Heidi Wiebe

From: Evelyn Gah [mailto:Evelyn_Gah@gov.nt.ca]
Sent: Tuesday, January 18, 2011 5:24 PM
To: Heidi Wiebe
Cc: Karen Hamre; Michael Palmer; Claudia Haas
Subject: Follow up from Nov 19th mtg - what drives areas consistently selected >90% of the time in Sahtu ERS

Hi Heidi,

in the PAS Science Team's comments on the Draft 3 of the Sahtu Land Use Plan, we pointed out that there a number of areas that the Marxan computer program conistently selects >90% of the time, regardless of which areas are locked into a scenario. The Science Team suggested that these areas, that are deemed "irreplaceable" and that are currently not captured by any existing or proposed protected areas or draft conservation zones, would be a good starting point to increase ecological representation in the Sahtu.

At the follow-up meeting with you end of November 2010, you asked us to provide more information on what drives Marxan to consistently select these areas more than 90% of the time, regardless of which scenario is run.

I looked into this in more detail and have summarized my findings. Attached is a map that shows areas that Marxan consistently selects. Also attached is a write-up of which features drive the selection of these areas and which other features (that aren't necessarily drivers) are captured by these areas.

While the areas outlined in blue on the map consistently get selected in every Marxan run, regardless of which areas are locked in, the description of the percentage of representation goals already met is based on an August 2010 Marxan run that locks in all currently existing and proposed protected areas, Gwich'in LUP conservation and heritage conservation zones (CZs), Sahtu Land Use Plan (LUP) draft3 CZsand PCIs and Dehcho draft LUP CZs.

This analysis will hopefully help to better understand the importance of these areas for increasing ecological representation in the Sahtu.
Please let me know if you have any questions.

Thanks,
Evelyn

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Ecological Representation in Sahtu Ecoregions

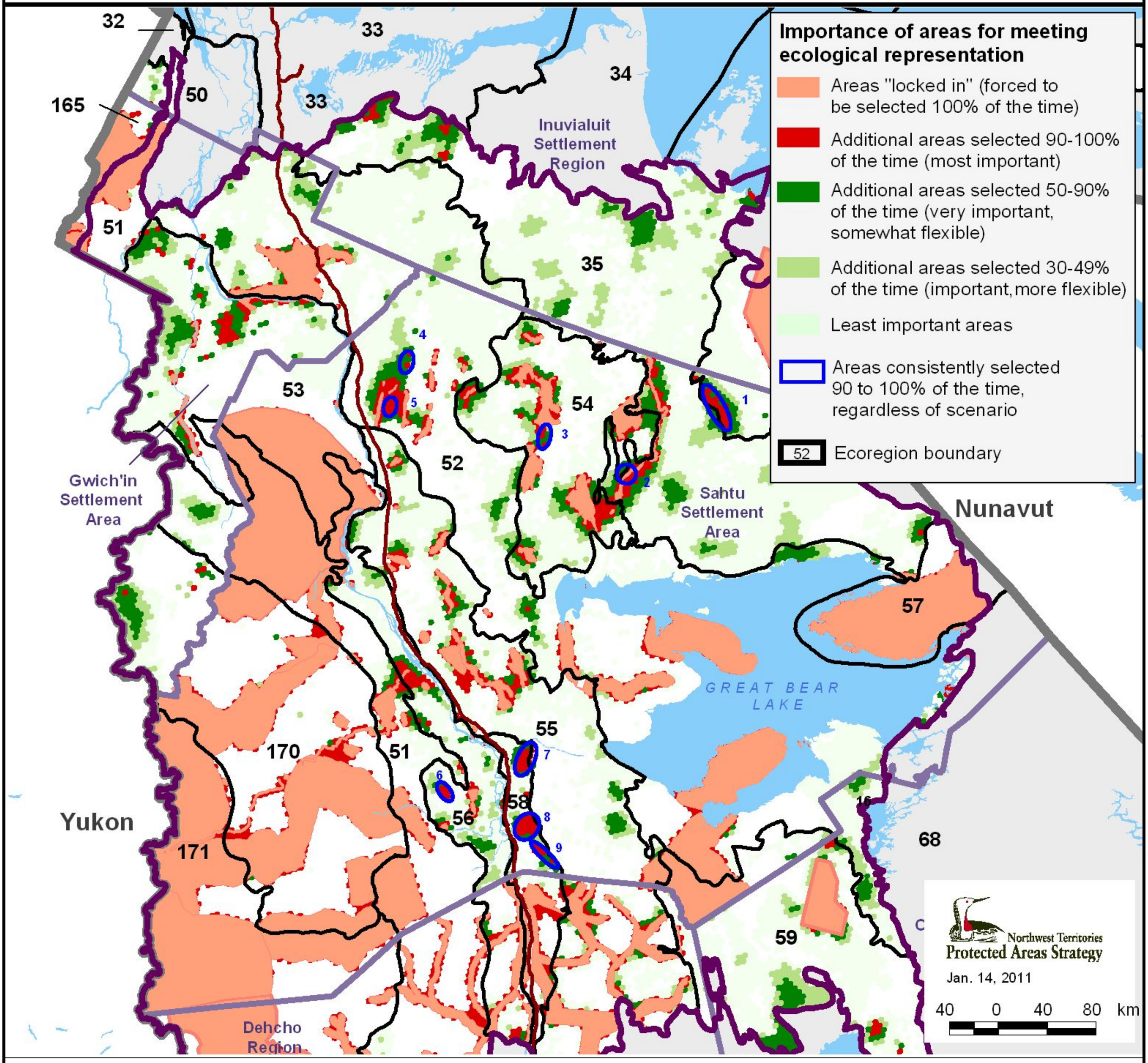
This Map shows the one of the most efficient ways to get ecological representation in the ecoregions wholly or partially within the Sahtu Settlement Area.. Existing protected areas, PAS proposals and approved and draft Land Use Plan conservation zones are "locked in" (the computer program must choose these areas for representation).This map shows which areas - in addition to the "locked in" areas - are most important for achieving ecological representation in Sahtu ecoregions. It also shows - in blue outlines - areas that Marxan selects > 90% of the time, regardless of scenario run. These indicate the most important areas that should be considered to increase ecological representation in the Sahtu.

Areas "locked in" or forced to be selected 100% of the time:

- National Parks/National Park Reserves
- Areas protected through Land Claim Agreements (Kelly Lake, Canol Heritage TrailEzǫdzìtì)
- PAS Proposals
- Sahtu Draft Conservation Zones - Draft 3
- Dehcho Draft Land Use Plan Conservation Zones
- Gwich'in Conservation and Heritage Conservation Zones

Areas "locked out" (excluded from selection)

- Large water bodies
- 1 km wide proposed Mackenzie Gas Pipeline corridor
- Oil and gas leases (production licences, significant dicovery licences- Feb. 2010)
- Active mineral leases (Aug. 2010)



Jan. 13 2011

Areas consistently selected >90% of the time regardless of Marxan scenario run – what drives the selection of these areas?

Area1 in Ecoregion 37

Main drivers and additional features captured

Main drivers:
The main driver for Area1 in ecoregion 37 is the EOSD land cover class wetland treed which occurs in only small amounts in this ecoregion. Area1 would significantly increase the representation of this land cover class which is currently poorly represented in this ecoregion (from 8% of representation goal met to 60% of goal met).

The land cover class mixedwood open can probably also be considered a driver for Area1 being selected as goals for this land cover class can be met very efficiently there. Goals met for that landcover class would be increased from 4% (captured in Tuktut Nogait) to fully represented.

Additional representation met through Area 1:
Area1 would also increase representation of EOSD land cover class broadleaf sparse, which is currently poorly represented (5% of representation goals met) in ecoregion 37, to 52% of representation goals met .

Representation for EOSD land cover class broadleaf open would increase from 84% of goal met to fully met.

For landscape unit M /T/m/m, which is currently not represented at all, representation goals met would increase to 45%.

For Physiographic Unit Horton River Upland, which is currently not represented at all, representation goals met would increase to 44%

Feature	Current representation goals met	representation through Area1	Total representation goals met
EOSD land cover class			
Wetland treed	8%	52%	60%
Mixedwood open	4%	95%	99%
Broadleaf sparse	5%	53%	48%
Broadleaf open	84%	34%	118%
Landscape Unit			
M /T/m/ m	0%	45%	45%
Physiographic Unit			
Horton River Upland	0%	44%	44%

Table1: Increase in ecological representation through Area1. Dark red indicates main drivers, light red indicates additional landscape features captured

Area2 in ecoregion 54 was deleted

Unclear what drives this area

Area3 in ecoregion 54

Main drivers and additional features captured

Main drivers:

The main driver for Area3 in ecoregion 54 is the EOSD land cover class mixedwood sparse which only occurs in small amounts in this ecoregion. Area3 would increase representation for this land cover class from currently 30% to 50% of representation goal met.

For EOSD land cover class herb the amount of representation goal met in Area3 would increase by 50% from 14 to 64%. This makes area3 a very efficient area for meeting representation goals for this land cover class

Additional representation met through Area 3:

Area3 would also increase representation for broadleaf dense by 27% (from currently 52 to 79% of representation goal met).

Representation for EOSD land cover classes Bryoids would increase from currently 43 to 60% of representation goal met.

Representation for EOSD land cover class wetland herb would increase from currently 37 to 53% of representation goal met.

Parts of two landscape units are within Area3. For landscape unit B/O/-/vw, representation would increase from 41 to 66% goals met. For landscape unit M/T/m/m representation goals are currently already fully met.

Small parts of three physiographic units (Colville Hills high subarctic, Colville Plain high subarctic and Colville Upland high subarctic) are captured by Area3. Colville Plain is currently already fully represented, For Colville Upland more than half (68%) of the representation goals are currently met and Area 3 only increases representation by less than 1%. Currently about 40% of the representation goal for Colville Hills has been met and Area 3 adds another 4%.

Feature	Current representation goals met	representation by Area3	Total representation goals met
EOSD land cover class			
Mixedwood sparse	30%	20%	50%
Herb	14%	50%	64%
Broadleaf dense	52%	27%	79%
Wetland herb	37%	16%	53%
Landscape Unit			
B/O/-/vw	41%	25%	66%
M/T/m/m	fully represented		
Physiographic Unit			
Colville Plain high	fully represented		

subarctic			
Colville Hills high subarctic	39%	4%	43%
Colville Upland high subarctic	61%	<1%	61%

Table2: Increase in ecological representation through Area3. Dark red indicates main drivers, light red indicates additional landscape features captured

Area 4 (in Ecoregion 52)

Main drivers and additional features captured

Main drivers:
The main driver for Area4 in ecoregion 52 is the EOSD land cover class mixedwood sparse which only occurs in small amounts in this ecoregion. Area4 would increase representation goals met for this land cover class from currently 10% to 34%. While this is not a significant increase in representation, the area is required to contribute to meeting the high representation goals set for this land cover class (high representation goals are set for landscape features that occur only in very small amounts (<1,000 ha) within ecoregions).

Additional representation by Area4:

Mixedwood dense:
Area4 would also increase representation of EOSD land cover class mixedwood dense from 10 to 25% of goal met.

For landscape unit B.M.M/O.T.T/-.m.f/vw.w.w, representation goals met would increase from 11 to 24%

A small part of the physiographic unit Travaillant Upland high subarctic is captured by Area4. For this pysiographic unit, 70% of the representation goals are currently already met and Area 4 only increases representation by 6%.

Feature	Current representation goals met	representation by Area4	Total representation goals met
EOSD land cover class			
Mixedwood sparse	10%	24%	34%
Mixedwood dense	10%	15%	25%
Landscape Unit			
B.M.M/O.T.T/-.m.f/vw.w.w	11%	13%	24%
Physiographic Unit			
Travaillant Upland HS	70%	6%	76%

Table3: Increase in ecological representation through Area4. Dark red indicates main drivers, light red indicates additional landscape features captured

Area 5 (in Ecoregion 52)

Main drivers and additional features captured

Main drivers:
As in Area4, the main driver for Area5 in ecoregion 52 is also the EOSD land cover class mixedwood sparse which as noted above only occurs in small amounts in this ecoregion. Area5 would increase representation goals met for this land cover class by 15%, from currently 10% to 25%. While this is not a significant increase in representation, Area5 is needed to contribute to meeting the high representation goals set for this land cover class (high representation goals are set for landscape features that occur only in very small amounts (<1,000 ha) within ecoregions).

Additional representation by Area5:
Mixedwood dense:
Area5 would also increase representation of EOSD land cover class mixedwood dense from 10 to 27% of goal met. This land cover class occurs more widely in ecoregion 52 and could be captured elsewhere, which is why it is not considered a driver for selection of Area5.

For landscape unit M.M/T.T/m.f/m.m, representation goals met would increase by 10% from 63 to 73%

A small part of the physiographic unit Travaillant Upland high subarctic is captured by Area5. For this pysiographic unit 70% of the representation goals are currently already met and Area 5 only increases representation by 5%.

Feature	Current representation goals met	representation by Area5	Total representation goals met
EOSD land cover class			
Mixedwood sparse	10%	15%	25%
Mixedwood dense	10%	17%	27%
Landscape Unit			
M.M/T.T/m.f/m.m	63%	10%	73%
Physiographic Unit			
Travaillant Upland HS	70%	5%	75%

Table4: Increase in ecological representation through Area5. Dark red indicates main drivers, light red indicates additional landscape features captured

Area6 in Ecoregion 56

Main drivers and additional features captured

Main drivers:

Multiple Ducks Unlimited (DU) land cover classes drive the selection of this area:

- The main driver is dwarf shrub other, which only occurs in very small amounts in ecoregion 56 and is currently not represented at all in this ecoregion. Area 6 would fully represent that land cover class.
- Low shrub lichen is also a driver even though Area6 increases representation goals met for this land cover class by only 5% (from 30 to 35%). While this is not a significant increase in representation, Area6 is needed to contribute to meeting the high representation goals set for this land cover class (high representation goals are set for landscape features that occur only in very small amounts (<1,000 ha) within ecoregions).
- Tussock tundra and mesic dry herbaceous can also be considered drivers for the selection of Area7. Even though both occur more widely in ecoregion 56, representation goals for these two DU land cover classes can be met very efficiently in Area6, such that Area6 increases representation goals met from currently no representation at all to full representation of these two land cover classes in ecoregion56.
- For dwarf shrub lichen, Area6 would increase representation goals met by 62% (from currently 24 to 86%), so that this land cover class can be considered a driver as well.

Additional representation by Area6:

For DU land cover class rock/gravel, which is currently fairly well represented, Area6 would increase representation goals met by 25% (from 70 to 95%)

For the landscape unit M.R/MP.R4/m.-/vs.s, which is currently very poorly represented in ecoregion 56, Area 6 would increase representation goals met from currently only 8% to 92%.

The only physiographic unit captured by Area6 (Mackenzie Foothills LSbs) is currently already fully represented.

Feature	Current representation goals met	representation by Area6	Total representation goals met
DU land cover class			
Dwarf shrub other	0%	100%	100%
Low shrub lichen	30%	5%	35%
Tussock tundra	0%	100%	100%
mesic dry herbaceous	0%	100%	100%
Dwarf shrub lichen	24%	62%	86%
Rock/gravel	70%	25%	95%
Landscape Unit			
M.R/MP.R4/m.-/vs.s	8%	84%	92%
Physiographic Unit			
Mackenzie Foothills LSbs	fully represented		

Table5: Increase in ecological representation through Area6. Dark red indicates main drivers, light red indicates additional landscape features captured

Area7 (mostly in ecoregion 58, with a very small part extending into ecoregion 55)

Main drivers and additional features captured

Main drivers:
Multiple DU land cover classes drive the selection of this area:

- Open mixed needleleaf/deciduous – This land cover class occurs in only small amounts in ecocregion 58 and only in the Sahtu part of the ecoregion. It is currently not represented at all. 45% of representation goals for this land cover class would be met in Area7.
- Aquatic bed occurs somewhat more widely in ecoregion 58 and currently 27% of representation goals are met in ecoregion 58. Area7 would increase representation goals met by 71% to full representation of this land cover class. This indicates that representation goals can be met very efficiently in this area, making the land cover class a driver for selection of Area7
- Land cover class emergent vegetation also occurs somewhat more widely in ecoregion 58 and is currently very poorly represented (under 2% of representation goals met), Area7 would increase representation goals met by 59%.
- For DU land cover woodland needleleaf other, Area7 would increase representation goals met by 57% (from 42% to fully met) in ecoregion 58.

The part of Area7 being consistently selected in Ecoregion 55 is driven by a very small landscape unit, M.R/T.R4/m.-/m.s which is currently not represented at all in ecoregion 55. Area7 would fully represent this landscape unit.

Additional representation by Area7:
For woodland needleleaf lichen, which is currently poorly represented in ecoregion 58 (17% of representation goals met) Area7 would result in more than half (52%) of the representation goals being met.

For DU land cover class open spruce other, which is currently also poorly represented in ecoregion 58, Area7 would increase representation goals met by 40% (from 18 to 58%)
Area7 would increase representation goals met for clear water in ecoregion 58 by 29% (from 51 to 80%).

Area7 would not contribute to any significant increase in representation of DU land cover classes in ecoregion 55 as only a small part of that area extens into ecoregion 55.

For the landscape unit L.L/MP.S/f.f/w.w, which occurs fairly widely in ecoregion 58 and is currently not represented at all in this ecoregion, Area 7 would fully represent this landscape unit.
Area7 also captures a small part of landscape unit 25.M/O.MP/-.f/w.w, which is currently not represented at all in ecoregion 58.

Area7 also captures small parts of 3 physiographic units, 2 of which are already fully represented and one of which is currently fairly represented.

Feature	Current representation goals met	representation by Area7	Total representation goals met
DU land cover class			
Mixedwood needleleaf deciduous	0%	45%	45%
Aquatic bed	27%	71%	98%
Emergent vegetation	2%	59%	61%
Woodland needleleaf other	42%	57%	99%
Woodland needleleaf lichen	17%	37%	54%
Open spruce other	18%	40%	58%
Clear water	51%	29%	80%
Landscape Unit			
M.R/T.R4/m.-/m.s	0%	100%	100%
L.L/MP.S/f.f/w.w	0%	100%	100%
25.M/O.MP/-.f/w.w	0%	16%	16%
Physiographic Unit			
North Mackenzie Plain LS	fully represented		
Keller Plain LS	fully represented		
Norman Range LS	80%	2%	82%

Table6: Increase in ecological representation through Area7. Dark red indicates main drivers, light red indicates additional landscape features captured

Area 8 (in ecoregion 58)

Main drivers and additional features captured

Main drivers:

As with Areas 6 and 7, multiple DU land cover classes drive the consistent selection of Area8.

- Open mixed needleleaf/deciduous – this land cover class occurs only in very small amounts in only the Sahtu part of ecoregion 58 and is currently not represented at all. More than half of the representation goals for this land cover class (51%) would be met in Area8.
- Mesic dry herbaceous also occurs in only very small amounts in only the Sahtu part of ecoregion 58 and it is currently not represented at all. Area8 would fully represent this land cover class.
- Dwarf shrub other also occurs in only very small amounts and in only the Sahtu part of ecoregion 58 and it is currently not represented at all. Area 8 would fully represent this land cover class.
- Tussock tundra also occurs in only very small amounts and in only the Sahtu part of ecoregion 58 and it is currently not represented at all. Area 8 would fully represent this land cover class.
- Moss also occurs in very small amounts in ecoregion 58 and even though Area8 would only increase representation goals for this land cover class by 10%, it is still a driver for the selection

of Area8 because of the high goals set on land cover classes that only occur in very small amounts within ecoregions

In total, Area 8 would fully represent 3 land cover classes and meet more than half of the representation goals for 1 land cover class.

Additional representation by Area8:

For DU land cover class open spruce other, which is currently poorly represented in ecoregion 58, Area8 would increase representation goals met by 46% (from 18 to 64%)

For woodland needleleaf other less than half of the representation goal is currently met (46%). Area 8 would increase representation goals met for this land cover class by 31% to 77%.

Representation for low shrub lichen which is currently fairly well represented (76% of representation goals met) would be increased to fully represented by Area8.

For land cover class lichen, which is currently not represented at all in ecoregion 58, Area8 would increase representation goals met to 28%.

For land cover class rock/gravel, which is currently well represented (82% of representation goals met), Area8 would increase representation to fully represented.

Parts of two landscape units are captured by Area8. Both occur in fairly large amounts in ecoregion 58. M.C/T.MP/m.m/m.m, which is currently not represented at all would be fully represented by Area8.
For landscape unit 25.M/O.MP/-.f/w.w, 66% of representation goals would be met.

Parts of 3 physiographic units are captured by Area8. Increase of representation goals met is not significant for two of these, but Area8 increases representation of one physiographic region (Franklin Mountains Lssa) by 30%.

Feature	Current representation goals met	representation by Area8	Total representation goals met
DU land cover class			
Open Mixed Needleleaf/Deciduous	0%	51%	51%
Mesic dry herbaceous	0%	100%	100%
Dwarf shrub other	0%	98%	98%
Tussock tundra	0%	99%	99%
Moss	61%	10%	71%
Open spruce other	18%	46%	64%
Woodland needleleaf other	42%	31%	73%
Low shrub lichen	76%	30%	106%
Lichen	0%	28%	28%
Rock/gravel	82%	15%	97%
Landscape Unit			

M.C/T.MP/m.m/m.m	0%	100%	100%
25.M/O.MP/-.f/w.w	0%	66%	66%
Physiographic Unit			
Franklin Mountains LSsa	75%	30%	105%
Central Mackenzie Valley LSb	26%	8%	34%
Blackwater Upland LS	fully represented		8

Table7: Increase in ecological representation through Area8. Dark red indicates main drivers, light red indicates additional landscape features captured

Area9 in Ecoregion 58

Main drivers and additional features captured

Main drivers:

- The main driver for selection of this area is DU land cover class lichen. It occurs in small to medium amounts in ecoregion 58, mostly in the Sahtu part of the ecoregion. Lichen is currently not represented at all in ecoregion 58. Area9 appears to be where most of the lichen in this ecoregion can be found, making it very efficient for achieving representation. The area fully represents DU land cover class lichen
- DU land cover class open spruce lichen is another driver for Area9 being selected. While a fair amount of this land cover class occurs in ecoregion 58, Area9 is an efficient place to significantly increase representation of open spruce lichen. Currently 41%of representation goals are met for this land cover class and Area9 would increase represenation to fully met.
- Moss occurs in very small amounts in ecoregion 58 and even though Area9 would only increase representation goals for this land cover class by 11%, it is still a driver for the selection of Area9 because of the high goals set on land cover classes that only occur in very small amounts within ecoregions

Additional representation by Area8:

For land cover class wet herbaceous, which is currently well represented (82% of representation goal met) Area9 would increase representation goals met by 16% to fully represented

Low shrub lichen is currently fairly well represented (76% of representatin goal met). Area9 would increase representation by 51%, more than fully representing this land cover class.
For land cover class low shrub other, which is currently well represented (81% of representation goals met), Area9 would increase representation by 30%, more than fully representing the land cover class.

Woodland needleleaf lichen is currently poorly represented (17% of representation goals met). Area9 would incease representation goals met by by 35% to a total of 52%.

For land cover class tall shrub Area9 would increase representation goals met from currently 40% to 59%.

For land cover class rock/gravel, which is currently well represented (82% of representation goals met), Area9 would increase representation to fully represented.

Parts of 2 landscape units would be captured by Area9. Both occur in fairly large amounts in ecoregion 58. Landscape unit M.C/T.MP/m.m/m.m is currently not represented at all, Area9 would increase representation goals met to 35%. The other landscape unit is already fully represented.

Part of one pysiographic unit (Franklin Mountains Lssa) is captured by Area9. It is already fairly well represented (75% of representation goals met) Area9 would increase representation to fully met for this unit

Feature	**Current representation goals met**	**representation by Area8**	**Total representation goals met**
DU land cover class			
Lichen	0%	100%	100%
Open spruce lichen	41%	75%	116%
Moss	61%	10%	71%
Wet herbaceous	82%	16%	98%
Low shrub lichen	76%	51%	128%
Low shrub other	81%	30%	111%
Woodland needleleaf lichen	17%	35%	52%
Tall shrub	40%	19%	59%
Rock/gravel	82%	28%	110%
Landscape Unit			
M.C/T.MP/m.m/m.m	0%	35%	35%
C.M/MP.T/m.m/m.m	fully represented		
Physiographic Unit			
Franklin Mountains LSsa	75%	24%	99%

Table8: Increase in ecological representation through Area9. Dark red indicates main drivers, light red indicates additional landscape features captured