Barred Owl Habitat Analysis

1. Overview

In the development of HWP's 2014 Detailed Forest Management Plan, ESRD wanted habitat modelling undertaken for barred owl (*Strix varia*) on the Hinton FMA area. As barred owl is not a threatened or endangered species, in Alberta, HWP was reluctant to carry out such modelling. In addition, HWP felt strongly that managing cover types and seral stages within their Natural Range of Variation addressed barred owl habitat.

It was subsequently agreed that ESRD would carry out barred owl habitat modelling for HWP, and the results of that modelling would be presented in the DFMP.

What follows is a brief discussion about the biology of the barred owl (provided by HWP). After the discussion about barred owl biology, the barred owl habitat modelling outputs provided to HWP by ESRD will be presented. Further questions about the model outputs should be directed to Mike Russell or Anne Hubbs of Alberta Environment and Sustainable Resource Development.

2. Barred Owl Biology

2.1. Species Description and Distribution

The adult is 40–63 cm long with a 96–125 cm wingspan. Weight in this species is 500 to 1,050 g. It has a pale face with dark rings around the eyes, a yellow beak and brown eyes. It is the only typical owl of the eastern United States which has brown eyes; all others have yellow eyes. The upper parts are mottled gray-brown. The underparts are light with markings; the chest is barred horizontally while the belly is streaked vertically. The legs and feet are covered in feathers up to the talons. The head is round and lacks ear tufts, a distinction from the slightly smaller short-eared owl, which favors more open, marginal habitats.

Outside of the closely related spotted owl, this streaky, chunky-looking owl is unlikely to be confused over most of the range. The spotted owl is similar in appearance but has spots rather than streaks down the underside. Due to their fairly large size, the barred owl may be confused for the great horned owl by the inexperienced but are dramatically different in shape, eye color and markings.
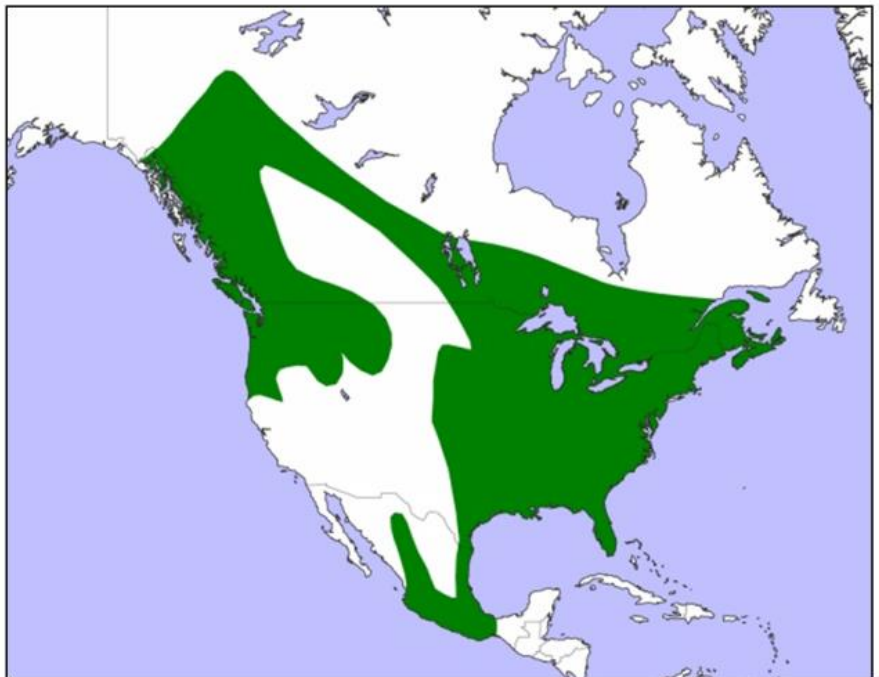

Figure 1 – Distribution of the barred owl

The Barred Owl is widespread in North America (Figure 1), they occur across most of the eastern half of the continent from Florida

northward to southern Canada; they are also spreading westward in the north of their range. Their spread westward is causing concern as they may compete with the endangered spotted owl. Northern populations may be partially migratory depending on food resources.

2.2. Preferred Habitat

Barred Owls live in large, mature forests made up of both deciduous trees and evergreens, often near water. They nest in tree cavities. Preferred barred owl forest habitat includes:

- Un-fragmented old mixedwood forests with tall, large–diameter trees (> 36 cm dbh)
- Dense understory and coarse woody debris of old forests that provide:
  - ➢ A diversity of prey for owls
  - ➢ Protection from predators as a result of hiding cover and places for young owls to climb to safety
- Many other boreal species benefit from structural diversity of habitat including: other owl species, hawks, songbirds, bats, American martens, and wolverines

2.3. Reproduction

The barred owl's nest is often in a tree cavity, usually natural cavities. Barred owls are too large to fit into cavities created by pileated woodpeckers, which build the largest excavated cavities in the area; it may also take over an old nesting site made previously by a red-tailed hawk, Cooper's hawk, northern goshawk, crow, raven, or squirrel. It is a permanent resident, but may wander after the nesting season. If a nest site has proved suitable in the past they will often reuse it as the birds are non-migratory. Eggs are brooded by the female with hatching taking place approximately four weeks later. Young owls fledge four to five weeks after hatching. These owls have few predators, but young, unwary owls may be taken by cats. The most significant predator of barred owls is the great horned owl. The barred owl has been known to live up to 10 years in the wild and 23 years in captivity.

2.4. Food and feeding

The barred owl is a very opportunistic predator. The principal prey of this owl consists of meadow voles, followed by mice and shrews of various species. Other mammals preyed upon include rats, squirrels, rabbits, bats, moles, opossums, mink, and weasels. Birds are taken occasionally and commonly include woodpeckers, grouse, and pigeons, and even domestic ducks and chickens, where they will even swoop through small openings in enclosed and covered runs.

The barred owl hunts by waiting on a high perch at night, or flying through the woods and swooping down on prey. A barred owl can sometimes be seen hunting before dark. This typically occurs during the nesting season or on dark and cloudy days. Daytime activity is often most prevalent when barred owls are raising chicks. However, this species still generally hunts near dawn or dusk.

3. Modelling Barred Owl Habitat

According to ESRD, the model used was from the following reference:

- Russell, M.S. 2008. Habitat selection of barred owls (*Strix varia*) across multiple spatial scales in a boreal agricultural landscape in north-central Alberta. M.Sc. thesis, University of Alberta, Edmonton, AB. 5

3.1. Barred Owl Model Technical Process

Using the classified landbase as an input, five rasters are created to use in calculating the Habitat Suitability.

1. UPSW (Softwoods);
2. HW (Hardwood);
3. DISTOLD (defined open area or young harvest area (less than 30 years); other than water),
4. DISTOPEN (represents the distance to the nearest forest stand that is older than 90 years); and
5. ATOP (area to perimeter ratio).

A mean aggregate (referred to as focal area, (Focal Stats in ArcInfo)) within 150m of each raster cell is calculated to determine the required proportion and proximity metrics to implement the models. This geometric radius represents the approximate scale that both models were developed for based on the error radius of radio-telemetry locations. Therefore, UPSW and HW represent the average proportion of mixedwood upland softwood (balsam fir and white spruce), and hardwood species, respectively, within 150m of each raster cell.

DISTOLD and DISTOPEN require calculating proximity metrics rather than proportion. The distance to the nearest target feature is calculated from the centre of each raster cell. Euclidian Distance functions in ArcInfo are used to calculate these values.

The five rasters are used to calculate the barred owl habitat model indices, or the relative importance of habitat, by calculating the exponential equation below for each cell raster cell (Russell 2008).   There are no hard numerical break points for the values produced in the output raster, HSI. The values are read low to high, with the lower numbers indicating habitat being less suitable for and the higher numbers indicating habitat being more suitable for the barred owl.

3.2. Interpreting Results

Examine the forecasted outcomes of the barred owl habitat assessment regarding planned forestry operations. Where the outcomes are deemed acceptable or low risk (i.e. habitat supply for species falls within a desired range over time), no further action is required. Where the outcomes are not deemed acceptable or low risk, mitigation measures and/ or modification of the SHS should be considered. Mitigation can be applied at the strategic and/ or operational level, depending on what is most appropriate for the species in question. Examples of mitigation strategies include:

Strategic Mitigation:

- Increase the amount of old and very old seral stages retained on the DFA;
- Redesign harvest areas to increase or decrease edge;
- Retain visual buffers around key habitats;
- Revise the location of proposed harvest areas in the draft SHS (e.g. aggregate harvest areas);
- Retain additional structure (including snags and coarse woody material) adjacent to key habitat.

Operational Mitigation:
- Alter timing of operations (winter vs. summer);
- Alter location of proposed harvest areas to avoid sensitive areas;
- Locate roads to avoid highly sensitive wildlife habitat;
- Minimize road densities; and/ or
- Incorporate wildlife values when locating structure retention.

4. Model Results

Table 1 outlines the results of the model as provided to HWP by ESRD. The model was run for year 0 (2012) and then again after the implementation of 20 years of spatial harvest sequence. Then the change in the suitability index was calculated.

Table 1 – *Barred Owl Mean Habitat Suitability Index (Year 0 compared to Year 20)*

Planning Unit	Compartment	Current (2012) Barred Owl Mean Habitat Suitability Index	20y Barred Owl Mean Habitat Suitability Index	Change	Change in Mean Habitat Suitability Index
16141	Athabasca 13	0.043066412	0.04217045	-0.0009	-2.08%
16142	Athabasca 9	0.083705708	0.092714414	0.0090	10.76%
16143	McLeod 19	0.035168137	0.040695276	0.0055	15.72%
16144	Athabasca 8	0.086345859	0.094331004	0.0080	9.25%
16321	McLeod 12	0.061098214	0.06077899	-0.0003	-0.52%
16322	McLeod 18	0.03902344	0.040479209	0.0015	3.73%
16323	Athabasca 1	0.01944302	0.027191879	0.0077	39.85%
16324	Athabasca 20	0.052831538	0.050202336	-0.0026	-4.98%
16325	Athabasca 3	0.03797831	0.040627774	0.0026	6.98%
16326	McLeod 15	0.122805044	0.11903581	-0.0038	-3.07%
16327	McLeod 27	0.032470297	0.039587587	0.0071	21.92%
16328	Athabasca 6	0.032572262	0.030086927	-0.0025	-7.63%
16329	Athabasca 2	0.06255582	0.064650156	0.0021	3.35%
16330	McLeod 17	0.035480298	0.033945747	-0.0015	-4.33%
16331	Athabasca 34	0.063399717	0.063972525	0.0006	0.90%
16332	Athabasca 16	0.043308537	0.043000575	-0.0003	-0.71%
16333	Berland 9	0.02887118	0.027572095	-0.0013	-4.50%
16334	Berland 13	0.015911967	0.024319891	0.0084	52.84%
16335	Berland 8	0.028532384	0.029287772	0.0008	2.65%
16336	McLeod 13	0.090929985	0.087828971	-0.0031	-3.41%
16337	Athabasca 18	0.098692097	0.098845087	0.0002	0.16%
16338	Athabasca 23	0.04573654	0.045223091	-0.0005	-1.12%
16339	McLeod 16	0.094469726	0.085941598	-0.0085	-9.03%
16340	Athabasca 14	0.067120448	0.061830133	-0.0053	-7.88%
16341	Berland 34	0.025662528	0.025621902	0.0000	-0.16%
16342	Athabasca 10	0.055408102	0.064637877	0.0092	16.66%
16344	Athabasca 35	0.024399739	0.030354513	0.0060	24.41%
16345	McLeod 9	0.041268852	0.042268638	0.0010	2.42%
16346	Athabasca 4	0.033013664	0.042585161	0.0096	28.99%
16347	Athabasca 12	0.026272662	0.028658779	0.0024	9.08%
16348	McLeod 25	0.038544197	0.033826724	-0.0047	-12.24%
16349	Embarras 9	0.038659666	0.039468002	0.0008	2.09%
16350	Berland 27	0.026664596	0.036872875	0.0102	38.28%
16351	Berland 28	0.0235989	0.027658353	0.0041	17.20%

Planning Unit	Compartment	Current (2012) Barred Owl Mean Habitat Suitability Index	20y Barred Owl Mean Habitat Suitability Index	Change	Change in Mean Habitat Suitability Index
16352	Berland 33	0.034042481	0.038935568	0.0049	14.37%
16353	Berland 26	0.036405873	0.032838307	-0.0036	-9.80%
16354	Athabasca 33	0.068230115	0.080200776	0.0120	17.54%
16355	Athabasca 32	0.033794899	0.032329772	-0.0015	-4.34%
16356	Berland 30	0.031171635	0.03342301	0.0023	7.22%
16357	Marlboro 1	0.110285841	0.10963133	-0.0007	-0.59%
16358	Marlboro 20	0.032887109	0.034862287	0.0020	6.01%
16359	Marlboro 5	0.038282998	0.054346617	0.0161	41.96%
16360	Marlboro 21	0.020884003	0.041055374	0.0202	96.59%
16361	Marlboro 4	0.02339901	0.037019771	0.0136	58.21%
16362	Marlboro 2	0.059403453	0.09301281	0.0336	56.58%
16363	Berland 29	0.023220897	0.02946358	0.0062	26.88%
16364	Berland 22	0.020400949	0.019055905	-0.0013	-6.59%
16365	Berland 20	0.021305854	0.023924597	0.0026	12.29%
16366	Marlboro 3	0.068466924	0.065054134	-0.0034	-4.98%
16367	Marlboro 25	0.065544322	0.065971442	0.0004	0.65%
16368	Berland 31	0.023275731	0.022892511	-0.0004	-1.65%
16369	Athabasca 28	0.041829091	0.054086916	0.0123	29.30%
16370	Berland 25	0.045091819	0.042736568	-0.0024	-5.22%
16371	Marlboro 19	0.05437202	0.063213453	0.0088	16.26%
16372	Berland 21	0.023076562	0.025571838	0.0025	10.81%
16373	Athabasca 31	0.04216443	0.036913875	-0.0053	-12.45%
16374	Marlboro 11	0.058708005	0.062672853	0.0040	6.75%
16375	Berland 24	0.039861102	0.039283216	-0.0006	-1.45%
16376	Marlboro 24	0.062112294	0.063355073	0.0012	2.00%
16377	Marlboro 22	0.020093141	0.043447915	0.0234	116.23%
16378	Marlboro 18	0.074468188	0.108373538	0.0339	45.53%
16379	Marlboro 6	0.055622272	0.062934346	0.0073	13.15%
16380	Berland 23	0.024637876	0.031938929	0.0073	29.63%
16381	Marlboro 7	0.087699316	0.081578992	-0.0061	-6.98%
16382	Marlboro 13	0.055043399	0.066455655	0.0114	20.73%
16384	McLeod 20	0.031136863	0.034263566	0.0031	10.04%
16385	Embarras 8	0.023593653	0.025408328	0.0018	7.69%
16386	McLeod 28	0.030550757	0.029055484	-0.0015	-4.89%
16387	McLeod 1	0.052285053	0.051885985	-0.0004	-0.76%
16388	McLeod 10	0.034004252	0.033589508	-0.0004	-1.22%
16389	McLeod 21	0.030292969	0.026832322	-0.0035	-11.42%
16390	McLeod 5	0.030726198	0.034482118	0.0038	12.22%

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16391	McLeod 6	0.024169059	0.02474824	0.0006	2.40%
16392	McLeod 7	0.028422363	0.034716338	0.0063	22.14%
16393	Embarras 7	0.034349084	0.042298682	0.0079	23.14%
16394	McLeod 8	0.021484278	0.033217527	0.0117	54.61%
16395	Embarras 3	0.038674708	0.040138319	0.0015	3.78%
16397	McLeod 23	0.038486373	0.048652824	0.0102	26.42%
16398	McLeod 4	0.028710909	0.029105999	0.0004	1.38%
16399	McLeod 11	0.045308188	0.042300873	-0.0030	-6.64%
16400	McLeod 2	0.034023702	0.033527944	-0.0005	-1.46%
16401	Embarras 15	0.028191442	0.031048944	0.0029	10.14%
16402	Embarras 22	0.026659602	0.034514844	0.0079	29.46%
16403	Embarras 16	0.023026075	0.022538157	-0.0005	-2.12%
16404	Embarras 17	0.017334489	0.023978611	0.0066	38.33%
16405	Embarras 18	0.020027362	0.035400912	0.0154	76.76%
16406	Marlboro 17	0.058805697	0.058519591	-0.0003	-0.49%
16407	Marlboro 16	0.075069651	0.08458139	0.0095	12.67%
16415	Embarras 11	0.046712525	0.050802916	0.0041	8.76%
16416	Embarras 10	0.036522612	0.037028916	0.0005	1.39%
16417	Embarras 12	0.023488576	0.032341909	0.0089	37.69%
16418	Embarras 2	0.026972195	0.035776015	0.0088	32.64%
16419	McLeod 3	0.030874338	0.03225233	0.0014	4.46%
16420	Embarras 6	0.02226677	0.026620006	0.0044	19.55%
16421	Embarras 4	0.040880192	0.057404533	0.0165	40.42%
16422	McLeod 24	0.031596616	0.046086181	0.0145	45.86%
16423	Embarras 20	0.023627212	0.030331265	0.0067	28.37%
16424	Embarras 21	0.024238588	0.021984756	-0.0023	-9.30%
16425	Embarras 14	0.019800058	0.031183859	0.0114	57.49%
16426	Embarras 1	0.031872336	0.029167224	-0.0027	-8.49%
16427	Embarras 13	0.025190134	0.020774094	-0.0044	-17.53%
16428	Embarras 5	0.027166158	0.020485692	-0.0067	-24.59%
16432	Marlboro 15	0.081758149	0.091714941	0.0100	12.18%
16435	Embarras 19	0.020719096	0.02904216	0.0083	40.17%
16437	Athabasca 30	0.032608513	0.037493102	0.0049	14.98%
16438	Marlboro 12	0.049667813	0.060651977	0.0110	22.12%
16439	Marlboro 8	0.084754579	0.079183728	-0.0056	-6.57%
16440	Berland 7	0.015494884	0.019171018	0.0037	23.72%
16441	Athabasca 29	0.032188438	0.028824253	-0.0034	-10.45%
16442	Berland 6	0.021905977	0.021990038	0.0001	0.38%
16443	Berland 1	0.024172127	0.040230397	0.0161	66.43%
16444	Marlboro 9	0.052631184	0.049839504	-0.0028	-5.30%

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16445	Berland 12	0.01834541	0.02234338	0.0040	21.79%
16446	Athabasca 24	0.028775552	0.036558229	0.0078	27.05%
16447	Berland 11	0.02800996	0.026400888	-0.0016	-5.74%
16448	Athabasca 26	0.029193804	0.035892505	0.0067	22.95%
16449	Berland 16	0.028337447	0.030732518	0.0024	8.45%
16451	Marlboro 10	0.053655244	0.069601372	0.0159	29.72%
16452	Athabasca 22	0.042526152	0.040563267	-0.0020	-4.62%
16453	Berland 2	0.0226063	0.027115503	0.0045	19.95%
16454	Berland 3	0.02699603	0.032042027	0.0050	18.69%
16455	Marlboro 23	0.097452648	0.101806648	0.0044	4.47%
16456	Athabasca 19	0.034748141	0.034296762	-0.0005	-1.30%
16457	Berland 18	0.023984151	0.026364366	0.0024	9.92%
16458	Berland 5	0.02290882	0.023861686	0.0010	4.16%
16459	Athabasca 27	0.030221995	0.025854969	-0.0044	-14.45%
16460	Athabasca 21	0.061475702	0.074190468	0.0127	20.68%
16462	Marlboro 14	0.047166139	0.050754711	0.0036	7.61%
16463	Berland 4	0.032586142	0.033666417	0.0011	3.32%
16464	Athabasca 15	0.03180084	0.031097865	-0.0007	-2.21%
16466	Berland 10	0.025695421	0.024884563	-0.0008	-3.16%
16467	Berland 14	0.02098617	0.022957375	0.0020	9.39%
16468	Athabasca 11	0.029124266	0.029421644	0.0003	1.02%
16469	Athabasca 17	0.071001172	0.063019656	-0.0080	-11.24%
	FMA-wide change in habitat value	0.0143539	0.0175587	0.0032	22.33%

The maps on the following pages describe the gross FMA landbase showing the barred owl habitat suitability index at Year 0 (Figure 2), Year 20 after the implementation of the Spatial Harvest Sequence (Figure 3), and the net change in the barred owl suitability index (Figure 4).
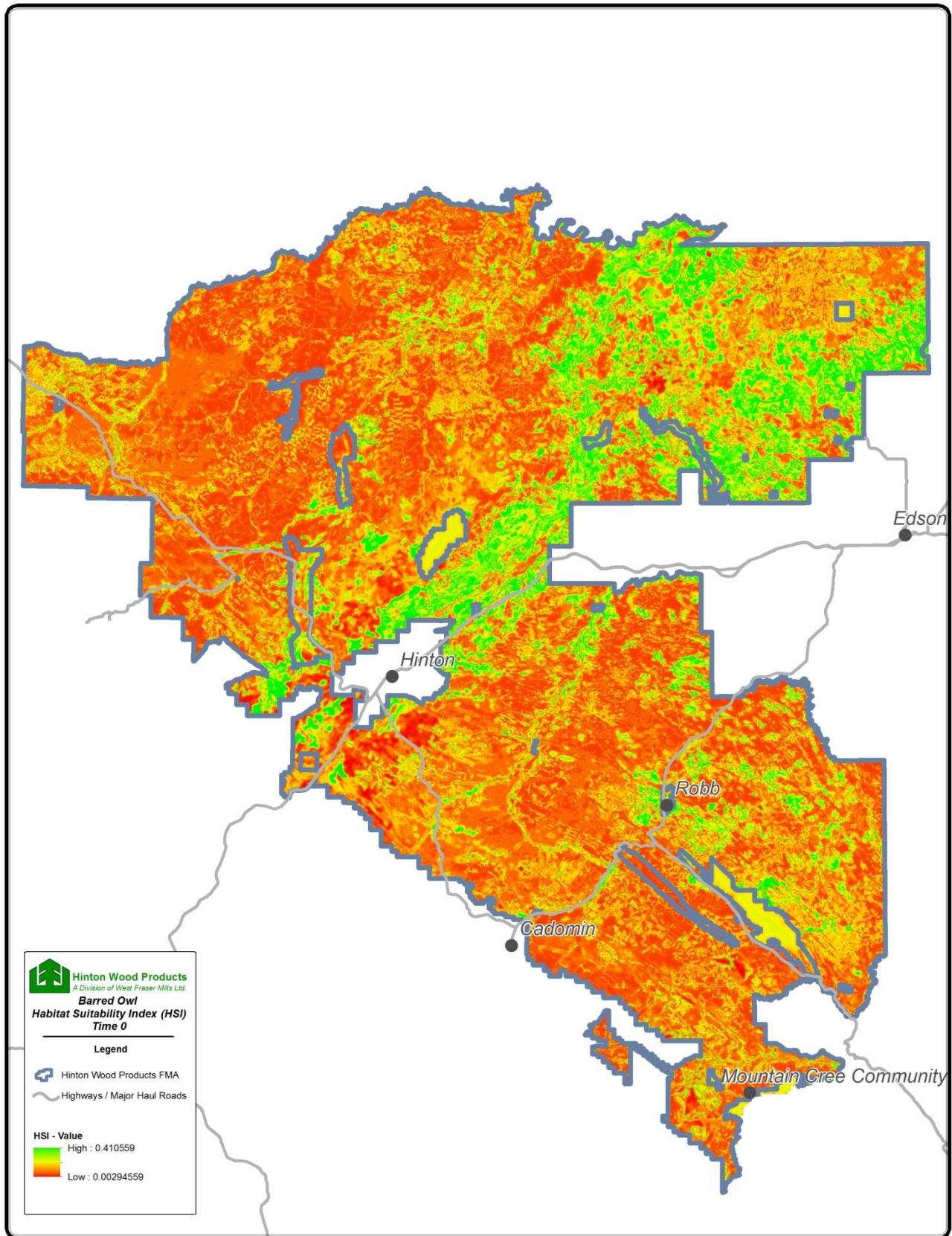
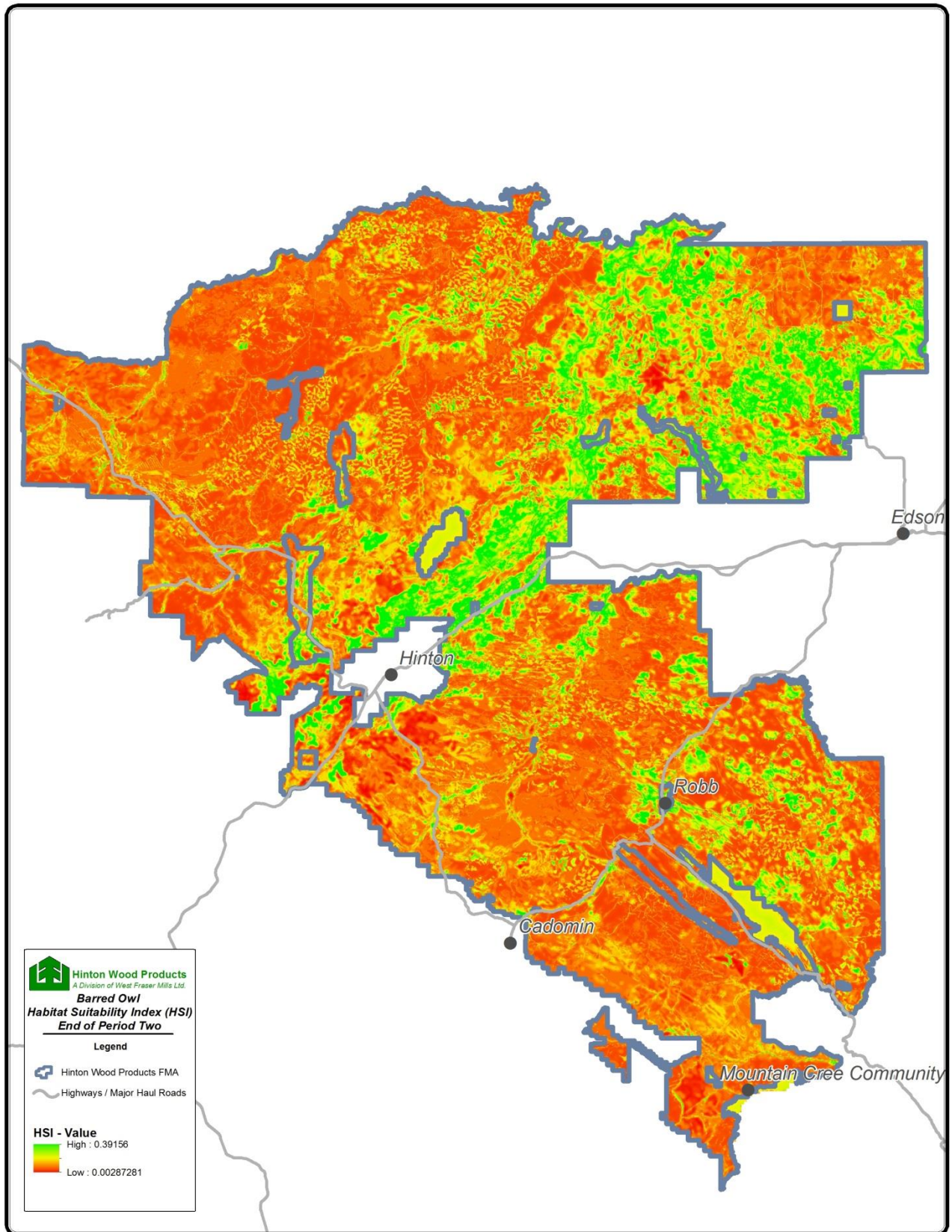**Figure 2** – *Barred owl habitat suitability index at Year 0 (2012)*

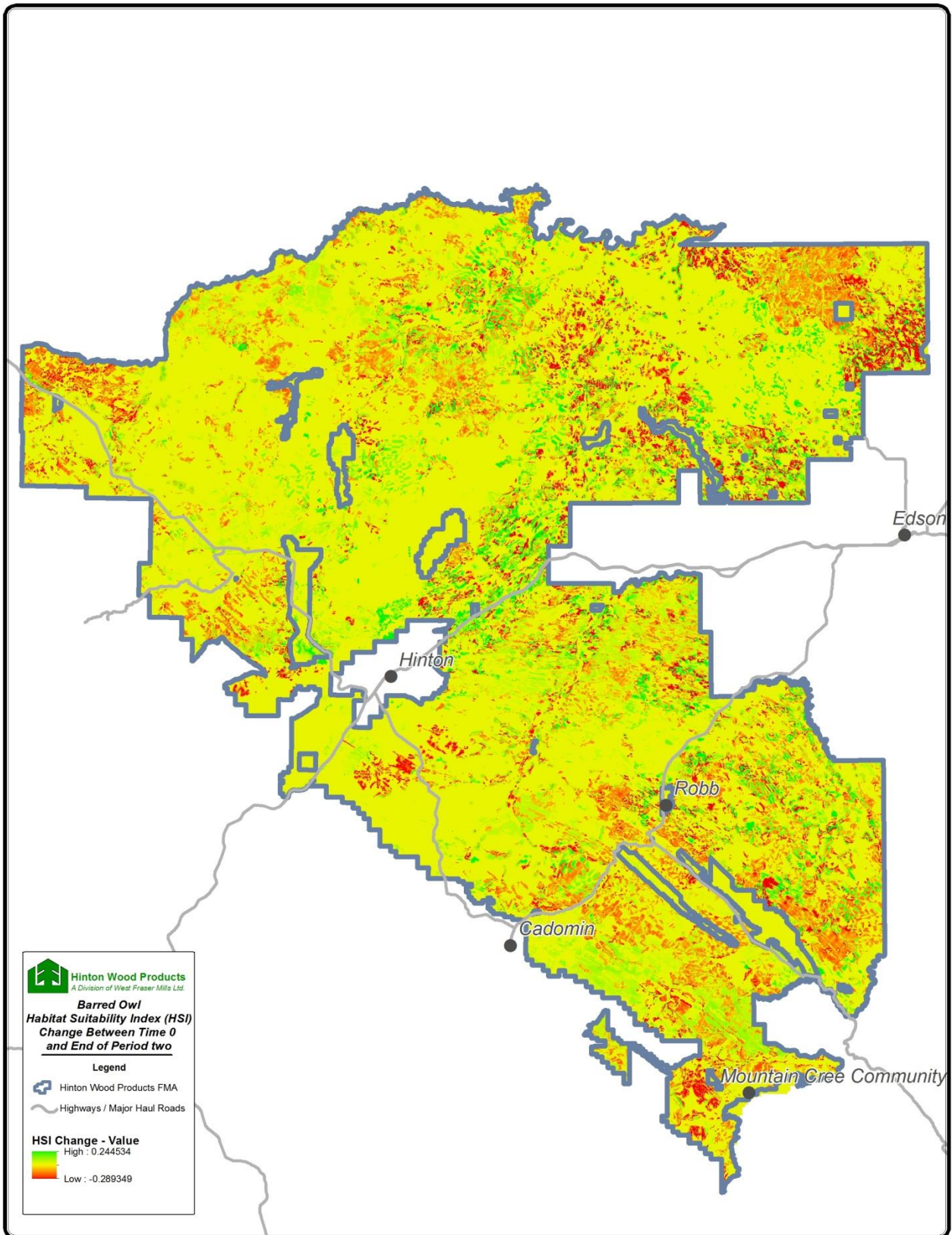**Figure 3** – *Barred owl habitat suitability index at Year 20*

Figure 4 – *Change in barred owl Habitat Suitability Index after 20 Year Spatial Harvest Sequence*

5. References:

- Russell, M.S. 2008. Habitat selection of barred owls (*Strix varia*) across multiple spatial scales in a boreal agricultural landscape in north-central Alberta. M.Sc. thesis, University of Alberta, Edmonton, AB. 5

- http://en.wikipedia.org/wiki/Barred_owl