Habitat Quality Models, Species at Risk, and Wildlife VECs

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Habitat and Related Terms

Robert Fuller – Birds and Habitat Relationships in Changing Landscapes – 2012

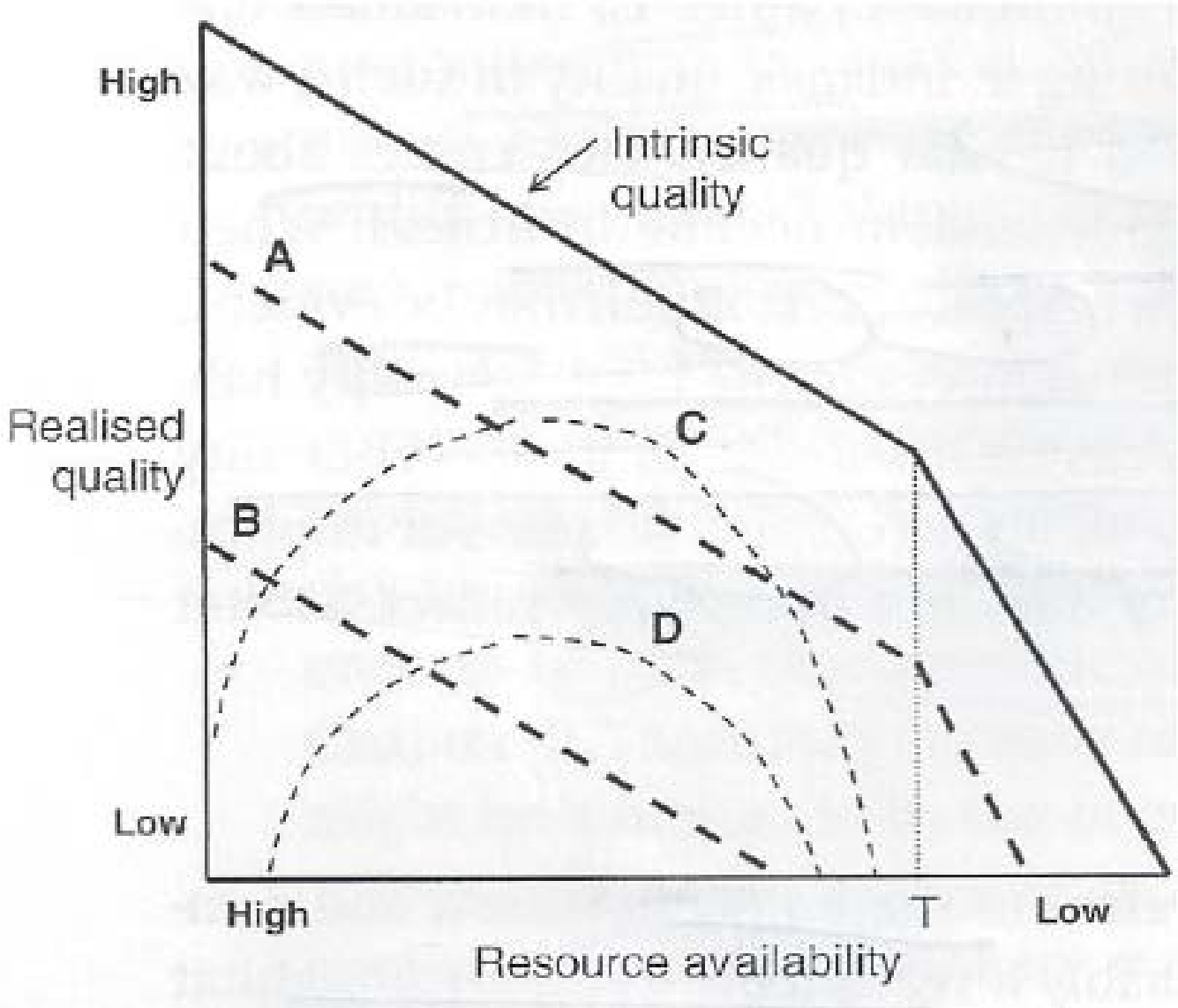
"Clarity about the meaning of these and other habitat-related terms is essential."

Habitat: " The environment of the individual bird, including all biotic and abiotic elements."

Habitat Quality: " The fitness potential or value of a defined habitat."

Intrinsic Habitat Quality: "… the fundamental fitness in the habitat taking no account of conspecific individuals and other species."

Realized Habitat Quality: "… combines intrinsic habitat quality with … competition, predation risk, etc."



Source: Fuller (2012)

Measuring Fitness for a Habitat –

Lamda –

Rate of Increase in a population from one time to another.

Sources and Sinks:

- Source - Habitat that provides individuals of a species to a population- Lamda is positive.

- Sink – Habitat that results in a net loss of individuals of a species to a population.
- Lamda is negative.

Landscape Ecology

- Habitat is patchy. Patches vary as does their arrangement.
- Source-sink systems not static.
- Dynamics vary across landscapes.
- Spatial scale. Wide ranging vs ‘sedentary’ species. Have different scale range areas, migration patterns etc.

- J. Liu and Others – Sources, Sinks and Sustainability – 2011

Table 1
"Ecological value to moose of … stand types in the boreal forest, based on food and cover availability", partial table from Dussault et al. (2006)."

Stand type	Age-class (years)	Browse availability (stems/ha)	Food value
Deciduous with shade-intolerant trees	≥30	4,528	0.50
Deciduous with shade-tolerant trees	≥50	13,923	1.00
Deciduous or mixed in regeneration, recently disturbed stands (insect outbreak, windthrow, etc.)	10	10,097	1.00
Coniferous without balsam fir (e.g., black spruce, tamarack, etc.).	≥30	433	0.05

The Threatened Olive-sided Flycatcher – Concepts

- Landscape – Summer and winter.
- Breeding Habitats – Natural and logged forests.
- Logged Forests – High densities but poor nest success = Sinks.
- High intrinsic habitat quality. Not so for realized habitat.
- High density does not mean high habitat quality.
- COSEWIC (2007) status report – Forestry industry implicated.

Ecostem et al (2013) Habitat Relationships and Wildlife Habitat Quality Models for the Keeyask Region

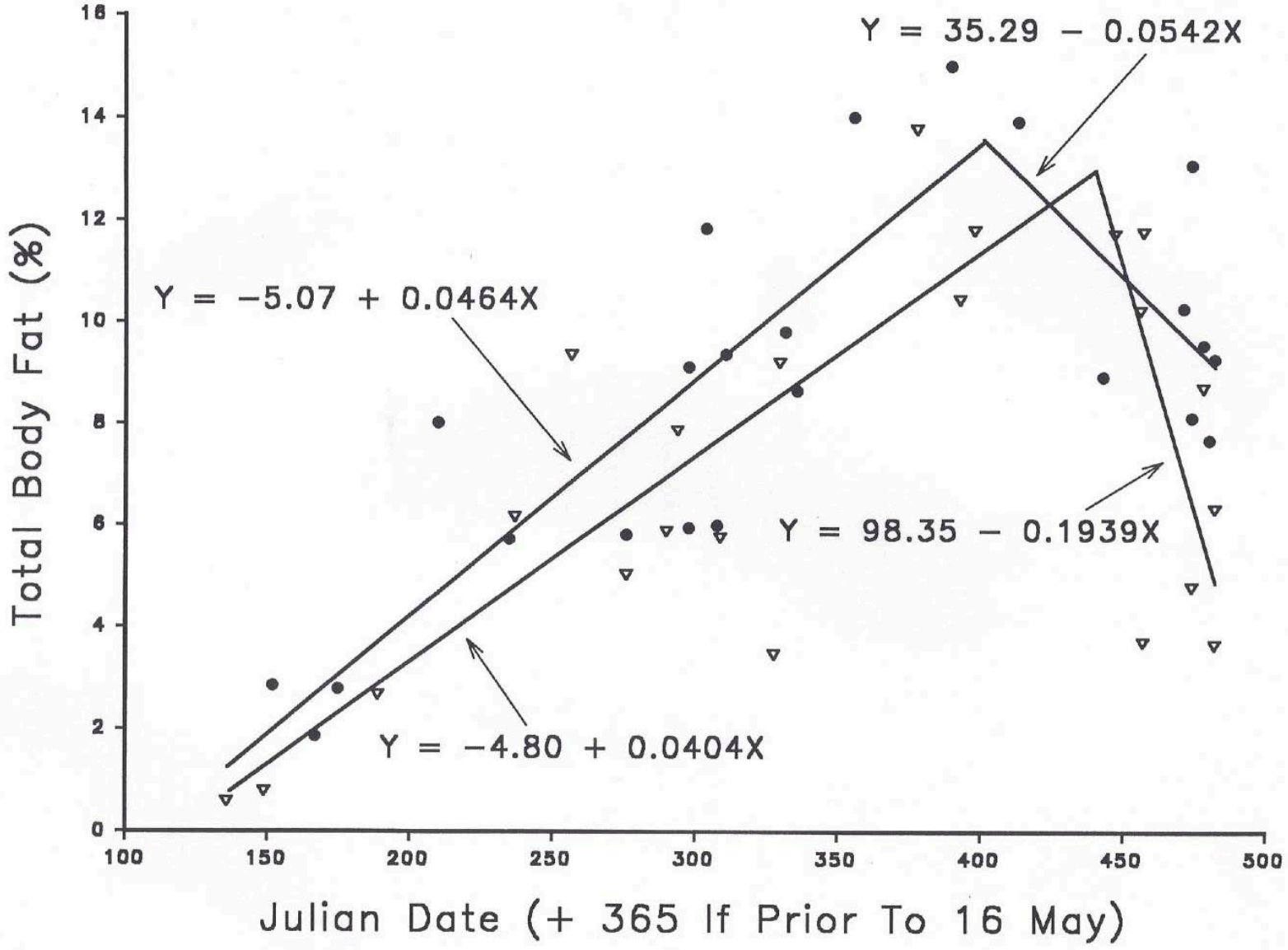
- Habitat Quality – Defined by species. No universal definition
- 'Primary' and 'Secondary' Habitat – Not defined in Glossaries.
- Not in Fuller (2012) or Johnson (2007).
- What do the terms mean?
- Intrinsic or realized habitat?
- Source and sink?

Beaver Habitat Quality Model

- Keeyask Key Assumptions/Approaches
- Terrestrial habitat (shrubs and trees). Based on cuttings and contents of winter caches.
- Other than the 'marsh'coarse habitat type, aquatic habitat and aquatic plants ignored. Rated aquatic plants of low value and woody plants, including alder, of much higher value. (Ecostem et al 2013)
- Alder rated as an important food. (Ecostem, et al 2013)
- 100 m of terrestrial habitat relevant for beaver (Ecostem et. al 2013)

The Facts: Beaver Habitat Quality Model

- Cuttings are not the same as food. Beaver can forage outside the cache.
- Alder. Speckled alder? Fryxell et al (1994)
- 95% of the shrubs and trees cut by beaver within 50 m of shoreline Stoffyn-Egli and Martin Willison (2011)
- Aquatic habitat critical, including in winter.
- Manitoba – Nash (1951), Dyck and MacArthur (90's), Soprovich (1995) … and Severud (2013).
- Manitoba literature ignored
- Ecostem et al. (2013) ratings for plants inconsistent with literature.
- Various other inconvenient truths relative to Ecostem et al (2013) information.



Source : Soprovich (1995)

No Explicit Definitions in Ecostem et al (2013) Habitat Relationships and Wildlife Habitat Quality Models for the Keeyask Region Report

But….

- Primary habitat: Coarse habitat types "meeting all food requirements".
  Terrestrial food only!!! Other than coarse habitat type 'marsh'.

- Secondary habitat: "… provided additional sources of less desirable and potentially less abundant browse, or as a secondary source of lodge building materials."

- Meaning of primary and secondary habitat?
  Fitness ? … intrinsic or realised? … source or sink?
  What is the dichotomy?
  Some 'secondary' habitat is likely not realized habitat.

Ecostem et al (2013) Strange 'Validation' Test of its Beaver Habitat Quality Model

- Terrestrial vegetation only, other than the coarse habitat type 'marsh'. Ignoring all aquatic food.
- Active and abandoned lodges lumped. 53% of sample active lodges. Why lump? Active lodge source and abandoned lodge sink?
- 100 m from shoreline considered habitat. Anything beyond 50 m is very low realized habitat or not realised habitat (predation/energetic costs).
- Circles around the lodges …
- Different scales, i.e., 100 m, 250 m, 500 m, 1000 m.
- Most common coarse habitat types representing 80% treated as 'selected'.

- Technical problem. Aquatic and terrestrial habitat should be treated and assessed independently.

- Water now a dominant ‘selected for’ coarse habitat type, when testing terrestrial habitat. Artifact - Masks or hides real effects.

- Assessed 50-100 m same value as 0-50 m. Masks real effects by including habitat of low or no realised habitat quality.

Robert Fuller – Birds and Habitat Relationships in Changing Landscapes 2012

- "The extent to which an individual or a population depends upon, or shows disproportionate use or avoidance of, a defined habitat type. Can be positive, neutral or negative."

Ecostem et al. (2013) Habitat Relationships and Wildlife Habitat Quality Models for the Keeyask Region Report

- Validation test method did not test habitat association, as it did not relate the habitats found within the circles to what habitat was available.

Outcome of the Validation Test per Ecostem et al (2013)

"Of the 139 beaver lodges examined, only 28 (20%) were directly on areas identified as primary habitat.".

- Does not demonstrate association, require details on how much primary habitat is available.
- Exactly what does 'directly on areas' mean ?
- "Tall shrub on riparian peatland was predicted correctly, and ranked fifth." A primary habitat.

Table 6-8: Rankings of Coarse Habitat Types Based on Abundance With 100, 250, 500 and 1000 m Buffers Applied to Observed Beaver Lodge Locations

Coarse Habitat Type	Burn Age Class	100 m	250 m	500 m	1000 m
Black spruce treed on shallow peatland	1	1	1	1	1
Black spruce treed on thin peatland	1	2	2	2	2
Shallow water	1	3	3	3	3
Low vegetation on riparian peatland	1	4	4	4	7
Tall shrub on riparian peatland	1	5	6	9	-
Nelson River	1	6	5	6	6
Black spruce treed on riparian peatland	1	7	8	10	-
Black spruce treed on shallow peatland	6	8	10	-	8
Black spruce treed on wet peatland	1	9	-	11	10
Low vegetation on shallow peatland	1	10	-	8	9
Black spruce treed on mineral soil	1	-	7	5	5
Black spruce treed on thin peatland	6	-	9	7	4

Source: Ecostem et al (2013)

Ecostem et al (2013) concludes: No need to change the Beaver habitat Quality Model

But …

- Failed to demonstrate positive association.
- Soprovich concludes failure of the model.
- ‘Validation’ test itself not a valid test.

Ecostem et al. (2013) Habitat Relationships and Wildlife Habitat Quality Models for the Keeyask Region report

- Model validation is an evaluation of "how well the model performs relative to its intended use".
- "Intended use" – To accurately predict beaver habitat quality?
- Why collect test data if the appropriate test is not made, or the data will be ignored? What is the point?

Designing and Conducting Field Surveys of Animals

- Factors specific to species determine means of survey (yellow rail vs olive-sided flycatcher)
- Animal survey challenges
- Songs and calls
- Aircraft

Survey for Olive-sided Flycatcher

Olive-sided flycatcher habitat per COSEWIC (2007).

- "most often associated with open areas containing tall trees or snags for perching. Open areas may be forest openings, forest edges near natural openings (such as rivers, muskeg, bogs or swamps) or human-made openings (such as logged areas), burned forest or open to semi-open mature forest stands. … Generally, forest habitat is either coniferous or mixed coniferous. In the boreal forest, suitable habitat is more likely to occur near wetlands."

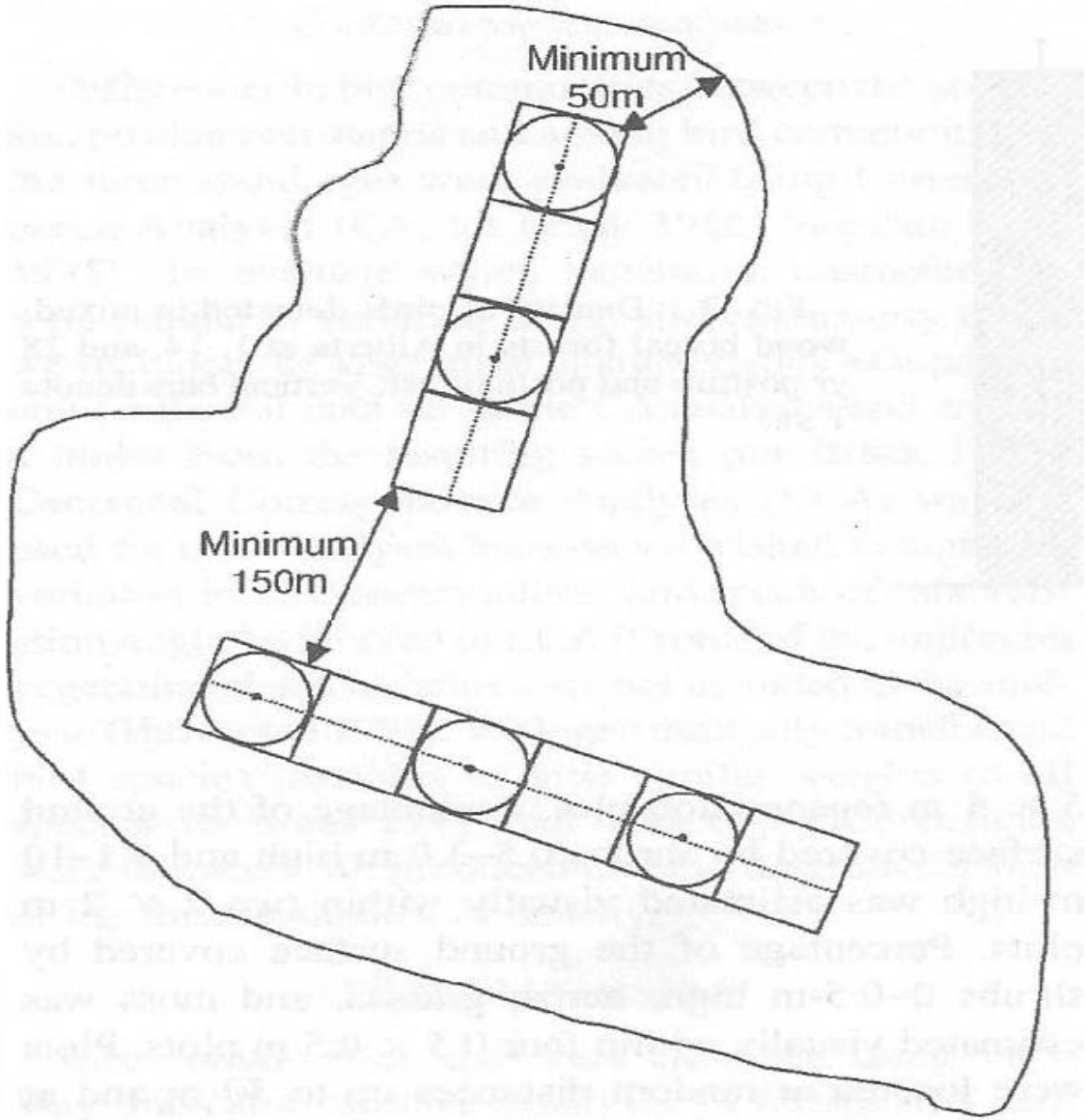
- Edge is important to the species.

Keeyask Terrestrial Supporting Volume: Section 6-Birds

Method: "breeding-bird surveys were consistent with standard procedures and included using the point count method" for olive-sided flycatcher.

- Estimating distance to a bird in forested cover is difficult. Can differ in relation to:
  - Types of forest
  - Height of bird
  - Observer
  - Weather conditions

- Simons et al. (2009) … 'measurement error' can be substantial.



Source: Hobson and (1999)

“Restricting sampling to part of any environmental gradient can give an incomplete representation of habitat association.” Fuller (2012).

Keeyask Terrestrial Supporting Volume
Section 6-Birds

75-m radius for point count plot

Did proponent locate plots away from edges like Hobson and Schieck (1999)?

TetrES (2004) – "transects were located within relatively homogenous habitat".

Keeyask Terrestrial Supporting Volume (Birds) – "final selections" were "within habitats that were as homogenous as possible".

Change in base habitat types over the course of data collection for Keeyask.

Ecostem et al (2013) Table 7-2 footnote: Some plots include several broad habitat types. Why? How many cases?

Olive-sided flycatcher. Did Keeyask EIS match the sampling design to the biology of the species for olive-sided flycatcher? Implications?

Olive-sided Flycatcher Habitat Quality Model

Table 6B-8: Primary and Secondary Habitat for Olive-sided Flycatcher, Rusty Blackbird and Common Nighthawk

VEC	Primary Habitat	Secondary Habitat
Olive-sided Flycatcher	Old and mature needle forest/woodland (spruce dominated) or late successional open and semi-open coniferous and or mixedwood forests within 50m of an edge - *e.g.*, burn that is between 5 and 15 years, Beaver ponds with snags; water; bogs; muskegs; open areas with snags and lakes with standing dead trees. Or adjacent to poor wooded fen, rich wooded fen and wooded swamp.	Young needle forest/woodland (spruce dominated) or late successional open and semi-open coniferous and or mixedwood forests within 50m of an edge

Source: Keeyask Terrestrial Supporting Volume: Section 6-Birds

Test of Olive-Sided Flycatcher Habitat Quality Model

Table 7-4 provided as evidence of model working.
E.g., "the broad habitats with the highest recorded densities include; 1) black spruce dominant on ground ice peatland".

Table 7-4 Territories (# of singling males) per hectare of Olive-sided flycatcher in Keeyask Bird Regional Study Area, 2001-2012

	Density (Singing males/ha)										
Broad Habitat type	2001	2002	2003	2004	2005	2006	2007	2009	2010	2011	2012
Black spruce dominant on ground ice peatland	0.09 ± 0.22	0.03 ± 0.12	0.13 ± 0.24	-	-	0	0	0	0	0	0.07 ± 0.2
Black spruce dominant on mineral	0.03 ± 0.13	0.045 ± 0.16	0	0	0	0.04 ± 0.15	0	0	0	0	0
Black spruce dominant on riparian peatland	-	-	-	-	-	-	-	-	-	-	0.14 ± 0.38
Black spruce dominant on shallow peatland	0	0	0.04 ± 0.14	-	0	0	0	0	0	0	0
Black spruce dominant on thin peatland	0	0.02 ± 0.11	0	0	0	0	0	0.02 ± 0.11	0	0	0
Black spruce dominant on wet peatland	0	0	0	-	0	0.56 ± 0	-	0	0	0	0
Black spruce mixture on ground ice peatland	0	0.28 ± 0.4	0	-	-	-	-	-	-	-	-
Black spruce mixture on thin peatland	0	0	0	-	-	-	-	0.06 ± 0.18	0	0	0
Human infrastructure	0	0	0	-	0	0	-	0.56 ± 0	0	0	0
Low vegetation on ground ice peatland	0.28 ± 0.4	0	0	0	0	0	0	0	0	0.19 ± 0.33	0
Low vegetation on riparian peatland	0	0	0.28 ± 0.4	-	-	-	0	0	0	0	0
Low vegetation on shallow peatland	0	0	0	-	0.03 ± 0.12	0.06 ± 0.18	0	0	0.04 ± 0.16	0	0
Low vegetation on thin peatland	0	0	0	-	0.05 ± 0.16	0	0	0	0	0	0
Trembling aspen dominant on all ecosites	0	0.28 ± 0.4	0	0	0	0	-	0	0	0	-
Young regeneration on shallow peatland	0	0	0.56 ± 0	-	-	-	0	-	-	-	-

Note: Only broad habitat types where olive-sided flycatcher was present are listed in the table. Broad habitats where they are absent are not listed, as rare species absence data is considered ambiguous due to low number of observations, activity patterns, elusive behaviors and/or inaccessible habitats (Ottaviani *et al.* 2004).

Source: Ecostem et al(2013)

Test of Olive-Sided Flycatcher Habitat Quality Model

Ecostem et al 2013 - "Model performs well" because "the majority of field observations fell within … primary or secondary habitat", and therefore the model was not changed.

- Was there a positive association with the primary and secondary habitats, as required, for predictions to be accurate?
  - Not addressed.
  - Primary vs secondary habitat. Where is the analysis to demonstrate separation between primary and secondary habitat?

- 41% of observations in 'non-habitat' … very high.

- Why did Ecostem et al (2013) ignore almost half of the observations?

- What was the reason for ignoring those data?

- Why does that habitat not count?

- Should the model have incorporated those data?

Some of the Obvious Problems with the Model

- 'Density' – Can be misleading for the species.
- 50 m width - Why not 32 m or 73 m? or ? – Where are the data to support 50m width?
- Forests 5 – 15 years old after fire considered to be habitat. Basis?
- Model – Where is the evidence to support?

Wildlife VECs

Olangunju (2012), in a recent review document, indicated that:

- "surprisingly little research has been done in the past few decades to examine the principles, processes, and rationales applied to VEC selection in either assessment modality"

- "there remains a considerable gap in terms of understanding the processes applied in selecting VECs in project EAs and CEA.".

Wildlife VECs

Criteria for VEC selection reasonably communicated and specifics provided in Table 1A-3. Source: Keeyask Terrestrial Supporting Volume: Section 1.

Yellow rail

Species at risk but not selected as a VEC
Why not? None found so presume that is the reason.
Uncertainty in surveys – Type II error – conclude species not there when it really is. 'not detected'.
Should level of uncertainty be a consideration?

Northern leopard frog

Species at risk but not selected as a VEC.
Once quite common, but not found.
'Spring' surveys? Timing?
Level of uncertainty? Precautionary principle.

Greater transparency needed to explain VEC selection. A document that provides the basis for VEC selection, in detail, should be required.

Wildlife VECs

One of criteria for VEC selection –
"The high importance to local people … includes particularly high importance to KCNs."

Over-weighting to local and KCNs is appropriate.

But appears to have ignored others. E.g., Manitobans, Metis,

Birds Conclusions and Recommendations – The 'Larger Picture'

- Data on nest success are required for the threatened olive-sided flycatcher. Given that realised habitat quality for olive-sided flycatcher can be wrongly predicted by 'density', an attempt should have been made to collect data on nest success for this species.

- Keeyask olive-sided flycatcher individuals may be of high relative value within Manitoba's landscape.

- For assessment, we should always consider going beyond simply counting breeding individuals for avian species at risk … to at least attempt to understand realised habitat quality, source and sink.

- Survey designs for birds must be appropriate to their biology.

- Require an audit of the olive-sided flycatcher data … far too much uncertainty around the dataset.

- Consider published mitigation strategies for olive-sided flycatcher (i.e., Robertson 2012). Compensation for lost habitat ?

Birds Conclusions and Recommendations – The 'Larger Picture'

- Effects monitoring is very important for olive-sided flycatcher given its use of 'Human infrastructure' in the Keeyask area.
- It was impossible for Soprovich to evaluate the veracity of the olive-sided flycatcher habitat quality model given Keeyask information.
- The test of the beaver habitat quality model was inappropriate for technical and scientific reasons.
- The consequence of failure of the beaver habitat quality model has implications to compensation for resource users.
- There is cause to critically evaluate the other four habitat quality models.