Management Plan for the Northern Goshawk, *laingi* subspecies (*Accipiter gentilis laingi*) in British Columbia

Prepared by the Ministry of Forests, Lands, and Natural Resource Operations and Ministry of Environment

June 2013
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Cover photograph

Adult Northern Goshawk on a nest in the Cowichan Lake area of Vancouver Island. Photograph by Rory Hill, 2010.

Additional copies

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Disclaimer

This plan was developed jointly by the Ministry of Environment, the agency responsible for species at risk policy and planning in British Columbia, and the Ministry of Forests, Lands and Natural Resource Operations, the agency charged with leading implementation activities for the management of Northern Goshawk, laingi subspecies.

This document identifies ongoing and recommended actions that are deemed necessary, based on the best available scientific information, to manage Northern Goshawk, laingi subspecies populations in British Columbia. Actions to achieve the goals and objectives identified herein are subject to the priorities and budgetary constraints of participatory agencies and organizations. These goals, objectives, and recovery approaches may be modified in the future to accommodate new objectives and findings.

Success in the management of this species depends on the commitment and cooperation of many different constituencies that may be involved in implementing the directions set out in this plan. The Province of British Columbia encourages all Canadians to participate in the conservation of the Northern Goshawk, laingi subspecies.
ACKNOWLEDGEMENTS

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Linda Sinclair assisted the Northern Goshawk Accipiter gentilis laingi Recovery Team to produce range maps, which were modified for this report.

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EXECUTIVE SUMMARY

The Northern Goshawk, laingi subspecies (Accipiter gentilis laingi) is a raven-sized predatory bird with short, rounded wings and a long tail. It is the largest accipiter in North America and nests in various forest types. Its nest site is typically in a large tree and is usually surrounded by mature forest types. It prefers to forage in forests that provide prey and hunting opportunities typically found in mature and old forests. It was designated as Threatened by the Committee on the Status of Endangered Wildlife in Canada. As a result, this subspecies was listed as Threatened in Canada on Schedule 1 of the Species at Risk Act (SARA). In British Columbia, Northern Goshawk, laingi subspecies is ranked S2B (imperiled) by the Conservation Data Centre and is on the provincial Red list.

The B.C. Conservation Framework ranks Northern Goshawk, laingi subspecies as a priority 1 species under goal 1 (contribute to global efforts for species and ecosystem conservation) and goal 3 (maintain the diversity of native species and ecosystems). It is protected from capture and killing, under the B.C. Wildlife Act. It is also listed as a species which requires special management attention to address the impacts of forest and range activities under the Forest and Range Practices Act (FRPA) and/or the impacts of oil and gas activities under the Oil and Gas Activities Act (OGAA) on crown land (as described in the Identified Wildlife Management Strategy).

There are currently 162 known Northern Goshawk, laingi territories (360 known nests; Northern Goshawk, laingi subspecies may build multiple nests within each territory) across the four conservation regions in British Columbia (18 territories in Haida Gwaii, 20 territories in North Coast, 25 territories in South Coast, and 99 territories in Vancouver Island). Based on recent modelling results, there is currently suitable habitat to support an estimated 682–764 potential Northern Goshawk, laingi territories within the four conservation regions in British Columbia if a forage supply threshold of 40% of suitable forage habitat within a territory is applied.

The most imminent threats to populations of Northern Goshawk, laingi subspecies within British Columbia are roads and forest harvesting that result in loss and fragmentation of nesting and foraging habitats. Ecosystem modification and subsequent reductions in prey diversity and abundance in Haida Gwaii due to introduced Black-tailed Deer (Odocoileus hemionus columbianus) are also a concern.

The following long-term recovery goal identified by the Northern Goshawk Accipiter gentilis laingi Recovery Team (2008) will guide management efforts within the province:

To ensure viable populations of Northern Goshawk, laingi subspecies persist in each conservation region in coastal British Columbia.

This management plan is informed by the objectives outlined in the 2008 B.C. Recovery Strategy:

1. To manage and, where necessary, conserve and recover habitat that meets the needs of Northern Goshawk, laingi subspecies through its annual cycle.
2. To conserve and, where necessary, recover a well-distributed and viable population of Northern Goshawk, *laingi* subspecies within coastal B.C.

The objectives of this management plan are intended to support conservation and ongoing recovery efforts for the Northern Goshawk, *laingi* subspecies while providing continued resource development opportunities.
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1 SCOPE OF THE PLAN

This plan is limited to the Northern Goshawk, *laingi* subspecies (*Accipiter gentilis laingi*) found in British Columbia (B.C.). Only basic species information is presented in this document. Please refer to the Recovery Strategy for the Northern Goshawk, *laingi* subspecies (*Accipiter gentilis laingi*) in British Columbia (hereafter “B.C. Recovery Strategy”; Northern Goshawk *Accipiter gentilis laingi* Recovery Team 2008) for more complete information about Northern Goshawk, *laingi* subspecies in British Columbia. This plan includes an updated threat assessment for Northern Goshawk, *laingi* subspecies as well as outlines B.C.’s current management framework and recommended actions to support ongoing conservation efforts for the Northern Goshawk, *laingi* subspecies.

2 COSEWIC* SPECIES ASSESSMENT INFORMATION

| Date of Assessment: November 2000 |
| Common Name: Northern Goshawk, *laingi* subspecies |
| Scientific Name: *Accipiter gentilis laingi* |
| Status: Threatened |
| Reason for Designation: This small, sedentary goshawk population has been negatively impacted by degradation of forested habitat. |
| Last Examination and Change: November 2000 up-listed from Special Concern to Threatened |
| Canadian Occurrence: British Columbia |

* Committee on the Status of Endangered Wildlife in Canada.

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1 Review of the COSEWIC designation of Northern Goshawk, *laingi* subspecies is expected to be re-assessed in April 2013.
3 SPECIES STATUS INFORMATION

<table>
<thead>
<tr>
<th>Northern Goshawk, laingi subspeciesa</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Legal Designation:</strong></td>
</tr>
<tr>
<td>FRPA: Species at Riskb (2004)</td>
</tr>
<tr>
<td>OGAA: Species at Riskb (2004)</td>
</tr>
<tr>
<td>B.C. Wildlife Act: Schedule A²</td>
</tr>
<tr>
<td><strong>Conservation Statusd</strong></td>
</tr>
<tr>
<td>B.C. List: Red</td>
</tr>
<tr>
<td>National Rank: N2 (2011)</td>
</tr>
<tr>
<td>Global Rank: G5T2 (2008)</td>
</tr>
<tr>
<td>Other Subnational Ranks: Alaska: S2</td>
</tr>
<tr>
<td><strong>B.C. Conservation Framework (CF)f</strong></td>
</tr>
<tr>
<td>Goal 3: Maintain the diversity of native species and ecosystems.</td>
</tr>
</tbody>
</table>

a Data source: B.C. Conservation Data Centre (2012a) unless otherwise noted.
b Species at Risk = a category of wildlife which require special management attention to address the impacts of forest and range activities on Crown land under the FRPA (Province of British Columbia 2002) and/or the OGAA (Province of British Columbia 2008a) as described in the Identified Wildlife Management Strategy (Province of British Columbia 2004).
² Schedule A = designated as wildlife under the B.C. Wildlife Act, which offers it protection from direct persecution and mortality (Province of British Columbia 1982).
³ S = subnational; N = national; G = global; T = refers to the subspecies level; B = breeding; X = presumed extirpated; H = possibly extirpated; 1 = critically imperiled; 2 = imperiled; 3 = special concern, vulnerable to extirpation or extinction; 4 = apparently secure; 5 = demonstrably widespread, abundant, and secure; NA = not applicable; NR = unranked; U = unrankable. U.S. data from NatureServe (2012).
⁵ Data source: Ministry of Environment (2010).
⁶ Six-level scale: Priority 1 (highest priority) through to Priority 6 (lowest priority).

4 SPECIES INFORMATION

4.1 Species Description

The Northern Goshawk is the largest accipiter hawk in B.C., although the size varies widely between genders and between populations. Two subspecies, *A. gentilis* laingi and *A. gentilis* atricapillus, are recognized in B.C.

Discussion continues regarding the delineation of these subspecies’ boundaries and current and future work will likely inform issues regarding conservation units for this species. Existing information, including recent unpublished genetic and morphological information, has resulted in a recommendation from the COSEWIC bird species specialists subcommittee members to retain the boundaries as shown in the B.C. Recovery Strategy (Northern Goshawk *Accipiter gentilis laingi* Recovery Team 2008), which includes Vancouver Island and the Mainland Coast as part of the Northern Goshawk, *laingi* subspecies distribution (D. Fraser, pers. comm., 2012). A review of the subspecies designation by COSEWIC is expected in April 2013.

The breeding home range or territory of Northern Goshawk, *laingi* subspecies is currently regarded as two areas: one or more breeding areas and a surrounding foraging area (McClaren et al. 2005; Stuart-Smith et al. 2012). The breeding area can include multiple nest trees, roost trees,
and prey plucking posts (often referred to as the “nesting area”), and a surrounding “post-fledging area” where fledglings spend time after leaving the nest but before they become independent (Reynolds et al. 1992). The larger foraging area makes up most of the territory, and is where the adults hunt (Squires and Reynolds 1997).

4.2 Populations and Distribution

In B.C., the Northern Goshawk, *laingi* subspecies inhabits Haida Gwaii, Vancouver Island, the coastal islands, and the coastal mainland west of the Coast Mountains (Campbell et al. 1990; COSEWIC 2000; McClaren 2005; Northern Goshawk Accipiter gentilis laingi Recovery Team 2008). The range of the *laingi* subspecies is thought to follow the distribution of the Coastal Western Hemlock and Coastal Douglas-fir biogeoclimatic zones (Green and Klinka 1994). Four conservation regions are currently recognized for Northern Goshawk, *laingi* subspecies in coastal B.C.: Haida Gwaii (HG), North Coast (NC), South Coast (SC), and Vancouver Island (VI) (Northern Goshawk Accipiter gentilis laingi Recovery Team 2008). There are currently 162 known Northern Goshawk, *laingi* territories across the four conservation regions (HG = 18; NC = 20; SC = 25; and VI = 99). Within these territories, there are currently 360 known nests (Northern Goshawk, *laingi* may build multiple nests within each territory) across all conservation regions in B.C. (B.C. Conservation Data Centre 2012b).

Range boundaries for Northern Goshawk, *laingi* subspecies are imprecise and may be revised as the genetics of this subspecies is reviewed; therefore, the exact percentage of the global population distribution within Canada is unknown (Talbot 2006; USFWS 2007; Bayard de Volo 2008; Talbot et al. 2011; Sonsthagen et al. 2012). Using the 2008 Northern Goshawk, *laingi* subspecies range map (Figure 1), it is estimated that approximately 50–60% of the total range occurs within Canada and 100% of Canada’s distribution of this subspecies is within B.C. (Northern Goshawk Accipiter gentilis laingi Recovery Team 2008).

Limited information on global, national, and regional population sizes and trends for Northern Goshawk, *laingi* subspecies exist due to difficulties in assessing productivity, survival, and recruitment.
Figure 1. Range map for Northern Goshawk, laingi subspecies showing the four conservation regions in British Columbia (adapted from the Northern Goshawk Accipiter gentilis laingi Recovery Team 2008).
5 THREATS

Threats are defined as the proximate activities or processes that have caused, are causing, or may cause in the future the destruction, degradation, and/or impairment of the entity being assessed (population, species, community, or ecosystem) in the area of interest (global, national, or subnational) (Salafsky et al. 2008). For purposes of threat assessment, only present and future threats are considered. Threats presented here do not include biological features of the species or population such as inbreeding depression, small population size, and genetic isolation; or the likelihood of regeneration or recolonization for ecosystems, which are considered limiting factors.

For the most part, threats are related to human activities, but they can be natural. The impact of human activity may be direct (e.g., destruction of habitat) or indirect (e.g., invasive species introduction). Effects of natural phenomena (e.g., fire, hurricane, flooding) may be especially important when the species or ecosystem is concentrated in one location or has few occurrences, which may be a result of human activity (Master et al. 2009). As such, natural phenomena are included in the definition of a threat, though should be applied cautiously. These stochastic events should only be considered a threat if a species or habitat is damaged from other threats and has lost its resilience, and is thus vulnerable to the disturbance (Salafsky et al. 2008) so that this type of event would have a disproportionately large effect on the population/ecosystem, compared to the effect they would have had historically.

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2 Past threats may be recorded but are not used in the calculation of Threat Impact. Effects of past threats (if not continuing) are taken into consideration when determining long-term and/or short-term trend factors (Master et al. 2009).

3 It is important to distinguish between limiting factors and threats. Limiting factors are generally not human induced and include characteristics that make the species or ecosystem less likely to respond to recovery/conservation efforts.
5.1.1 Threat Assessment

The threat classification below is based on the IUCN-CMP (World Conservation Union–Conservation Measures Partnership) unified threats classification system and is consistent with methods used by the B.C. Conservation Data Centre and the B.C. Conservation Framework. For a detailed description of the threat classification system, see the CMP website (CMP 2010). Threats may be observed, inferred, or projected to occur in the near term (< 10 years or 3 generations). Threats are characterized here in terms of scope, severity, and timing. Threat “impact” is calculated from scope and severity. For information on how the values are assigned, see Master et al. (2009) and table footnotes for details. Threats for the Northern Goshawk, *laingi* subspecies were assessed for the entire province (Table 1).

**Table 1.** Threat classification table for Northern Goshawk, *laingi* subspecies.

<table>
<thead>
<tr>
<th>Threat #</th>
<th>Threat description</th>
<th>Impact</th>
<th>Scope</th>
<th>Severity</th>
<th>Timing</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Residential &amp; commercial development</td>
<td>Negligible</td>
<td>Negligible (&lt; 1%)</td>
<td>Extreme (71–100%)</td>
<td>High</td>
</tr>
<tr>
<td>1.1</td>
<td>Housing &amp; urban areas</td>
<td>Negligible</td>
<td>Negligible (&lt; 1%)</td>
<td>Extreme (71–100%)</td>
<td>High</td>
</tr>
<tr>
<td>1.2</td>
<td>Commercial &amp; industrial areas</td>
<td>Negligible</td>
<td>Negligible (&lt; 1%)</td>
<td>Extreme (71–100%)</td>
<td>High</td>
</tr>
<tr>
<td>1.3</td>
<td>Tourism &amp; recreation areas</td>
<td>Negligible</td>
<td>Negligible (&lt; 1%)</td>
<td>Moderate - Slight (1–30%)</td>
<td>High</td>
</tr>
<tr>
<td>2</td>
<td>Agriculture &amp; aquaculture</td>
<td>Negligible</td>
<td>Negligible (&lt; 1%)</td>
<td>Extreme (71–100%)</td>
<td>High</td>
</tr>
<tr>
<td>2.1</td>
<td>Annual &amp; perennial non-timber crops</td>
<td>Negligible</td>
<td>Negligible (&lt; 1%)</td>
<td>Extreme (71–100%)</td>
<td>High</td>
</tr>
<tr>
<td>2.2</td>
<td>Wood &amp; pulp plantations</td>
<td>Negligible</td>
<td>Negligible (&lt; 1%)</td>
<td>Extreme (71–100%)</td>
<td>High</td>
</tr>
<tr>
<td>2.3</td>
<td>Livestock farming &amp; ranching</td>
<td>Negligible</td>
<td>Negligible (&lt; 1%)</td>
<td>Negligible (&lt; 1%)</td>
<td>High</td>
</tr>
<tr>
<td>3</td>
<td>Energy production &amp; mining</td>
<td>Negligible</td>
<td>Negligible (&lt; 1%)</td>
<td>Extreme (71–100%)</td>
<td>High</td>
</tr>
<tr>
<td>3.2</td>
<td>Mining &amp; quarrying</td>
<td>Negligible</td>
<td>Negligible (&lt; 1%)</td>
<td>Extreme (71–100%)</td>
<td>High</td>
</tr>
<tr>
<td>3.3</td>
<td>Renewable energy</td>
<td>Negligible</td>
<td>Negligible (&lt; 1%)</td>
<td>Unknown</td>
<td>High</td>
</tr>
<tr>
<td>4</td>
<td>Transportation &amp; service corridors</td>
<td>Low</td>
<td>Slight (1–10%)</td>
<td>Slight (1–10%)</td>
<td>High</td>
</tr>
<tr>
<td>4.1</td>
<td>Roads &amp; railroads</td>
<td>Low</td>
<td>Small (1–10%)</td>
<td>Slight (1–10%)</td>
<td>High</td>
</tr>
<tr>
<td>4.2</td>
<td>Utility &amp; service lines</td>
<td>Negligible</td>
<td>Negligible (&lt; 1%)</td>
<td>Unknown</td>
<td>High</td>
</tr>
<tr>
<td>4.4</td>
<td>Flight paths</td>
<td>Negligible</td>
<td>Negligible (&lt; 1%)</td>
<td>Unknown</td>
<td>High</td>
</tr>
<tr>
<td>5</td>
<td>Biological resource use</td>
<td>Low</td>
<td>Small (1–10%)</td>
<td>Serious - Moderate (11–70%)</td>
<td>High</td>
</tr>
<tr>
<td>5.1</td>
<td>Hunting &amp; collecting terrestrial animals</td>
<td>Negligible</td>
<td>Negligible (&lt; 1%)</td>
<td>Extreme (71–100%)</td>
<td>High</td>
</tr>
<tr>
<td>5.2</td>
<td>Gathering terrestrial plants</td>
<td>Negligible</td>
<td>Negligible (&lt; 1%)</td>
<td>Negligible (&lt; 1%)</td>
<td>High</td>
</tr>
<tr>
<td>5.3</td>
<td>Logging &amp; wood harvesting</td>
<td>Low</td>
<td>Small (1–10%)</td>
<td>Serious - Moderate (11–70%)</td>
<td>High</td>
</tr>
<tr>
<td>Threat #</td>
<td>Threat description</td>
<td>Impact&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Scope&lt;sup&gt;b&lt;/sup&gt;</td>
<td>Severity&lt;sup&gt;c&lt;/sup&gt;</td>
<td>Timing&lt;sup&gt;d&lt;/sup&gt;</td>
</tr>
<tr>
<td>--------</td>
<td>-----------------------------------------------</td>
<td>--------------------</td>
<td>-------------------</td>
<td>----------------------</td>
<td>-------------------</td>
</tr>
<tr>
<td>6</td>
<td>Human intrusions &amp; disturbance</td>
<td>Negligible</td>
<td>Negligible (&lt;1%)</td>
<td>Negligible (&lt;1%)</td>
<td>High</td>
</tr>
<tr>
<td>6.1</td>
<td>Recreational activities</td>
<td>Negligible</td>
<td>Negligible (&lt;1%)</td>
<td>Negligible (&lt;1%)</td>
<td>High</td>
</tr>
<tr>
<td>7</td>
<td>Natural system modifications</td>
<td>Low</td>
<td>Small (1–10%)</td>
<td>Serious (31–70%)</td>
<td>High</td>
</tr>
<tr>
<td>7.1</td>
<td>Fire &amp; fire suppression</td>
<td>Negligible</td>
<td>Negligible (&lt;1%)</td>
<td>Extreme (71–100%)</td>
<td>High</td>
</tr>
<tr>
<td>7.3</td>
<td>Other ecosystem modifications</td>
<td>Low</td>
<td>Small (1–10%)</td>
<td>Serious (31–70%)</td>
<td>High</td>
</tr>
<tr>
<td>8</td>
<td>Invasive &amp; other problematic species &amp; genes</td>
<td>Negligible</td>
<td>Negligible (&lt;1%)</td>
<td>Slight (1–10%)</td>
<td>High</td>
</tr>
<tr>
<td>8.1</td>
<td>Invasive non-native/alien species</td>
<td>Negligible</td>
<td>Negligible (&lt;1%)</td>
<td>Slight (1–10%)</td>
<td>High</td>
</tr>
<tr>
<td>10</td>
<td>Geological events</td>
<td>Negligible</td>
<td>Negligible (&lt;1%)</td>
<td>Extreme (71–100%)</td>
<td>Moderate</td>
</tr>
<tr>
<td>10.2</td>
<td>Earthquakes/tsunamis</td>
<td>Negligible</td>
<td>Negligible (&lt;1%)</td>
<td>Extreme (71–100%)</td>
<td>Moderate</td>
</tr>
<tr>
<td>10.3</td>
<td>Avalanches/landslides</td>
<td>Negligible</td>
<td>Negligible (&lt;1%)</td>
<td>Serious (31–70%)</td>
<td>High</td>
</tr>
<tr>
<td>11</td>
<td>Climate change &amp; severe weather</td>
<td>Negligible</td>
<td>Negligible (&lt;1%)</td>
<td>Slight (1–10%)</td>
<td>High</td>
</tr>
<tr>
<td>11.1</td>
<td>Habitat shifting &amp; alteration</td>
<td>Negligible</td>
<td>Negligible (&lt;1%)</td>
<td>Negligible (&lt;1%)</td>
<td>High</td>
</tr>
<tr>
<td>11.3</td>
<td>Temperature extremes</td>
<td>Negligible</td>
<td>Negligible (&lt;1%)</td>
<td>Slight (1–10%)</td>
<td>High</td>
</tr>
<tr>
<td>11.4</td>
<td>Storms &amp; flooding</td>
<td>Unknown</td>
<td>Pervasive (71–100%)</td>
<td>Unknown</td>
<td>High</td>
</tr>
</tbody>
</table>

<sup>a</sup> **Impact** – The degree to which a species is observed, inferred, or suspected to be directly or indirectly threatened in the area of interest. The impact of each threat is based on Severity and Scope rating and considers only present and future threats. Threat impact reflects a reduction of a species population or decline/degradation of the area of an ecosystem. The median rate of population reduction or area decline for each combination of scope and severity corresponds to the following classes of threat impact: Very High (75% declines), High (40%), Medium (15%), and Low (3%). Unknown: used when impact cannot be determined (e.g., if values for either scope or severity are unknown); Not Calculated: impact not calculated as threat is outside the assessment timeframe (e.g., timing is insignificant/negligible or low as threat is only considered to be in the past); Negligible: when scope or severity is negligible; Not a Threat: when severity is scored as neutral or potential benefit.

<sup>b</sup> **Scope** – Proportion of the species that can reasonably be expected to be affected by the threat within 10 years. Usually measured as a proportion of the species’ population in the area of interest. (Pervasive = 71–100%; Large = 31–70%; Restricted = 11–30%; Small = 1–10%; Negligible < 1%).

<sup>c</sup> **Severity** – Within the scope, the level of damage to the species from the threat that can reasonably be expected to be affected by the threat within a 10-year or 3-generation timeframe. Usually measured as the degree of reduction of the species’ population. (Extreme = 71–100%; Serious = 31–70%; Moderate = 11–30%; Slight = 1–10%; Negligible < 1%; Neutral or Potential Benefit ≥ 0%).

<sup>d</sup> **Timing** – High = continuing; Moderate = only in the future (could happen in the short term (< 10 years or 3 generations)) or now suspended (could come back in the short term); Low = only in the future (could happen in the long term) or now suspended (could come back in the long term); Insignificant/Negligible = only in the past and unlikely to return, or no direct effect but limiting.
5.1.2 Description of Threats

The overall province-wide Threat Impact for this species is Low. \(^4\) It is acknowledged that some threats are interrelated and compounding (Table 1) and although the overall threat is low, the small population present in B.C. continues to face steady habitat loss. Details are discussed below under the Threat Level 1 headings. \(^5\)

IUCN-CMP Threat 4. Transportation and service corridors
New development on southern and northern Vancouver Island as well as Haida Gwaii continues to affect Northern Goshawk, *laingi* subspecies habitat.

IUCN-CMP Threat 5. Biological resource use
Timber harvesting impacts Northern Goshawk, *laingi* subspecies due to habitat loss and habitat fragmentation. Although the scope of this threat is small, current forest harvest rates may exceed recruitment of suitable habitat. Such recruitment from second growth within the Haida Gwaii and the North Coast Conservation Regions generally requires a longer period of time (Doyle 2006a; Mahon *et al.* 2012) compared to those farther south. The severity scoring for this threat accounts for the time it takes for the recruitment of young forest into suitable habitat. It reflects the likelihood that the small Northern Goshawk, *laingi* subspecies population present in B.C. will continue to face steady habitat loss as a result of forest harvest rates (Federal Register 2012). Better tracking of harvest and stand regeneration would improve the threats assessment and allow a better understanding of the type and scope of change in forest planning and practices that would be required to forecast stable Northern Goshawk, *laingi* subspecies populations across the four conservation regions.

IUCN-CMP Threat 7. Natural system modifications
Introduced Black-tailed Deer (*Odocoileus hemionus columbianus*) have modified the ecosystem (e.g., changes to the forest understory) in Haida Gwaii and some Gulf Islands (Martin *et al.* 2011) in such a way as to reduce prey abundance for the Northern Goshawk, *laingi* subspecies (Doyle 2003, 2005, 2006b; Mahon *et al.* 2012).

Other Factors Considered
Other threats were assessed but it was determined that the severity of such threats would result in less than a 1% reduction of the species’ population in B.C. (e.g., residential and commercial.

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\(^4\) The overall threat impact was calculated following Master *et al.* (2009) using the number of Level 1 Threats assigned to this species where Timing = High or Moderate. This includes 3 Lows (Table 1). The overall threat considers the cumulative impacts of multiple threats.

\(^5\) Although the threat assessment presented in this document supercedes the one found in the B.C. Recovery Strategy (Northern Goshawk *Accipiter gentilis laingi* Recovery Team 2008), the threats section of the B.C. Recovery Strategy still provides relevant supporting information and references for the threats to the Northern Goshawk, *laingi* subspecies presented here.
development; agriculture; energy production and mining, including wind farms; recreational activities; invasive species; and geological events).

The Haida Gwaii population faces greater threat impacts than the remainder of the B.C. population (Doyle 2006a). Compiling a separate threats assessment for each conservation region would provide a more accurate accounting of the threats. For example, Haida Gwaii may have a higher than neglible threat for persecution (Threat #5.1); and introduced Raccoons (*Procyon lotor*) were recently suspected of predaing a nest (K. Dhanwant, pers. comm. as cited in Cooper and Stevens 2000; Threat # 8.1).

Climate change (Threat #11) may exacerbate declines of the Northern Goshawk, *laingi* subspecies. Wetter springs are suspected already and this results in lower nesting activity and/or chick survival (Bloxton 2002; Fairhurst and Bechard 2005; Manning *et al.* 2007; Doyle 2009). Wetter springs are being modelled for the area inhabited by the species on Haida Gwaii under most climate change scenarios. Cool springs may also have an impact on chick survival, however the scope of this threat is thought to be neglible over the next 10 years. In addition, there is an observed increase in storminess in the region due to increasing climate variability effects in the Northeast Pacific (Abeyesirigunawardena and Walker, pers. comm., 2005 as cited in Connor 2003); however, the effect this may have on nesting success is not understood.

## 6 CURRENT MANAGEMENT FRAMEWORK

### 6.1 Habitat Protection Measures and Management

In B.C., threats are managed through a variety of measures aimed at protecting nesting (breeding) and foraging habitats for the Northern Goshawk, *laingi* subspecies.

#### 6.1.1 Habitat Protection Tools on Crown Land

Northern Goshawk, *laingi* subspecies is listed as a species at risk under the *Forest and Range Practices Act* (FRPA; Province of British Columbia 2002), which enables habitat management tools such as Wildlife Habitat Areas (WHAs) and associated General Wildlife Measures (GWMs), as described in the Identified Wildlife Management Strategy (IWMS; Province of British Columbia 2004). The IWMS provides direction regarding the management of Northern Goshawk, *laingi* subspecies habitats, including a species account that outlines the taxonomy, distribution, habitat requirements, and management recommendations for forester practitioners working in the range of this subspecies.

Over 5200 hectares of core breeding habitat (i.e., suitable nesting and post-fledging habitats) and over 9500 ha of additional foraging habitat have been protected through WHA designations and GWMs established specifically for Northern Goshawk, *laingi* subspecies (Table 2).

The majority of WHAs established to date protect the breeding habitat area through a reserve (approximately 200 ha) around the nest tree or cluster of known nest sites. The two WHAs on
Haida Gwaii and two of those established on Vancouver Island protect the breeding habitat and also manage the foraging habitat through GWMs. Long-term monitoring of Northern Goshawk, *laingi* subspecies nesting and breeding will help determine the effectiveness of these WHAs. Work has been done under the Forest and Range Evaluation Program (FREP) monitoring program to develop indicators for this long-term monitoring; however, development of a sampling design and some field testing are still required (Ministry of Forests, Mines and Lands 2010).

**Table 2.** Northern Goshawk, *laingi* breeding and foraging habitat protected or managed through Wildlife Habitat Area designations and General Wildlife Measures as of September 2012.

<table>
<thead>
<tr>
<th>Conservation region</th>
<th>Number of WHAs a</th>
<th>Breeding area (ha)</th>
<th>Foraging area (ha)</th>
<th>Total area (ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Haida Gwaii</td>
<td>2</td>
<td>468</td>
<td>4437</td>
<td>4905</td>
</tr>
<tr>
<td>North Coast</td>
<td>1</td>
<td>254</td>
<td>0</td>
<td>254</td>
</tr>
<tr>
<td>Vancouver Island</td>
<td>25</td>
<td>4521</td>
<td>5084</td>
<td>9605</td>
</tr>
<tr>
<td>South Coast</td>
<td>0 b</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>TOTALS</td>
<td>28</td>
<td>5244</td>
<td>9521</td>
<td>14,765</td>
</tr>
</tbody>
</table>

a The WHA data presented is exclusive of 7 additional proposed WHAs currently in formal review for legal designation.

b No WHAs established specifically for Northern Goshawk, *laingi* subspecies at this time.

Protection of Northern Goshawk, *laingi* subspecies breeding and foraging habitat is also achieved on Crown land within:

- parks and protected areas through the legal provisions of the B.C. *Park Act*;
- Ungulate Winter Ranges (UWR) through the legal provisions of the FRPA;
- Old Growth Management Areas (OGMA) through the legal provisions of the B.C. *Land Act* (Province of British Columbia 1996);
- Conservancies, Biodiversity, Mining and Tourism Areas (BMTAs) and Strategic Landscape Reserve Design (SLRD) polygons within the Ecosystem-based Management (EBM) planning area on the North and Central Coast (Horn *et al.* 2009; Integrated Land Management Bureau 2012); and
- Strategic Land Use Agreements (SLUAs) with protection under Land Use Objectives Orders under the B.C. *Land Act*.6

See Section 6.2.2 Habitat Protection Analysis for the amount of suitable Northern Goshawk, *laingi* subspecies nesting and foraging habitat currently protected in all conservation regions.

### 6.1.2 Guidance and Best Management Practices

In June 2012, forest industry members of the Coast Forest Conservation Initiative (CFCI) produced a document that provides guidance to forest professionals concerning the management of Northern Goshawk, *laingi* subspecies nesting areas and adjacent post-fledging area habitat (Coast Forest Conservation Initiative 2012) within the EBM planning area.

The Private Forest Landowners Association (2012) and the Federation of B.C. Woodlot Associations (2012) also have best management practices in place to manage Northern Goshawk

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6 Northern Goshawk, *laingi* subspecies are managed through the designation of reserves under Schedule 12 of the Haida Gwaii SLUA (Province of British Columbia 2007).
nests during forestry operations and to promote sustainable management of foraging habitat through time (R. Bealing, pers. comm., 2012).

The Province is currently reviewing all existing guidance documents to develop comprehensive recommendations for the management of Northern Goshawk, *laingi* nesting and foraging habitats on Crown and private forest lands throughout the coastal B.C. range of Northern Goshawk, *laingi* habitat.

### 6.1.3 Private Land Stewardship

Approximately 23% of forests in the Vancouver Island Conservation Region are privately owned and managed. TimberWest Forest Corporation and Island Timberlands Ltd. are currently the main landowners in this area. Monitoring programs were developed by TimberWest Forest Corporation, which monitors 30–40 Northern Goshawk, *laingi* subspecies territories per year on average, most in second-growth forests (D. Lindsay, pers. comm., 2012).7

Management regimes for Northern Goshawk, *laingi* subspecies on private managed forest land were first applied in the mid-1990s when it appeared that Northern Goshawk, *laingi* subspecies were more abundant than previously thought in second-growth forests in the Vancouver Island Conservation Region. Large private managed forest landowners continue to carry out surveys, support applied research projects, and work cooperatively with the Province.

Landowners are engaged in management of Northern Goshawk, *laingi* subspecies through temporary forest land set-asides, and implementing best management practices to maintain breeding habitat viability while nests are active.

### 6.2 Existing Habitat Protection Relative to Suitable Habitat

#### 6.2.1 Suitable Habitat Analysis

In support of development of this management plan, a habitat suitability model was run in August 2012 for the range of the Northern Goshawk, *laingi* subspecies in B.C. (Mahon *et al.* 2012; Smith 2012). This model run was based on a habitat suitability algorithm initially developed by the Habitat Recovery Implementation Group (RIG) of the Northern Goshawk *Accipiter gentilis laingi* Recovery Team and described by Smith and Sutherland (2008) and Mahon *et al.* (2008). The model parameters were updated in 2012 to generate nesting, foraging, and territory model outputs (Mahon *et al.* 2012; Smith 2012). In support of development of this management plan, B.C. Ministry of Forests, Lands and Natural Resource Operations used this territory model to estimate the number and distribution of potential Northern Goshawk, *laingi* subspecies territories in coastal B.C. that could be supported within available, suitable habitat.8

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7 For the purpose of this document, second-growth forests are relatively young forests that have developed following a disturbance (e.g., wholesale cutting, extensive fire, insect attack) of the previous stand of old-growth forest (Ministry of Forests and Range 2008). Old-growth forests, for the purposes of this document, are simply defined by age criterion of 250 years or older (Parminter 1995; Province of British Columbia 2009a, 2009b).

8 “Suitable habitat” is considered to be modelled class 1 (High) and class 2 (Moderate) habitat.
Territories with more than 70%\(^9\) suitable foraging habitat have a high probability of Northern Goshawk, \textit{laingi} subspecies occupancy and re-occupancy over time. The probability of occupancy diminishes as suitable habitat declines and is essentially zero below 20% suitable foraging habitat. Other habitat factors that have not been explicitly analyzed from Northern Goshawk, \textit{laingi} subspecies territories may influence the probability of occupancy, such as the distribution of foraging habitat within territories, patch size, and connectivity (Daust \textit{et al.} 2010).

The territory model (Smith 2012) was run using different forage habitat supply threshold scenarios within a given territory. Three scenarios were modelled: 20% suitable foraging habitat representing a “low” probability of occupancy; 40% suitable foraging habitat representing a “medium” probability of occupancy; and 60% suitable foraging habitat representing a “high” probability of occupancy within a territory (Tables 3–5).

Based on this 2012 modelling (Smith 2012), there is currently suitable habitat to support an estimated 682–764 potential Northern Goshawk, \textit{laingi} subspecies territories in coastal B.C. if a forage supply threshold of 40% is applied (Table 4).

Table 3. Estimated number of potential Northern Goshawk, \textit{laingi} subspecies territories based on current suitable habitat by conservation region using a 20% forage supply threshold (Smith 2012).

<table>
<thead>
<tr>
<th>Estimated # of suitable territories (\textit{n} = 5)</th>
<th>Haida Gwaii (HG)</th>
<th>North Coast (NC)</th>
<th>South Coast (SC)</th>
<th>Vancouver Island (VI)</th>
<th>Total for all conservation regions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average(^a)</td>
<td>75</td>
<td>466</td>
<td>254</td>
<td>437</td>
<td>1232</td>
</tr>
</tbody>
</table>

\(^a\)This estimate is based on an average of 5 repeated measures estimates modelled for each conservation region.

Table 4. Estimated number of potential Northern Goshawk, \textit{laingi} subspecies territories based on current suitable habitat by conservation region using a 40% forage supply threshold (Smith 2012).

<table>
<thead>
<tr>
<th>Estimated # of suitable territories (\textit{n} = 5)</th>
<th>Haida Gwaii (HG)</th>
<th>North Coast (NC)</th>
<th>South Coast (SC)</th>
<th>Vancouver Island (VI)</th>
<th>Total for all conservation regions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average(^a)</td>
<td>40</td>
<td>228</td>
<td>201</td>
<td>261</td>
<td>730</td>
</tr>
</tbody>
</table>

\(^a\)This estimate is based on an average of 5 repeated measures estimates modelled for each conservation region.

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\(^9\)Percentage of suitable foraging habitat is equal to the area of suitable habitat in a territory divided by the total territory area. To calculate the area of suitable forage habitat, the area of each 1-ha cell is weighted by its Habitat Suitability Index (HSI) score (i.e., if a cell has a foraging HSI of 0.8, its area of suitable habitat is calculated as \(1 \times 0.8 = 0.8\) ha).
Table 5. Estimated number of potential Northern Goshawk, *laingi* subspecies territories based on current suitable habitat by conservation region using a 60% forage supply threshold (Smith 2012).

<table>
<thead>
<tr>
<th>Estimated # of suitable territories (n = 5)</th>
<th>Haida Gwaii (HG)</th>
<th>North Coast (NC)</th>
<th>South Coast (SC)</th>
<th>Vancouver Island (VI)</th>
<th>Total for all conservation regions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Averagea</td>
<td>9</td>
<td>30</td>
<td>65</td>
<td>60</td>
<td>164</td>
</tr>
<tr>
<td>Range of five estimates</td>
<td>7–10</td>
<td>29–33</td>
<td>63–67</td>
<td>56–63</td>
<td>156–173</td>
</tr>
</tbody>
</table>

This estimate is based on an average of 5 repeated measures estimates modelled for each conservation region.

Due to historic and continuing forest harvesting, there has been a reduction in the amount of available suitable forest habitat for Northern Goshawk, *laingi* subspecies in coastal B.C. (Federal Register 2012). It is unclear whether the overall balance of suitable habitat will be stable, positive, or negative in future years as second- and third-growth forests mature and become suitable habitat for this subspecies. The territory model (Smith 2012) demonstrates that the number of options in terms of suitable territories for Northern Goshawk, *laingi* subspecies has been reduced from historic times. The rate of coastal harvest and harvest rotation age are important considerations when planning for the maintenance of suitable breeding and foraging habitat for Northern Goshawk, *laingi* subspecies through time and space.

### 6.2.2 Habitat Protection Analysis

Model outputs were used to assess the relative level of current habitat protection of Northern Goshawk, *laingi* subspecies within suitable habitat in all conservation regions within B.C. (Table 6). In this protection analysis, the total nesting and foraging habitat protection results included patches of all sizes (i.e., any sized patch of suitable habitat was included in the total habitat protected). Future analyses will consider patch size and habitat functionality, specifically the spatial arrangement of suitable habitat relative to Northern Goshawk, *laingi* subspecies territoriality (i.e., size and inter-territory spread).

For this analysis, habitat considered “protected” includes national parks, provincial parks and protected areas, ecological reserves, recreation areas, conservancies, regional parks, forest recreation sites, heritage sites, UWRs, WHAs, OGMAs and wildlife management areas. It also includes habitat that has protection measures unique to specific areas of the coast. Biodiversity, Mining and Tourism Areas; Strategic Landscape Reserve Design polygons; and Class 1 Grizzly Bear habitat have protection measures through the Central and North Coast Order10 (Province of British Columbia 2009a) and the South Central Coast Order (Province of British Columbia 2009b). Wildlands have protection measures through the Sea-to-Sky Land Use Plan (Province of British Columbia 2008b). Clayoquot reserves have protection through Clayoquot Sound Watershed Plans (Province of British Columbia 2003, 2006). Haida Gwaii forest reserves, Northern Goshawk reserves and Northern Saw-whet Owl reserves all have protection measures through the Haida Gwaii Land Use Objectives Order (Province of British Columbia 2010).

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10 Northern Goshawk, *laingi* subspecies are managed as a “focal species” under objective 14(7)c.
See Appendix 2 for information on the habitat model and associated caveats regarding the protection data presented in this document.

**Table 6.** Percent of total suitable Northern Goshawk, *laingi* subspecies nesting and foraging habitat currently protected by conservation region.  

<table>
<thead>
<tr>
<th></th>
<th>Total suitable habitat (% protected)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Haida Gwaii</td>
</tr>
<tr>
<td><strong>Nesting</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>61</td>
</tr>
<tr>
<td><strong>Foraging</strong></td>
<td>53</td>
</tr>
</tbody>
</table>

*Analysis run April 2013. Data updated from September 2012 results.*

Model outputs indicate that 51% of moderate or high suitability nesting habitat, within a 200-ha buffer area around all known nests in B.C. is currently protected (Table 7). As well, 36% of modelled moderate and high suitability foraging habitat is protected across all four conservation regions (Table 8).

**Table 7.** Amount of modelled moderate or high suitability Northern Goshawk, *laingi* subspecies nesting habitat currently protected within a 200-ha buffer area around all known nests (n = 346) in all conservation regions.  

<table>
<thead>
<tr>
<th>Suitable nesting habitat</th>
<th>Total area (ha)</th>
<th>Protected area (ha)</th>
<th>Area protected (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moderate</td>
<td>5665</td>
<td>2583</td>
<td>46</td>
</tr>
<tr>
<td>High</td>
<td>4193</td>
<td>2466</td>
<td>59</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>9858</strong></td>
<td><strong>5049</strong></td>
<td><strong>51</strong></td>
</tr>
</tbody>
</table>

*Known nest sites and territory viability are not verified annually and the annual harvest depletion has not been considered in this analysis. In addition, this analysis was conducted on nest trees. There may be several nest trees within a single goshawk breeding area or territory. Therefore, the amount of protection represented within the table may be over-representative or under-representative at the breeding area or territory scale.  
*Analysis run April 2013. Data updated from September 2012 results.*

**Table 8.** Amount of modelled moderate or high suitability Northern Goshawk, *laingi* subspecies foraging habitat currently protected in all conservation regions.  

<table>
<thead>
<tr>
<th>Foraging habitat</th>
<th>Total area (ha)</th>
<th>Protected area (ha)</th>
<th>Area protected (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moderate</td>
<td>2,413,023</td>
<td>898,625</td>
<td>37</td>
</tr>
<tr>
<td>High</td>
<td>2,211,411</td>
<td>773,135</td>
<td>35</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>4,624,434</strong></td>
<td><strong>1,671,760</strong></td>
<td><strong>36</strong></td>
</tr>
</tbody>
</table>

*Analysis run April 2013. Data updated from September 2012 results.*

In addition to the protected habitats described above, timber harvest in B.C. is controlled by a regulated allowable annual cut (AAC) based on timber supply modelling. Over the long term, the projected outcome of this volume regulation on the timber harvesting landbase (THLB) is a steady state of balanced age-class structure/distribution so that the amount of area in old and mature age classes is intended to remain relatively constant in perpetuity.
6.3 Population Analysis

The quasi-extinction\(^{11}\) probability estimates and their uncertainty for Northern Goshawk, *laingi* subspecies, for a 200-year time horizon (approximately 40 generations) is presented in Figure 2. The number of territories needed to maintain a given population level depends on how an acceptable extinction risk is defined and the time horizon used. The two vertical arrows (2008 and historic) are the estimated number of territories from Smith and Sutherland (2008) applying “moderate” territory requirement assumptions.

The quasi-extinction risk (and its inverse, the probability of persistence) for Northern Goshawk, *laingi* subspecies can help inform decisions regarding the number of territories that are desired to be maintained in a suitable condition. Different scenarios (i.e., using different numbers of desired territories) need to be considered along with the socio-economic implications of the various management options that would be required to maintain the territories in a suitable condition. The results of these analyses will help inform government decisions regarding the management of Northern Goshawk, *laingi* subspecies.

![Figure 2](image)

*Figure 2.* Expected value of quasi-extinction probability, and its uncertainty, for varying number of potential territories, at 200-year time horizon (from Steventon 2012).

\(^{11}\)“Quasi-extinction” is defined as the population declining below 25 breeding females (Steventon 2012).
7 MANAGEMENT GOAL AND OBJECTIVES

7.1 Population and Distribution Goal

This management plan is guided by the recovery goal in the B.C. Recovery Strategy:

To ensure viable populations of Northern Goshawk, laingi subspecies persist in each conservation region in coastal British Columbia.

7.2 Objectives

This management plan is informed by the objectives outlined in the B.C. Recovery Strategy:

1. To manage and, where necessary, conserve and recover habitat that meets the needs of Northern Goshawk, laingi subspecies through its annual cycle.

2. To conserve and, where necessary, recover a well-distributed and viable population of Northern Goshawk, laingi subspecies within coastal B.C.

It is expected that these objectives will be refined and updated as more information becomes available and/or decisions are made by government.
8 APPROACHES TO MEET OBJECTIVES

8.1 Actions and Performance Measures

The following table contains recommendations arising from the development of this management plan that will help support Northern Goshawk, *laingi* subspecies recovery efforts.


Note: Actions and timelines in this table may be modified based on the priorities and budgetary constraints of participatory agencies and organizations.

<table>
<thead>
<tr>
<th>Priority</th>
<th>Threat or concern addressed</th>
<th>Action</th>
<th>Performance measures</th>
<th>Timeline</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Necessary Knowledge Gap</td>
<td>Convene expert team to conduct an IUCN threats assessment for each conservation region.</td>
<td>Threat assessment for Northern Goshawk, <em>laingi</em> subspecies in each conservation region completed.</td>
<td>2013</td>
<td>Not initiated</td>
<td></td>
</tr>
<tr>
<td>Essential Knowledge Gap</td>
<td>Identify all potentially suitable nesting and foraging habitat coast-wide based on the habitat suitability model.</td>
<td>Potentially suitable nesting and foraging habitat identified for all conservation regions.</td>
<td>Sept. 2012</td>
<td>Completed</td>
<td></td>
</tr>
<tr>
<td>Beneficial Knowledge Gap</td>
<td>Ongoing refinement of habitat suitability model through peer review and incorporation of latest science and nesting and foraging data.</td>
<td>Habitat model reflects variability between conservation regions/ecosystems to inform population targets and management strategies.</td>
<td>2013 onwards</td>
<td>Not initiated</td>
<td></td>
</tr>
<tr>
<td>Necessary Knowledge Gap</td>
<td>Use telemetry to fill knowledge gaps around coastal Northern Goshawk, <em>laingi</em> subspecies breeding and annual home range sizes.</td>
<td>Incorporate knowledge gained on home range sizes into habitat suitability and territory models and habitat management recommendations.</td>
<td>TBD</td>
<td>Not initiated</td>
<td></td>
</tr>
<tr>
<td>Priority*</td>
<td>Threat b or concern addressed</td>
<td>Action</td>
<td>Performance measures c</td>
<td>Timeline</td>
<td>Status d</td>
</tr>
<tr>
<td>-----------</td>
<td>-------------------------------</td>
<td>--------</td>
<td>-------------------------</td>
<td>----------</td>
<td>---------</td>
</tr>
<tr>
<td>Essential</td>
<td>Knowledge Gap</td>
<td>Expert Population Implementation Group to conduct risk of extinction population viability analysis to inform future establishment of population/management targets.</td>
<td>Risk curve developed and quasi-extinction probability defined for various population levels relative to number of potential territories.</td>
<td>Oct. 2012</td>
<td>Completed</td>
</tr>
<tr>
<td>Essential</td>
<td>Knowledge Gap</td>
<td>Peer review of heuristic population viability report (Steventon 2012).</td>
<td>Peer review of population viability report completed to determine if risk curve can be used to inform population targets and management objectives.</td>
<td>2013</td>
<td>Not initiated</td>
</tr>
<tr>
<td>Necessary</td>
<td>All</td>
<td>Develop an Implementation Plan.</td>
<td>Implementation Plan completed based on decisions made by government.</td>
<td>2013–2014</td>
<td>Not initiated</td>
</tr>
<tr>
<td>Beneficial</td>
<td>Knowledge Gap</td>
<td>Develop list of research topics, prioritize these topics, and initiate research partnerships.</td>
<td>Prioritized list of research needs available to government to focus future research efforts. Partnerships with academic institutions/industry established. Research initiated.</td>
<td>2013 onwards</td>
<td>In progress</td>
</tr>
<tr>
<td>Necessary</td>
<td>Knowledge Gap</td>
<td>Conduct taxonomy studies/review of the Northern Goshawk to help clarify <em>laingi</em> subspecies boundaries.</td>
<td>Published paper in refereed journal.</td>
<td>Unknown</td>
<td>Not initiated</td>
</tr>
<tr>
<td>Beneficial</td>
<td>All</td>
<td>Develop a Science Update document.</td>
<td>Science Update completed based on new information.</td>
<td>TBD (as required)</td>
<td>Not initiated</td>
</tr>
<tr>
<td>Priority</td>
<td>Threat or concern addressed</td>
<td>Action</td>
<td>Performance measures</td>
<td>Timeline</td>
<td>Status</td>
</tr>
<tr>
<td>----------</td>
<td>-----------------------------</td>
<td>------------------------------------------------------------------------</td>
<td>----------------------</td>
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<td>----------</td>
</tr>
<tr>
<td>Essential</td>
<td>5.3</td>
<td>Establish WHAs to protect known nest sites.</td>
<td>% (TBD(^e)) of known nest sites on Crown land within WHAs.</td>
<td>2012–2013</td>
<td>Ongoing</td>
</tr>
<tr>
<td>Essential</td>
<td>5.3</td>
<td>Implement WHF policy requiring reporting of nest sites on Crown land.</td>
<td>WHF policy in place.</td>
<td>2012–2013</td>
<td>In progress</td>
</tr>
<tr>
<td>Necessary</td>
<td>5.3</td>
<td>Develop and implement reporting and tracking system for nest sites on Crown and private land.</td>
<td>Reporting and tracking system for nest sites created, in use, and up to date.</td>
<td>2013–2014</td>
<td>In progress</td>
</tr>
<tr>
<td>Necessary</td>
<td>5.3</td>
<td>Develop measures to ensure sufficient Northern Goshawk, <em>laingi</em> subspecies foraging habitat is conserved (including outside of WHAs).</td>
<td>TBD</td>
<td>2013–2014</td>
<td>In progress</td>
</tr>
<tr>
<td>Necessary</td>
<td>5.3</td>
<td>Implement measures to ensure sufficient Northern Goshawk, <em>laingi</em> subspecies foraging habitat is conserved.</td>
<td>% (TBD) of foraging habitats maintained in suitable condition.</td>
<td>2014 onwards</td>
<td>Not initiated</td>
</tr>
<tr>
<td>Necessary</td>
<td>5.3</td>
<td>Review available forestry operational guidance and develop provincial guidelines to promote consistency between all forest licensees.</td>
<td>Provincial science-based guidelines for forestry completed, available and in use.</td>
<td>2013–2014</td>
<td>In progress</td>
</tr>
<tr>
<td>Necessary</td>
<td>5.3</td>
<td>Review effectiveness of silviculture treatments (e.g., tree improvement, fertilization, stocking control, pruning, thinning) and analyze second-growth habitat to identify and quantify opportunities to improve habitat conditions for Northern Goshawk, <em>laingi</em> subspecies.</td>
<td>Review of effectiveness of silviculture treatments (e.g., tree improvement, fertilization, stocking control, pruning, thinning) to improve habitat conditions for Northern Goshawk, <em>laingi</em> subspecies completed.</td>
<td>2014 onwards</td>
<td>Not initiated</td>
</tr>
<tr>
<td>Necessary</td>
<td>5.3</td>
<td>Dependent on the review of silviculture treatments above, develop guidelines for silvicultural treatments that enhance forest attributes for Northern Goshawk, <em>laingi</em> subspecies breeding and foraging.</td>
<td>Completed guidelines for silviculture treatments that enhance forest attributes for Northern Goshawk, <em>laingi</em> subspecies breeding and foraging.</td>
<td>2013 onwards</td>
<td>Not initiated</td>
</tr>
<tr>
<td>Priority</td>
<td>Threat b or concern addressed</td>
<td>Action</td>
<td>Performance measures c</td>
<td>Timeline</td>
<td>Status d</td>
</tr>
<tr>
<td>----------</td>
<td>-------------------------------</td>
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<td>---------</td>
</tr>
<tr>
<td>Necessary</td>
<td>7.3</td>
<td>Assess management options to mitigate destruction of understorey vegetation on Haida Gwaii by Black-tailed Deer (and the resulting decrease in forest-dwelling prey availability to Northern Goshawk, laingi subspecies).</td>
<td>Plan developed to reduce deer-induced damage to understorey vegetation and increase forest-dwelling prey availability.</td>
<td>2013–2014</td>
<td>Not initiated</td>
</tr>
<tr>
<td>Necessary</td>
<td>Knowledge Gap</td>
<td>Develop a biological effectiveness monitoring program to determine if management approaches are effective over time.</td>
<td>Biological effectiveness monitoring program developed.</td>
<td>2013 onwards</td>
<td>Not initiated</td>
</tr>
<tr>
<td>Necessary</td>
<td>Knowledge Gap</td>
<td>Implement a biological effectiveness monitoring program to determine if management approaches are effective over time.</td>
<td>TBD</td>
<td>2014 onwards</td>
<td>Not initiated</td>
</tr>
<tr>
<td>Necessary</td>
<td>Knowledge Gap</td>
<td>Maintain data warehouse/repository of information to support/monitor management implementation coast-wide.</td>
<td>Species occurrences available from the Conservation Data Centre for use by government and industry.</td>
<td>2012–2013</td>
<td>In progress</td>
</tr>
<tr>
<td>Beneficial</td>
<td>5.1, 5.3</td>
<td>Create an outreach strategy that identifies opportunities to enhance management, reduce persecution, and share knowledge.</td>
<td>Outreach actions identified in a stewardship outreach strategy available to inform and prioritize government and industry-led stewardship outreach efforts.</td>
<td>2014</td>
<td>Not initiated</td>
</tr>
<tr>
<td>Necessary</td>
<td>Knowledge Gap, 5.3</td>
<td>Establish a socio-economic impact analysis and monitoring program associated with B.C.’s proposed management regimes.</td>
<td>Monitoring program to track economic impacts are developed and implemented.</td>
<td>2013 onwards</td>
<td>Not initiated</td>
</tr>
</tbody>
</table>

a Essential (urgent and important); Necessary (important but not urgent); or Beneficial.
b Threats are based on the IUCN-CMP unified threats classification system. Threats identified for Northern Goshawk, laingi subspecies are listed by IUCN threat level numbers. See Table 1.
c Performance measures for objectives and other implementation activities.
d Status: Not initiated; In progress; Ongoing; Completed.
e TBD = To be determined
8.2 Narrative to Support Management Actions Table

This section includes additional information to support the understanding of actions identified in Table 9 for Northern Goshawk, laingi subspecies management.

The Province intends to adopt a phased approach to enable ongoing refinement of the management regimes that benefit Northern Goshawk, laingi subspecies, and will continue to work with the forest industry to implement additional protection measures as necessary and support inventory, research, and monitoring. A substantial amount of work remains to understand the applicability of science published for atricapillus and other subspecies to the laingi subspecies and to improve the science related to the different habitat requirements and range boundaries of the laingi subspecies.

8.2.1 Improving Scientific Information

The Province is in the process of obtaining better information to inform the management of Northern Goshawk, laingi subspecies. Ongoing refinement and peer review of the habitat suitability model and actions to improve the knowledge base regarding habitat use and selection by Northern Goshawk, laingi subspecies are required.

Work is ongoing by species experts to determine the risk of extinction at varying population targets for the Northern Goshawk, laingi subspecies in B.C. and to develop population targets based on population viability analyses, habitat availability and the degree of protection provided through all existing protection measures. Once population targets are defined, additional analyses will occur to determine what proportion of suitable habitat is required to be maintained in perpetuity to achieve these targets. This information can then be used to inform management efforts in relation to the achievement of overall habitat conservation and population recovery goals for Northern Goshawk, laingi subspecies.

In the short-term, priority will be given to using the results of the coast-wide habitat suitability model outputs to stratify medium-term field inventory, and inform strategic scale habitat planning and conservation efforts (e.g., establishment of WHAs or other landscape scale reserve design products).

8.2.2 Habitat Protection on Crown Land

As outlined in Tables 3 through 6, a significant degree of habitat protection for Northern Goshawk, laingi subspecies has been achieved through B.C.’s land use planning efforts and designation of reserves for biodiversity, wildlife, and other resource values.

The Province intends to use legislation, policies, and guidelines to protect the species habitat. The Province also intends to continue to explore opportunities to maintain Northern Goshawk, laingi subspecies habitat through time by using habitat supply modelling to inform planning and management decisions. The degree of habitat protection provided through all enactments on
provincial Crown land and the contributions of management practices on managed private and 
Crown forest land across the Northern Goshawk, *laingi* range will also need to be monitored.

Additional WHAs will be established to protect known occurrences of Northern Goshawk, *laingi* 
subspecies, particularly in the South Coast Conservation Region as provided for in current policy 
and with due regard to the impact “tests” of the Government Actions Regulation (GAR). A review 
of existing policy and the degree of protection possible under the IWMS may be required to 
inform future habitat protection efforts. The results of habitat suitability/availability analyses and a 
review of existing habitat protection provided by all provincial management actions will inform 
any such policy review.

Work is underway by the B.C. Ministry of Environment on a GAR Order for Wildlife Habitat 
Features (WHF), which includes Northern Goshawk, *laingi* subspecies. Once enabled, the Order 
will trigger section 70 of the Forest Planning and Practices Regulation that requires all Northern 
Goshawk, *laingi* subspecies nest occurrences encountered by forest licensees not be damaged or 
rendered ineffective. All nests must also be reported on an annual basis (section 86 (3) (b)). A 
reporting and tracking system will be implemented in association with this Order.

### 8.2.3 Management of Forests

Substantial uncertainty remains related to the management approaches needed to effectively 
sustain the Northern Goshawk, *laingi* subspecies through time.

A work plan is being developed based on the outputs of the refined habitat suitability model 
(Smith 2012). Field inventories will be stratified and prioritized according to conservation region 
and conducted according to available funding. Due to the limited field work historically done on 
the South Coast, and the relatively limited amount of existing protection in this area, priority will 
be given to conducting inventories to supplement our knowledge of Northern Goshawk, *laingi* 
subspecies occurrences in the South Coast Conservation Region in the short term.

The degree to which this species uses second-growth forests is an important factor in addressing 
future management. For example, Northern Goshawk nesting in second-growth forests has been 
documented in several areas, particularly in the Vancouver Island Conservation Region (Northern 
Goshawk *Accipter gentilis laingi* Recovery Team 2008; Mahon *et al*. 2012). Further assessment of 
the contribution of second-growth stands to Northern Goshawk, *laingi* subspecies nesting and 
foraging habitat supply and availability is required.

It is unclear how management of second- and third growth forests and habitat restoration efforts 
may benefit Northern Goshawk, *laingi* subspecies through time. Further assessment of habitat 
restoration opportunities for potentially accelerating development of suitable habitat is required. 
Publication of available nesting data for second growth in the Vancouver Island Conservation 
Region will help to inform future management of Northern Goshawk, *laingi* subspecies.
8.2.4 Monitoring

Northern Goshawk, *laingi* subspecies nesting success will be monitored as part of field inventory activities. A structured monitoring program will be developed to continually assess the effectiveness of habitat protection measures relative to surrounding development, and refine management approaches as required.

Assessment of the socio-economic implications of habitat protection measures and alternative management regimes will also be explored as part of ongoing management of the Northern Goshawk, *laingi* subspecies in B.C.

9 SOCIO-ECONOMIC IMPLICATIONS

Given the extent of the range of Northern Goshawk, *laingi* subspecies in coastal B.C., and the extensive foraging habitats thought to be required by this species, the implementation of site-specific management actions may have significant impacts on resource development activities in this area. As a result, B.C. is proposing an adaptive approach wherein the results of monitoring are used to inform management practices on the ground.

All existing protection measures have been accounted for through the various land use planning initiatives that have been implemented in B.C. and through Timber Supply Reviews conducted in the relevant resource districts; consideration of economic impacts are implicit in these government decisions.

There may be increased planning costs to forestry companies operating in Northern Goshawk, *laingi* subspecies habitat, such as identifying nest sites and implementing habitat protection measures or temporal restrictions. There will also be additional costs associated with the required investment in monitoring and inventory model refinements, science reviews, and development of an adaptive management approach to management of Northern Goshawk, *laingi* subspecies in B.C.
10 REFERENCES


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**Personal Communications**


John Deal, Strategic Planning Biologist, Western Forest Products Inc., 2012.

Dave Fraser, Species Specialist, Ministry of Environment, 2012.

Dave Lindsay, Fish and Wildlife Specialist, TimberWest Forest Corp., 2012.
APPENDIX 1. HABITAT SUITABILITY MODEL OUTPUTS AND PROTECTION DATA

Between 2009 and 2012 a formal accuracy assessment of the nesting and foraging habitat model outputs was conducted in each conservation region by the Northern Goshawk Accipiter gentilis laingi Recovery Team and Habitat Recovery Implementation Group. In early 2012, the Province led a contract to provide a comprehensive review of the habitat suitability model. Where appropriate, model parameters were revised using the field verification data, new literature, and new local information. As a result of these initiatives, the Northern Goshawk, laingi subspecies suitability model has been revised and improved by adjusting several parameters, including optimal forest age and stand height (Mahon et al. 2012).

The habitat protection data presented in this document are derived from a revised/refined habitat suitability model that was run in August 2012 for the entire range of the Northern Goshawk, laingi subspecies (Mahon et al. 2012; Smith 2012).

The protection data in this report are presented with the following caveats:

- The habitat suitability model outputs are based primarily on forest cover data.
- Model errors appear to be largely driven by errors in the underlying forest cover data (Mahon et al. 2012).
- Formal field verification of the model has occurred at three scales. At the stand-level scale (10 ha), the average for the North Coast, South Coast, and Vancouver Island using the difference-based method is 82% accuracy for the nesting model and 85% accuracy for the foraging model (Mahon et al. 2012). For more detailed information about the accuracy assessment methodology and detailed results of each scoring method at each scale within each conservation region, refer to the project reports for each conservation region (North Coast: Mahon 2010; Vancouver Island: Mahon 2011; South Coast: Mahon 2012; Haida Gwaii: Doyle et al. 2010)
- Accuracy scores and patterns of bias were consistent across conservation regions. This suggests that the models are fairly robust and broadly applicable (Mahon et al. 2012)
- The protection analysis includes the habitat captured within strategic landscape reserves in the Ecosystem-based Management plan within the total area protected, although strategic landscape reserves are flexible and can be moved across the landscape over time and space. This may potentially overestimate available habitat protection if these reserves are moved from their current locations over time.
- In this protection analysis, the total nesting and foraging habitat protection results included patches of all sizes (i.e., any sized patch of suitable habitat was included in the total habitat protected). Future analyses will consider patch size and habitat functionality, specifically the spatial arrangement of suitable habitat relative to Northern Goshawk territoriality (i.e., size and inter-territory spread).
- In this protection analysis, all Ungulate Winter Ranges (UWRs) in all conservation regions were considered as 100% netdown, even though some UWRs allow for a rotational harvest over time.
- Some Parks and Protected Areas could not be analysed due to a lack of forest cover data for these areas (e.g., Kitlope Conservancy), so the actual degree of suitable habitat that is protected is likely underestimated.