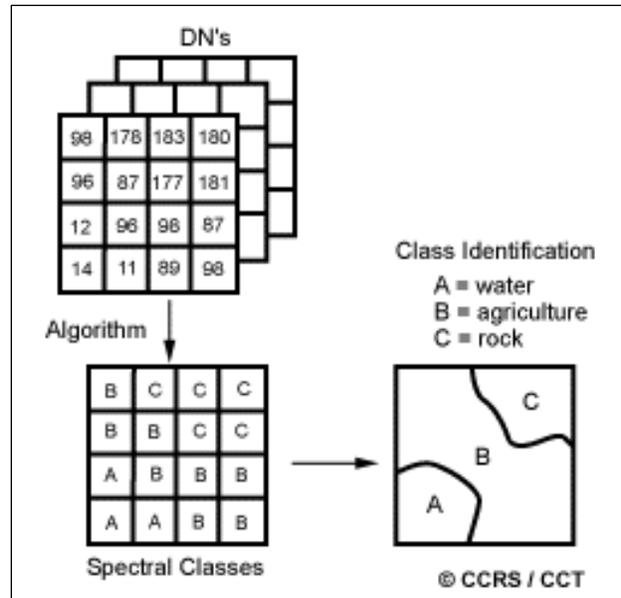


Figure 1: Digital Image Classification Process

5.2 Uncertainty in Remote Sensing

The use of satellite image classification offers several advantages to community and regional planning projects such as this Natural Area Preservation Strategy. It allows for the quantification of landscape features and the ability to quantify the interaction between landcover and other spatial datasets. However, it is important to understand the potential sources for error associated with the digital image classification process.

The very nature of image classification means that some uncertainty is inherent in the process. In ecology, landcover (e.g. vegetation) does not occur in discrete classes; rather it occurs as a gradient across the landscape. Therefore an area that is dominated by a particular landcover is

not necessarily void of other types of landcover. A good example of this can be seen in the photo below taken at the Hospital Rock.

Figure 2: Hospital Rock



The example to the left is a very extreme case, and is easily classified into a majority class (“Exposed Rock”). This concept introduces the first potential source of spatial uncertainty. By classifying the landcover as a majority class the obvious presence of Jack Pine and grasses present on the landscape is ignored. It is therefore important to realize that just because an area

has been classified as a particular class it may have components of other classes as well. Using the “Exposed Rock” example above, components of the “Coniferous forest” (by way of the Jack Pine) and the “wetland/tall grasses” class (by way of the grasses) can be identified.

Another source of spatial uncertainty encountered when using this classification process is the potential mis-classification due to spectral similarity between objects. Landcover which ‘looks’ the same to the computer (i.e. has the similar digital numbers) might be misclassified. The Figure on the next page highlights this issue.

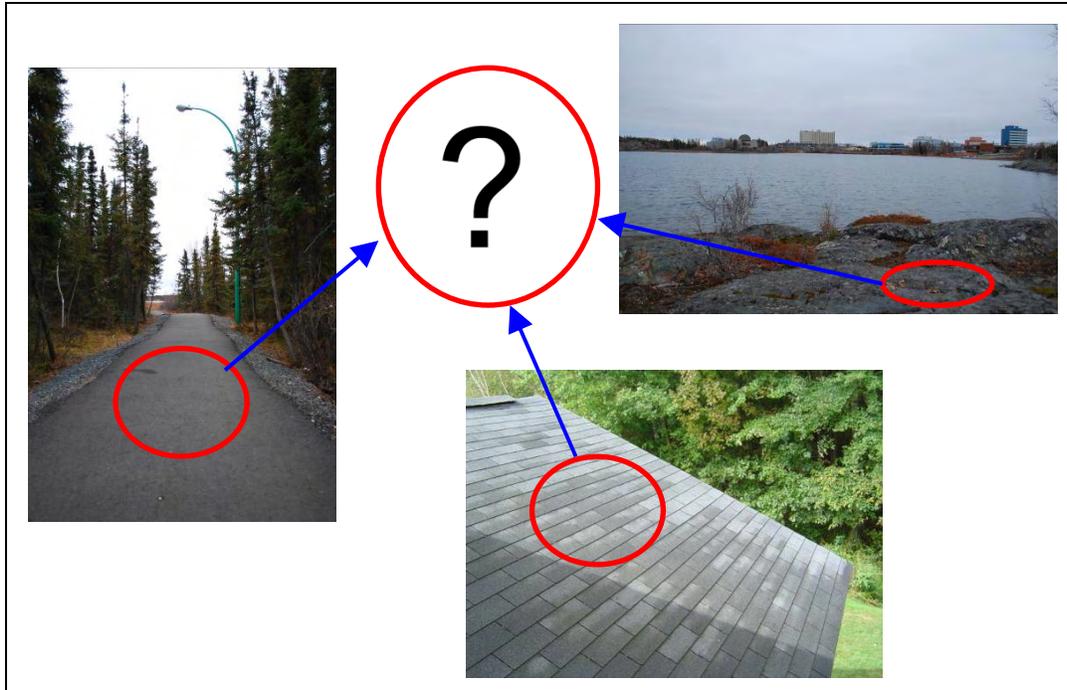


Figure3: Similarity in spectral reflectance between landcover classes

Where as the human brain uses both colour and texture differentiate objects, the computer software used in this study only uses the colour of the object. So in this example; “Pavement”, “Exposed Rock”, and “Buildings” all have a very similar spectral reflectance and therefore might ‘look’ the same to the computer. This issue is mitigated somewhat by using imagery which has several bands of colour (red, green, blue, near-infrared, etc.) This allows the software to increase the spectrum of colours used to differentiate one object from another. However, some amount of error will always be present in this form of digital image classification.

5.3 Advances in Remote Sensing

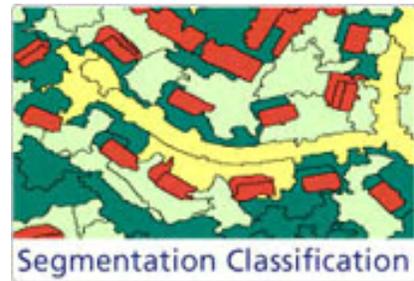
As with other technologically advanced disciplines the field of remote sensing and satellite image processing is rapidly evolving. Within the past two years a number of technological advances have taken place. The most significant of these and pertinent to this study have occurred in two primary areas; satellite sensors, and the image processing software.

Modern satellite based sensors with high spatial resolutions are continuously evolving and improving. While the commercially available imagery still lags behind military satellite imaging, the margin is significantly narrower. At the time the Yellowknife Natural Area Study began in

late 2008 the most modern commercially available satellite sensor suitable for this study was the Quickbird-2 satellite. Two years later the new Worldview-2 satellite was launched and has dramatically advanced the potential capabilities over the Quickbird satellite. The primary difference between the two satellites is the additional 4 spectral bands on the Worldview-2 sensor. This advancement will enable the user to produce more extensive image classifications with a greater number of spectral classes. In simple ecosystems, like the boreal forest, it may even be possible to classify individual species and land cover types within an image.

The other major advancement we have seen in the past several years has come from the software developers. The software used in the Yellowknife Natural Area Study was the IDRISI Andes suite. The recent upgrade to this software includes a new image classification function which creates an image of segments that are spectrally similar. This method of image classification would produce a result that is much easier to interpret and is conceptually very similar in ‘look’ to the majority of the manual image classifications most people are used to seeing.

The image to the right is an example of the results from using Segmentation Classification to classify an image.



It is impossible to predict exactly what advances in technology will bring to the field of remote sensing and image processing in the next ten to twenty years. Without a doubt the technology will become more widely used and will likely become integrated into many disciplines.

Conclusion

The application of satellite image classification can be used to shed light on a number of spatial questions in regional and open space planning studies. However, the users of such classifications should be aware of the potential sources of uncertainty discussed above when interpreting data. The digital image classifications completed for the Natural Area Preservation Strategy has proven to be well within acceptable levels of accuracy. Any observed mis-classifications should not inhibit the interpretation of the classification or limit its intended use.

APPENDIX F: References

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