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BLACK BEAR DEN CHARACTERISTICS AT FOREST STAND AND SITE SCALES, NEW BRUNSWICK

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BLACK BEAR DEN CHARACTERISTICS AT FOREST STAND AND SITE SCALES, NEW BRUNSWICK

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INTRODUCTION

Much of the province of New Brunswick is managed for the production of wood and fibre, resulting in forestry being one of the largest contributers to the provincial economy, and the greatest influence on the forested environment. Very little is known about the impacts of forestry on bears in New Brunswick. This poster discusses denning habitat characteristics and the relationship of den sites with forest operations in the southern part of the province.

Studies on habitat utilization, the effects of roads, and park management of bears have been conducted since 1992 in the Greater Fundy Ecosystem, a 841 km^2 area in south-central New Brunswick that includes Fundy National Park (207km^2). Areas surrounding the Park are owned by the public (72%) and a forest industry company (27%) and are managed principally for timber production.

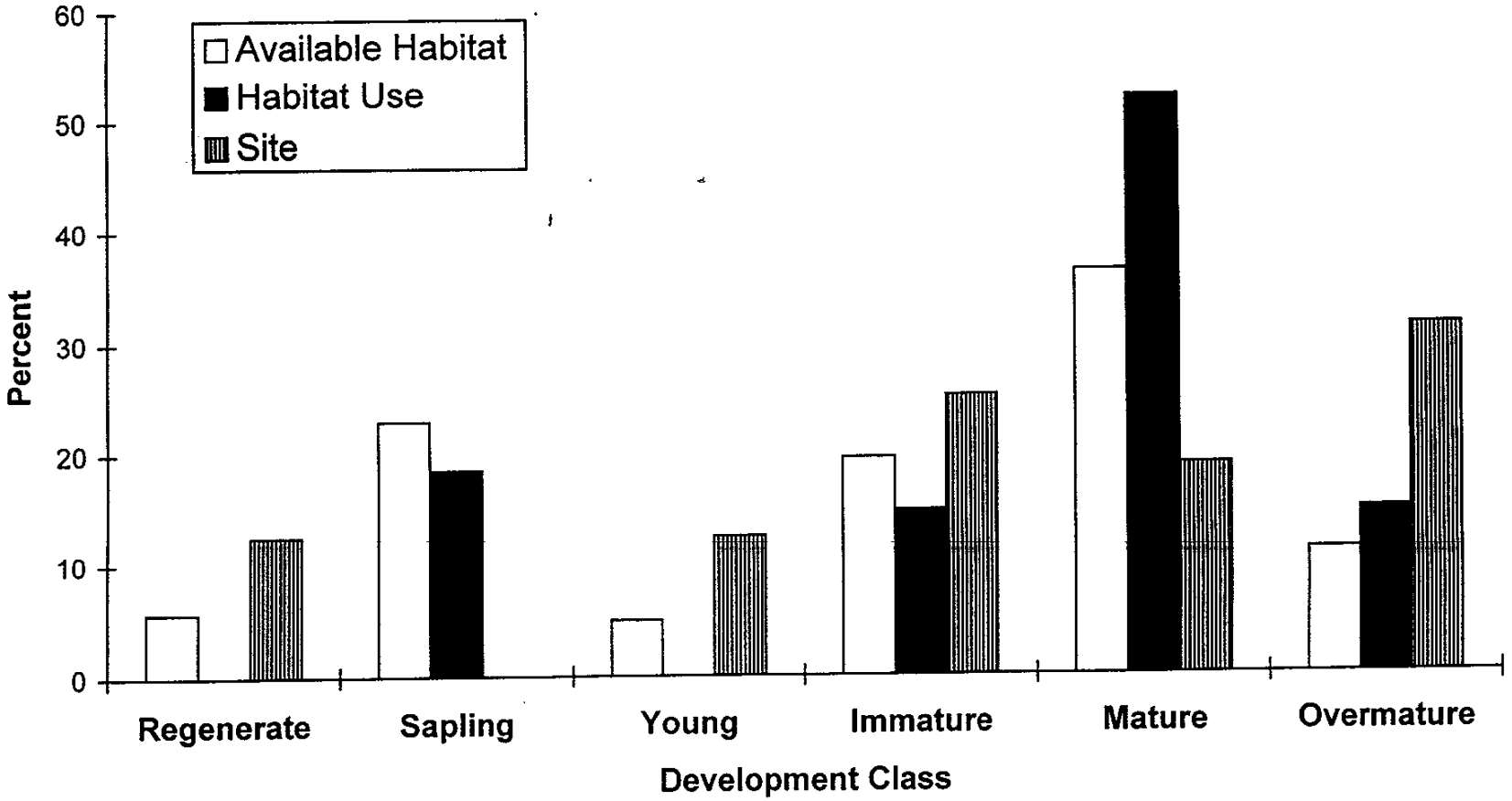
A total of 21 bears (14 males, 12 female) were radio-tagged from spring 1993-fall 1994. A total of 14 bears provided data over 3 winters (27 dens total) after the radio-failure and mortality of some radio-tagged bears. Dens were located in late fall or winter, and visited in spring after bears had vacated the den. Handling and disturbance of denning bears was avoided, except in 3 cases when bears were anaesthetized to handle cubs or change collars.

LANDSCAPE AND STAND SCALE

At what scale(s) do bears select a den site? Is any clump of conifer cover within the forest sufficient, or are bears selecting a den within a larger forest type, away from roads, or close to water? Most studies have focused on den site characterisitcs but bears may aslo be selecting dens to avoid people or disturbance. And, at what scale can bear dens be mapped. It would assist forest-wildlife managers if den site features could be determined from existing forest cover data sources

At a landscape scale we did not find bears selected the roadless region of the Park over the dense network of logging roads located outside the Park. >\19 bears had territories straddling these environments but no pattern of movement into the Park to den was evident. Roads, particularly unpaved logging roads, are abundant but not heavily travelled by people within the study area (density).

SELECTION OF DEVELOPMENT CLASS BY STAND AND SITE



Bear den locations averaged a distance of 1.48 km (±0.24 km S.E., range=1.5-2.6 km) from paved or well-travelled roads. There were no bear dens within 1 km of the busiest roads of the study area but it is not known if this is due to avoidance or chance because only 3 bears (8 bear den years) had territories adjacent to these roads. The distance to rarely-used roads was 0.96 km (±0.28 km S.E., range=0.03-2.5 km) suggesting that denning bears do not respond to the presence of rarely-used roads.

Other than those people residing n several small communities, few people live in the study area and buildings are rare. The average distance of bear dens from buildings was 3.4 km, and the minimum was 1.1 km. The average distance from water was 332 m though 52% of dens were within 200 m and several were very close to running water (15% of dens within 50m). Provincial forestry guidlines state that forestry companies must leave 30-50 m forest buffers adjacent to water. It was therefore not possible to determine if bears are selecting dens with access to water, or are attracted to the typically conifer-dominated buffer strips.

In order to make use of existing resource management tools, we used provincial forest inventory classifications as the basis for assesing den characteristics at the stand level. At the broadest forest cover classification, no apparent selection or avoidance of a particular forest cover was apparent; use of hardwood, softwood, or mixed forest was similar to the amount available of these forests (CHI-square) (Fig. X?). At a finer forest classification scale of forest types (ie. Tolerant Hardwood vs Intolerant Hardwood - Fig. X), use and availability of denning habitat also were similar (Chi-square), though there appeared to be some avoidance of Tolerant Hardwood (TOHW) and Intolerant Hardwood-mixed (IHMIX) stands.

The extent of canopy closure in the stands with dens varied. Only one bear den was in a stand with less than 30% canopy closure. Most of the dens (74%) were in stands with 30-70% canopy closure, likely the most abundant type. We do not have data on the proportion of the forest in the 30-70% canopy classes but much of the standing forest is comprised of thick plantations, or uncut or selectively cut forests whose canopies have been opened by logging and spruce budworm (*Choristoneura fumiferana*) related tree mortality.

The age of the stand appeared to be an important factor in the location of dens. Though bears in Fundy denned in a range of young (age) clearcut stands to overmature (age) stands, the majority of dens (66.7%) were located in mature-overmature forest stands (Chi-square) (Fig. X). Plantations comprise approximately 8% of the managed forests and do not apear to be avoided by denning bears. Almost a quarter of dens (24%) were within plantations 3-20 years old.

SITE SCALE

Characterisitcs of the den site did not relate well with stand level features. Though we do not have availability estimates for site level features, the use of

certain features for denning were consistent. The patch of trees within 50m radius of the dens were always either softwood or softwood-dominated mixed forest (FIG X). Similarily, softwood-dominated forest types such as Balsam Fir, Spruce, Pine contained all of the den sites. Hardwood stands in winter generally are colder and deeper in snow than conifer stands and we were suprised to find 5 dens classified under hardwood, or hardwood-dominated mixed forests. But of these 5 stands, the den site was actually in a conifer patch within the hardwood stand. Hardwood forests were not used by denning bears in this region.

The age of the forest patch over the den site varied from <1m to large, mature tress. Some dens were in thick, young forest that likely protected against wind. It may be that the age of the patch is not as important as the density of the trees. The amount of canopy at the stand level was not indicative of den locations. However, this was not unexpected because the scale of the stand does not reflect the heterogeneity of canopy conditions. Many of the stands with dens (56%) were classified as having a "patchy canopy closure" indicating that patches of open or very closed canopy exist within the stand. Canopy closure above the actual den was much more closed; 61% of dens had canopy closure between 70-100%. At the stand level, only 26% of the dens had closure greater than 70%. For this reason, stand level classifications of canopy cover are not worthwhile for identifying denning habitat.

Ground dens located under fallen trees seem to be a common den type in northern forest landscapes (Jonkel and Cowan 1971, Kolenosky and Strathearn 1987, Schooley 1990). Above-ground dens in hollow trees are more typical in southern areas (Wathen et al. 1986). Den selection in the boreal forest has been attributed to a bear's need to utilize the concealment and insulation provided by snow in a inhospitable winter environment. However, selection may also be related to the limited relative availability of large hollow trees in boreal forests. We found 3 bears denning above-ground, on open nests under a canopy of young conifers, suggesting that below-ground nesting is not critical in our study area. Tree species that often become hollow, such as the maples, oaks (absent in area), and beech (small size due to disease) are not as common as solid, conifer species (spruce and balsam fir).

The typical den in the GFE was located under the base of a fallen tree (65% of dens) where the mass of raised roots act as a windbreak, and the tree base provides overhead cover (PHOTO). Other sites included excavations under roots (15%), and on top of snow under a conifer thicket (15%). There were no dens in caves, hollow tress, or in brushpiles. Most of the den trees were either Red Spruce (*Picea rubens*) (60%) or Balsam Fir (*Abies balsamea*) (20%). The size of all den trees averaged 43 cm DBH (±7.9 cm S.E.). The only pattern of orientation of the den sites was southward; (41%) had a south-facing orientation, possibly indicating selection of warmer sites. No selection was evident in the orientation of den entrances; 38% of the dens had multiple entrances.

MANAGEMENT ISSUES

The significant number of dens in cut-over forest stands indicates that bears in this region can utilize distrubed sites for denning. However, bears were using large blowdown trees for denning within plantations and there is concern that short-rotation (50-60 year) forest practices will not permit the future production of large diameter trees on these sites. Forest companies harvesting public lands in New Brunswick must retain 10% of forests as mature coniferous stands and it is possible that the required number of dens will be provided by these areas. There also may be den trees provided in the buffer strips along waterways. The problem with relying on these areas to produce den sites are that bears will be forced into restricted spaces to den and closer proximity may be a problem, particularly for territorial males. The buffer strips also can not be relied on as the principal source of den tress because many of these low-lying areas flood each spring. Drowning of cubs has been a significant mortality sources in several studies (ie. Alt 1984). We recommend thar forest operations leave several large diameter (>40 cm dbh) trees per acre within clearcut sites. These trees should remain standing to allow for their eventual use 30-40 years later as a fallen den tree within the maturing plantation.

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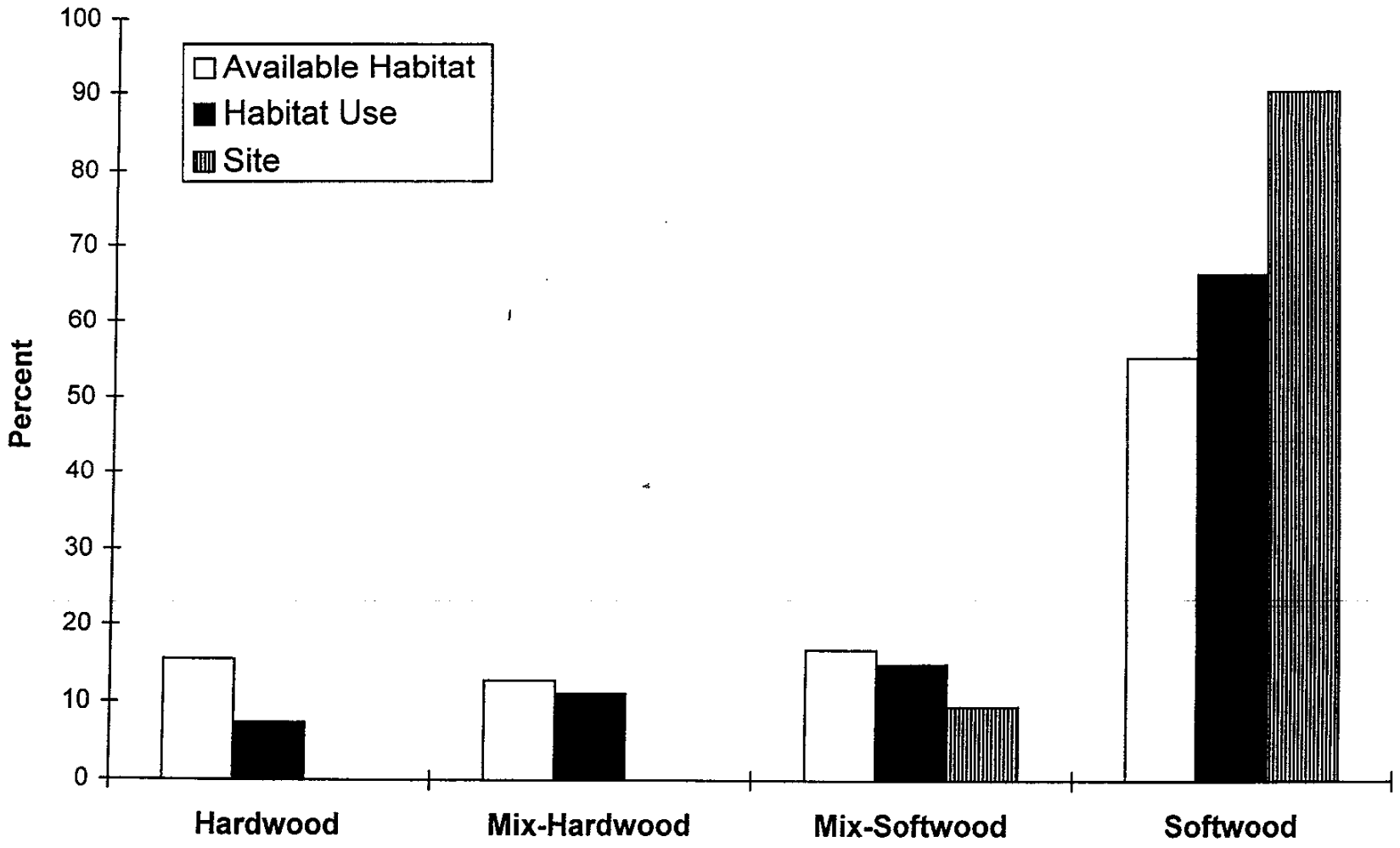
SELECTION OF FOREST COVER TYPE BY STAND AND SITE



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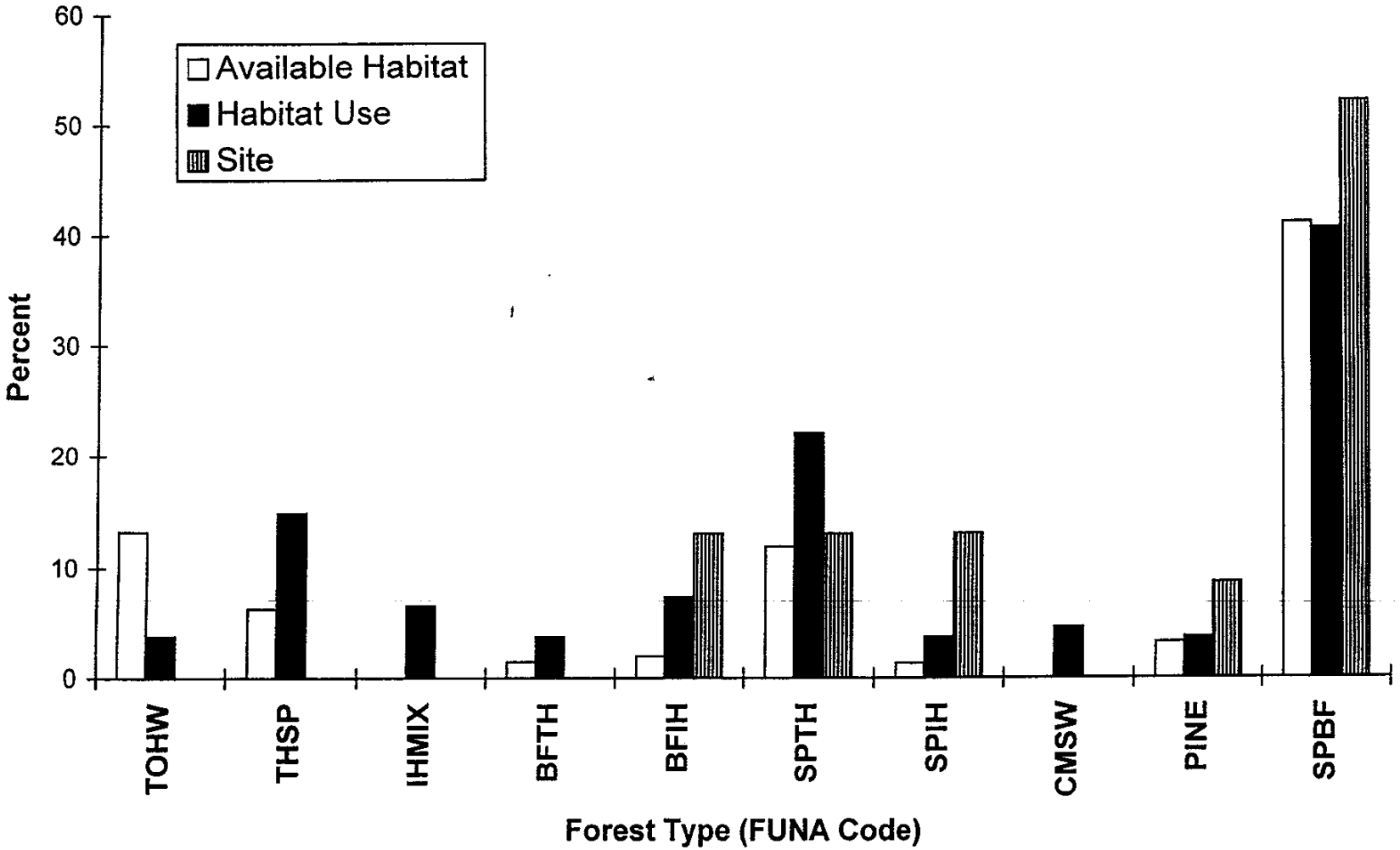
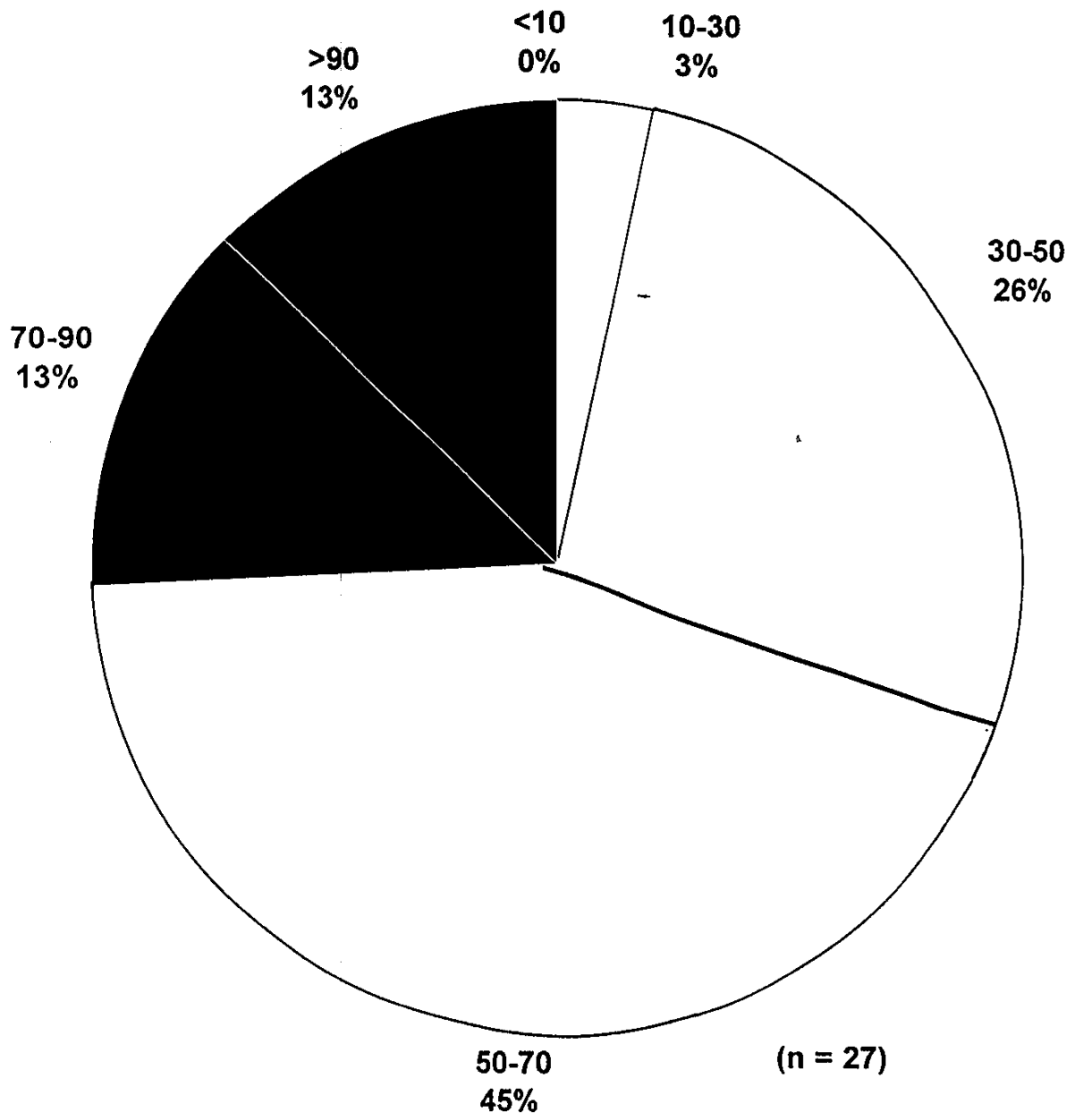
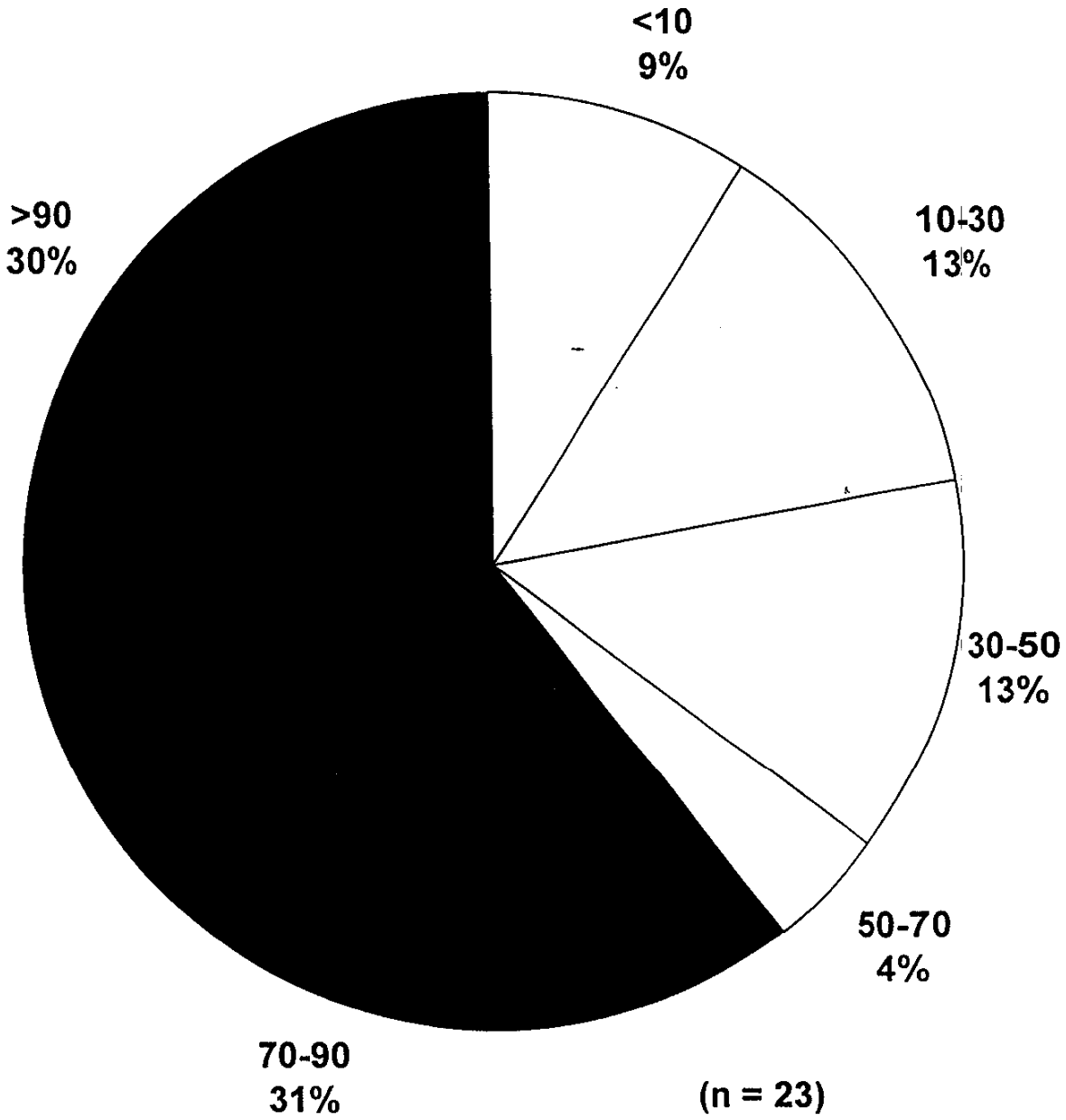


TOHW, TH=Tolerant Hardwood, IH=Intolerant Hardwood, SP=Spruce, BF=Balsam Fir, CMSW=Regen Softwood, PINE=Pine

DEN SITES BY CANOPY CLOSURE OF STAND



DEN SITES BY CANOPY CLOSURE OF SITE



SUMMARY

LANDSCAPE AND STAND LEVEL FEATURES

- NO SELECTION FOR ROADLESS AREAS
  - POSSIBLE AVOIDANCE OF BUSY ROADS
  (AVG = 1.48 km ± 0.24 km S.E., 1-2.6 km RANGE)
  - NO AVOIDANCE OF QUIET ROADS
  (AVG = 0.96 km ±0.28 km S.E., 0.03-2.5 km RANGE)
- WATER COURSES OR BUFFER ZONE BIAS ?
  (52% WITHIN 200 m; 15% WITHIN 50 m of WATER)
- PLANTATIONS USEFUL (26% OF TOTAL DENS; 58% OF NON-PARK DENS IN 8% OF NON-PARK HABITAT)
- SOFTWOOD FOREST SELECTION AT SITE BUT NOT STAND SCALE
- MATURE-OVERMATURE SELECTION AT STAND BUT NOT SITE SCALE
- SELECTION FOR CLOSED CANOPY AT SITE BUT NOT STAND SCALE

SITE LEVEL FEATURES

DEN TYPE

UNDER FALLEN TREE BASE (65%),
WITHIN ROOT EXCAVATION (15%)
ON TOP OF SNOW, UNDER FIR THICKET (15%)
- NO APPARENT USE OF HOLLOW TREES, CAVES, BRUSHPILES

COMMON DEN TREES:

RED SPRUCE (60%) BALSAM FIR (20%) SUGAR MAPLE (7%)
YELLOW BIRCH (7%) WHITE BIRCH (7%)

SIZE OF TREE:

MEAN DBH OF 43 cm (±7.96 S.E.; range 17-86)
15-20% LARGER DIAMETER AT BASE

ORIENTATION:

POSSIBLE SELECTION FOR SOUTH-FACING DEN SITES (41%)
DEN ENTRANCES SHOW NO PATTERN, 38% HAVE MULTIPLE ENTRANCES