INTEGRATED WILDLIFE – INTENSIVE FORESTRY RESEARCH (IWIFR) PROGRAM

DEER AND ELK CONCERNS IN B.C.'S COASTAL FORESTS

The most important big game species on British Columbia's south coast are:
- Columbian black-tailed deer (*Odocoileus hemionus columbianus*);
- Roosevelt elk (*Cervus elaphus roosevelti*).

Together they account for over 150,000 hunter-days of recreation annually. Non-hunting recreational values are also high.

On the south coast, deer and elk live primarily on forest land where logging and other forestry activities can cause widespread and significant changes in habitats. Until recently, concerns about managing both species and protecting their habitats arose mainly from the logging of old-growth timber. However, the increasing emphasis on intensive management of second-growth stands has generated new concerns about the future of deer and elk populations in these habitats.

For example:
- Can second-growth stands function as winter range to replace or supplement old-growth?
- Can pre-commercial thinning (juvenile spacing) produce large volumes of nutritious forage?
- At what stage do young stands provide hiding cover?

The agencies responsible for managing
wildlife (B.C. Ministry of Environment and Parks) and forests (B.C. Forest Service) must have answers to these questions and many others if they are to achieve their respective goals of:

- maintaining natural numbers and distributions of wildlife; and
- planning the use of forest resources so that the production of timber and the realization of wildlife values are coordinated and integrated.

**IWIFR PROGRAM CONCERNS**

Since 1980, the IWIFR program has been investigating forestry and wildlife relationships on B.C.'s south coast. Initially, the main concerns were:

- the conflict over whether to allocate old-growth forests for logging or to maintain them for wildlife habitat;
- the need to understand the impact of intensive forest management on wildlife habitats; and
- the need to explore opportunities for increased production of both timber and ungulates in managed forest stands.

**RESEARCH DIRECTIONS**

The IWIFR program was divided into two main phases. Phase one (1980-86) consisted of many separate but coordinated projects investigating:

- ecological factors:
  - deer and elk requirements for forage and cover;
  - how deer and elk meet forage and cover requirements;
  - influence of overstory and understory on forage and cover; and
  - effects of forestry activities on forage and cover.
- integrated management techniques:
  - seasonal range enhancement in young forests and
  - a handbook for managers of deer, elk, and forest resources.

The main projects in this first phase were:

- a study of deer behaviour, available habitats and habitat use in the Nanaimo River areas;
- a study of elk behaviour, available habitats and habitat use in the Sayward Forest;
- an assessment of the effects of natural and managed stands on forage and on cover on Vancouver Island.

Phase Two (1987-91) will focus on:

- communicating knowledge from the IWIFR program to resource managers and the scientific community;
- developing an assessment and mapping procedure to project habitat changes over time in watershed planning areas;
- testing hypotheses about habitat use, quality, and management; and
- filling key gaps in the knowledge base that are necessary for the successful completion of the above objectives.

Major projects to achieve these Phase Two objectives are:

- an extensive training program for wildlife and forest managers in the BCFS, the MoEP, and forest companies;
- the testing of management techniques on a larger scale, for example:
  - evaluating the potential for creating future wintering areas for deer by operational application of different thinning patterns and densities in young stands;
  - testing an elk model from Phase 1 by transplanting elk to two areas where availability and use of habitats will be assessed;
  - intensive investigation of deer use of old-growth and second-growth stands during severe winter weather (should it occur), and extensive surveys of deer population responses to habitat conditions and weather in nine watersheds;
- the development of a computerized system that will allow wildlife habitat evaluation to be linked to forest cover mapping and logging/silviculture plans (Habitat Assessment Procedure);
- a communications plan (as support to other projects) to keep the public and scientific community informed of IWIFR's direction and progress.

**SUMMARY OF RESULTS AND CONCLUSIONS – PHASE I**

**A. DEER AND ELK REQUIREMENTS**

Deer and elk require:

- **forage** (food) in sufficient quality and quantity;
- **water** which is not a limiting factor on B.C.'s south coast;
- **cover** to provide security from human disturbance and threat of predators (security cover), to offer protection from climatic extremes (thermal cover), and to intercept snow in severe winters so that forage is available and energy costs of movement are minimal (snow interception cover).

To meet all requirements, it is important that forage and cover areas be interspersed. For
temperatures and to move about. At the same time, the quality and quantity of forage are both reduced significantly, especially in winters when snow accumulates.

For Deer

In areas of deep snowpack, the best winter habitats for deer are heterogeneous old-growth stands. They best meet all the food and cover requirements. However, these stands must have the right topographic features (e.g. a southerly aspect, lower elevations, and moderate to steep slopes) and the right vegetative features (e.g. patchy canopies, large trees, and arboreal lichens of the “old man’s beard” type).

During most years in shallow snowpack areas near the coast, favourable winter range may be provided by interspersed cutblocks (up to 400 m in width) of different ages. Clearcuts and early seral stages provide important rooted forage; stands of young conifers two to four metres tall provide security cover; and closed second growth provides thermal cover. Old growth is important for those occasional years when snowpack is deep.

Key winter forage species are arboreal lichens, deer fern, red huckleberry, salal, western redcedar, and Douglas-fir. Deer eat large amounts of arboreal lichens when other forage is covered by snow.

For Elk

Elk use bogs and riparian areas extensively as forage areas in mild winters. Home ranges often center around areas containing bogs with large trees with dense canopies for snow interception and thermal cover.

Typically, each deer remains faithful to its own behaviour pattern and seasonal ranges. Some migrate to seasonal ranges annually while others migrate only when forced by deep snow, returning after the snow melts. Resident animals move insignificant distances—usually less than one kilometre. Migratory deer have larger seasonal ranges than resident deer. For example, seasonal ranges of a migratory deer may cover 180 hectares compared to 60 hectares for a resident deer.

The largest elk herds are migratory. Timing of their migration varies with the arrival of snow in the fall and the loss of snowpack in the spring. Annual home ranges of migratory elk may cover over 150 square kilometres while seasonal home ranges may be only 30 square kilometres. Annual home ranges of resident elk at lower elevations are usually about 10 square kilometres.

Winter Ranges

Good quality winter ranges are critical during snowy winters. During this season elk and deer require more energy to maintain body temperatures and to move about. At the same time, the quality and quantity of forage are both reduced significantly, especially in winters when snow accumulates.

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Some of the key winter forage plants in mild winters are sedges, grasses, deer fern, and twinflower. During moderate to severe winters, western redcedar, western hemlock, devil's club, huckleberries, Oregon grape, sword fern, willow, and cottonwood are used.

**Spring Ranges**

The availability of high quality, abundant forage on spring ranges is critical to both deer and elk. Preferred ranges, for example, are those with moderate slopes, low elevations, and southern aspects. These areas lose snow quickly and consequently "green up" early.

**For Deer**

The most favoured forage plants, such as fireweed, grow on burned clearcuts. When the stand is young, wide spacing helps to maintain these plants. Use of forage areas decreases greatly when they are more than 200 metres from security cover (i.e., stands with trees more than two metres tall).

**For Elk**

Clearcuts or widely spaced regenerating forests on south-facing slopes can meet spring forage requirements. Elk also use bogs with grasses and sedges; and moist, rich sites that provide skunk cabbage and other early-emerging preferred forage species.

Elk use of a forage area also decreases greatly when they are more than 200 m from security cover (i.e. stands with trees more than three metres tall.)

**Summer Ranges**

Summer (summer/fall) ranges are important for building energy and protein reserves for the winter. Females require high quality forage for nursing their young, and the young depend on it to maximize their growth from both milk and forage.

**For Deer**

Clearcuts, meadows, and other natural openings provide forage. Some deer migrate to subalpine and alpine areas where the growing season is delayed and the forage is high quality. Key forage plants include fireweed, wall-lettuce, hellebore, huckleberries, and Rubus species in the summer; and also huckleberry and salal berries in the fall.

At lower elevations a variety of vegetation and topographic features provides shelter from high temperatures (thermal cover). At high elevations it is usually not required. Security cover is usually supplied by topographic features (e.g., dips and swales, bluffs and ridges) and dense young stands.

**For Elk**

Summer ranges usually occur at higher elevations (400 to 1500 metres). Important features are:

- naturally vegetated slide areas (for excellent food and cover);
- bogs and riparian areas (for forage);
- clearcuts in early summer (for forage); and
- old-growth forests (for thermal cover and forage later in the season)

Calving usually occurs on the summer range on relatively flat ground among steeper terrain. Calving sites are often near wet areas where free-flowing water encourages the growth of high quality forage and the terrain offers excellent security cover for two to three weeks before the cows and calves rejoin larger groups.

**C. EFFECTS OF NATURAL AND MANAGED STANDS ON FORAGE AND COVER REQUIREMENTS OF DEER AND ELK**

**Effects on Forage**

Clearcuts and open young-growth stands produce more understory vegetation than old-growth stands. However, forage in clearcuts is buried most rapidly by snow — the rate varies according to species. Shrubs with large evergreen leaves, such as salal, are buried more quickly than deciduous shrubs like red huckleberry.

Understory plants respond best to early pre-commercial thinning before complete crown closure occurs. Once a species disappears due to lack of light, it generally will not re-invade a stand even if the canopy is opened up at a later age. Pre-commercial thinning to 500
Generally, forage abundance increases with heavier thinning. The greatest response to light thinning occurs on drier sites. Pre-commercial thinning produces greater results than commercial thinning that is done when stands are 30 to 50 years old.

In young, lightly thinned stands, nitrogen fertilization at the usual rate of 225 kilograms per hectare reduces the growth of some understory plants because the increased tree growth reduces available light. However, in more heavily thinned stands (less than 600 to 1200 stems per hectare) on some sites, fertilization increases understory growth.

Salal and red huckleberry, key deer winter forage species, are affected by canopy closure. Productivity of salal peaks at approximately 35% crown closure and huckleberry at approximately 60% crown closure. Thinning helps to maintain these degrees of closure.

Young stands that can be expected to eventually support arboreal lichens, an important deer winter forage, are those that are within 200 metres of old growth/snags providing a natural source of abundant lichens.

**Effects on Cover**

**Snow Interception Cover**

A forest's ability to intercept snow is affected mainly by canopy closure and storm size (the amount of snow falling during a storm). Silvicultural prescriptions that encourage stands with large, wide crowns of moderate closure (60% to 80%) will intercept significant amounts of snow. As storm size increases, a smaller proportion of the snow is intercepted.

Forest cover not only influences snow depth, but the density and hardness of the snow too. In turn, these factors influence the depths to which animals sink and the energy it costs them to move. If elk and deer sink to more than 50% of their leg length (25 centimetres for deer and 40 centimetres for elk), for instance, the energy costs may be eight times greater than the energy costs of walking on bare ground. Sometimes clearcuts have crusted snow that is hard enough to support elk. Generally, older, moderately closed stands produce more favourable snow conditions.

**Thermal Cover**

Cold and windy, cool and wet, or hot conditions cause deer and elk to use energy for thermoregulation (maintaining body temperature). This is energy that could otherwise be used for growth or reproduction. Because of the lack of shelter in clearcuts, energy costs for thermoregulation are high during snowy conditions.

Vegetation influences the major weather factors (air temperature, wind speed, and solar radiation) that determine the thermal environment for deer and elk. Stands of trees more than three metres tall can significantly reduce chilling effects of wind or provide necessary shade during summer. Stands that provide ideal thermal cover for deer and elk during the winter have a closed canopy above the height of the animal, understory thickets, and small openings that permit warming from direct radiation after cold nights.

**Security Cover**

The height, density and diameter of overstory, the density of understory, and the diversity of the topography determine a stand's ability to provide security cover. For elk, a stand must be at least three metres high and 120 metres wide to provide security cover. In clearcuts lacking security cover, deer and elk tend to stay less than 200 metres from the forest cover edge. For example, elk on a summer range were observed in clearcuts within 200 metres of the forest edge 95% of the time, and within 40 metres of the edge 50% of the time.

**D. POPULATION LEVELS**

Elk pregnancy rates are about 85%. Cows give birth between early May and mid-July. By August mortality of calves is high (probably between 22% to 51%) mainly due to predation. There is also a direct relationship between calf mortality and the severity of winter. Annual calf mortality rates are 46% - 70%.

Deer fawn production and survival have increased following wolf control. Knowledge of how deer respond to weather trends, habitat changes, and predation will help managers predict favorable management strategies for maintaining healthy deer populations.
RESEARCH, DEVELOPMENT, AND APPLICATION OF INTEGRATED MANAGEMENT TECHNIQUES

Tools, such as a handbook and a computer procedure, have been or are being developed to assist integrated management of deer, elk, and forest resources.

The application of techniques for stand management at the field level is important for enhancing key habitats such as winter and spring ranges.

A. HANDBOOK

A handbook, Deer and Elk Habitats in Coastal Forests of Southern British Columbia, (tentative title) will be available in Spring 1988. It provides information on:
- deer and elk ecology;
- effects of forestry programs on deer and elk habitat;
- effects of deer and elk on forestry programs;
- techniques for managing important habitats; and
- procedures for incorporating habitat concerns during the planning of forestry operations.

B. HABITAT ASSESSMENT PROCEDURE

A computer-based "Habitat Assessment Procedure" is being developed to ensure that site-specific prescriptions achieve their objectives. Watershed-wide habitat conditions—and the changes in these conditions as the forest grows and is managed—must be considered to assess deer and elk behaviour and habitat supply.

C. DEER WINTER RANGE CREATION

Specialized silvicultural practices in young forests can create good winter habitats for deer, at least in areas experiencing light to moderate snowfalls. These practices should incorporate:
- variable spacing and thinning to create small patches of open and closed canopies (a mosaic of forage and cover areas);
- cleared areas or small natural openings to encourage a quicker snow melt, thermoregulation, and abundant forage;
- coniferous thickets to provide hiding and thermal cover; and
- young stands that contain lichen-loaded snags/old trees or that are near old growth that has abundant lichen) to provide supplies of arboreal lichens.

For more information contact:
Research Branch
B.C. Ministry of Forests and Lands
31 Bastion Square
Victoria, B.C. V8W 3E7
(604)387-3144

Research and Development Section
Wildlife Branch
B.C. Ministry of Environment and Parks
Parliament Buildings
Victoria, B.C. V8V 1X5
(604)387-9796

For a listing of IWIFR publications contact:
Dave Butcher
Research Branch
B.C. Ministry of Forests and Lands
31 Bastion Square
Victoria, B.C. V8W 3E7
(604)387-6719

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