Conservation Strategy Review

An Assessment of New Information Since 1997

American marten

Interagency Review of Tongass National Forest Conservation Strategy

American marten

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Two species of martens on the Tongass National Forest?

- *Martes americana*
- *Martes caurina*

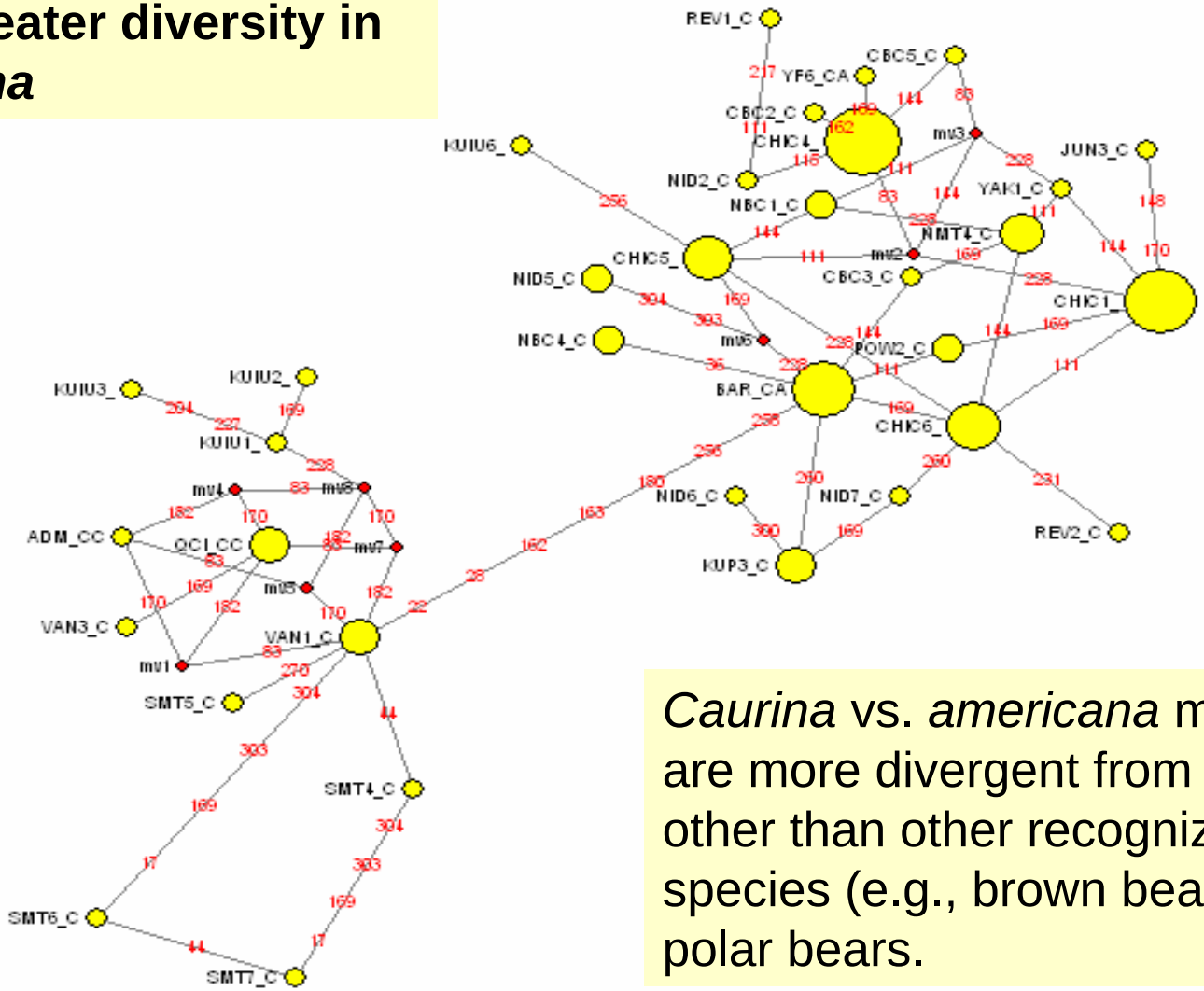
• Marten were long considered two species based on morphological characters (Merriam 1905).

• Lumped into a single species in 1953 (Wright 1953).

• Preliminary molecular analyses clearly distinguishes these two forms and indicate that they have very different evolutionary (and likely ecological) histories.

Degree of separation and genetic diversity

Note: Greater diversity in *americana*

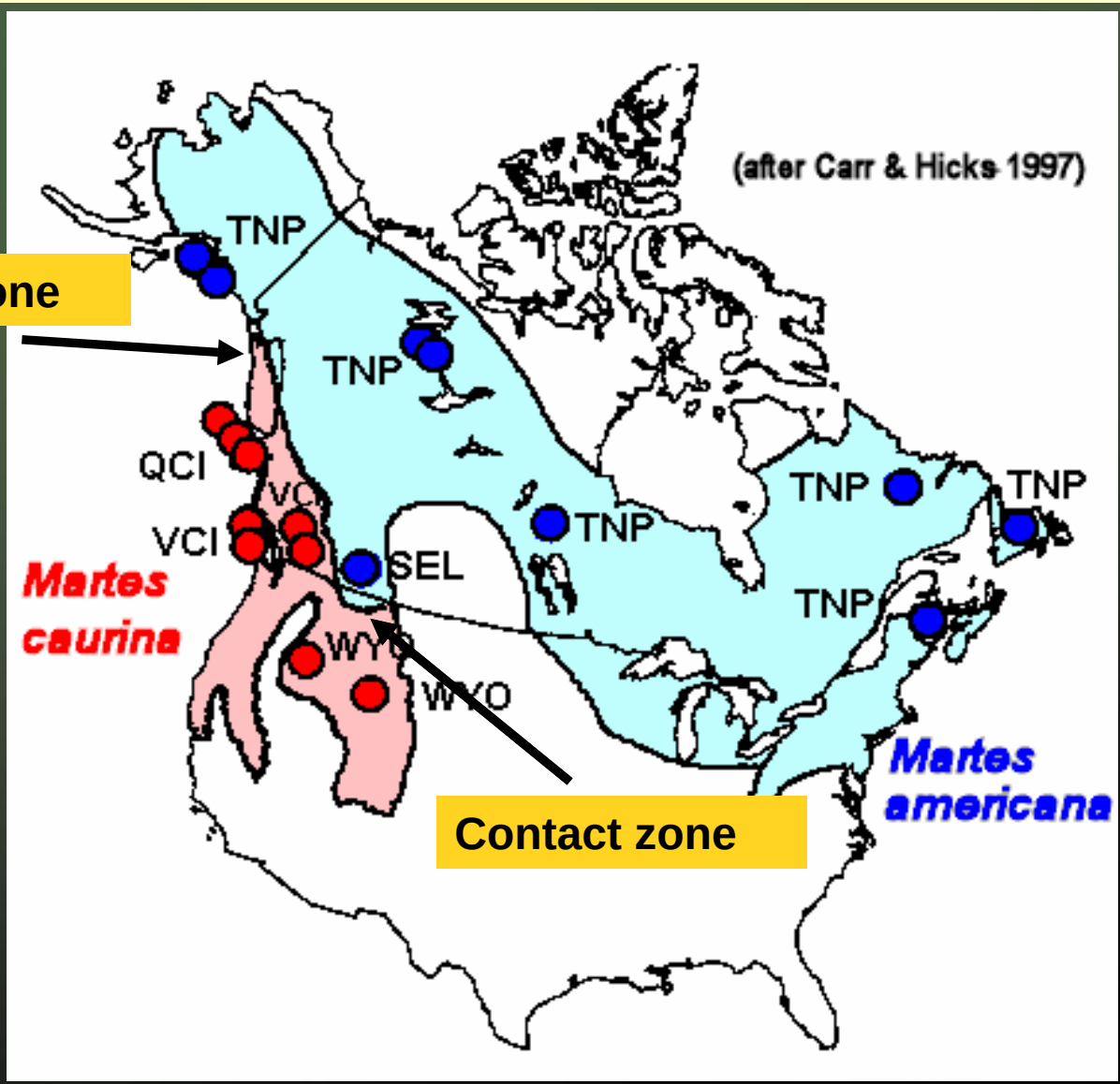


Caurina vs. *americana* martens are more divergent from each other than other recognized species (e.g., brown bears & polar bears.

Two species of martens on the Tongass National Forest?

- The endemic marten inhabit only two islands within the archipelago (Admiralty and Kuiu Islands).
- Caurina populations on Admiralty are genetically monomorphic and morphologically distinct.
- No movement of marten from Admiralty Island to any other island/mainland location.
- Endemic marten on Kuiu and Admiralty constitute ¼ of all genetic diversity for the species across North America (Dawson et al. in prep).

Contact zones indicate where two species coincide. For martens, both southeast Alaska and Montana contact zones have different characteristics (Dawson et al. in prep)



Conservation Strategy Review Consideration

Two species of martens on the Tongass National Forest?

- Standards and guidelines should be crafted for 2 distinct species of marten
- We need an inventory and monitoring protocol for the endemic marten populations on Kuiu and Admiralty. Ecological studies from other islands may not apply to these populations
- Large reserves (such as wilderness areas) do not facilitate movement among the endemic populations (Kuiu and Admiralty)

Chichagof Studies 1990-98

Broad ecological

- Habitat selection at multiple scales
- Demographics
- Diet
- Prey availability

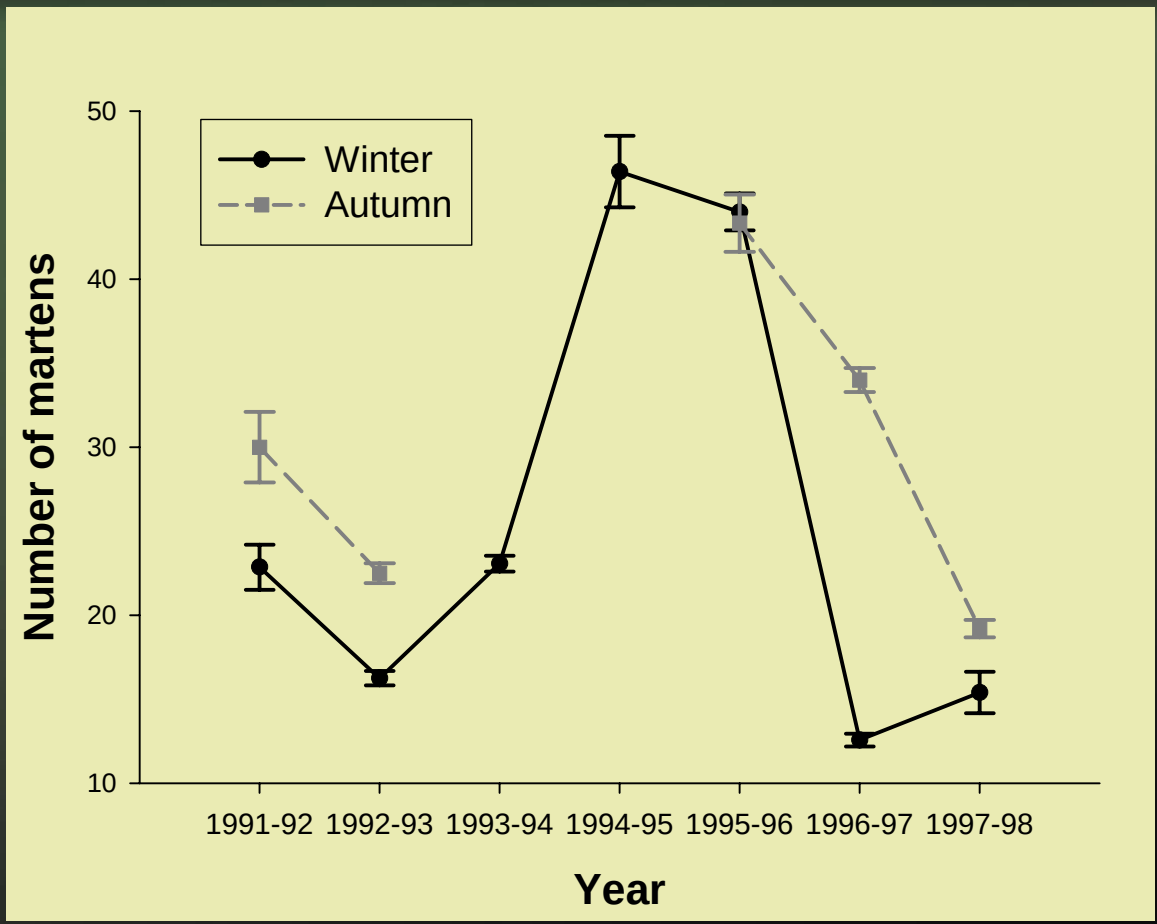
Captured 360 martens, radiocollared 137 (86 males and 51 females) & located them 2,978 times throughout the year.

Measured stand characteristics at random & den sites.

Used landcover map derived from LANDSAT TM imagery.

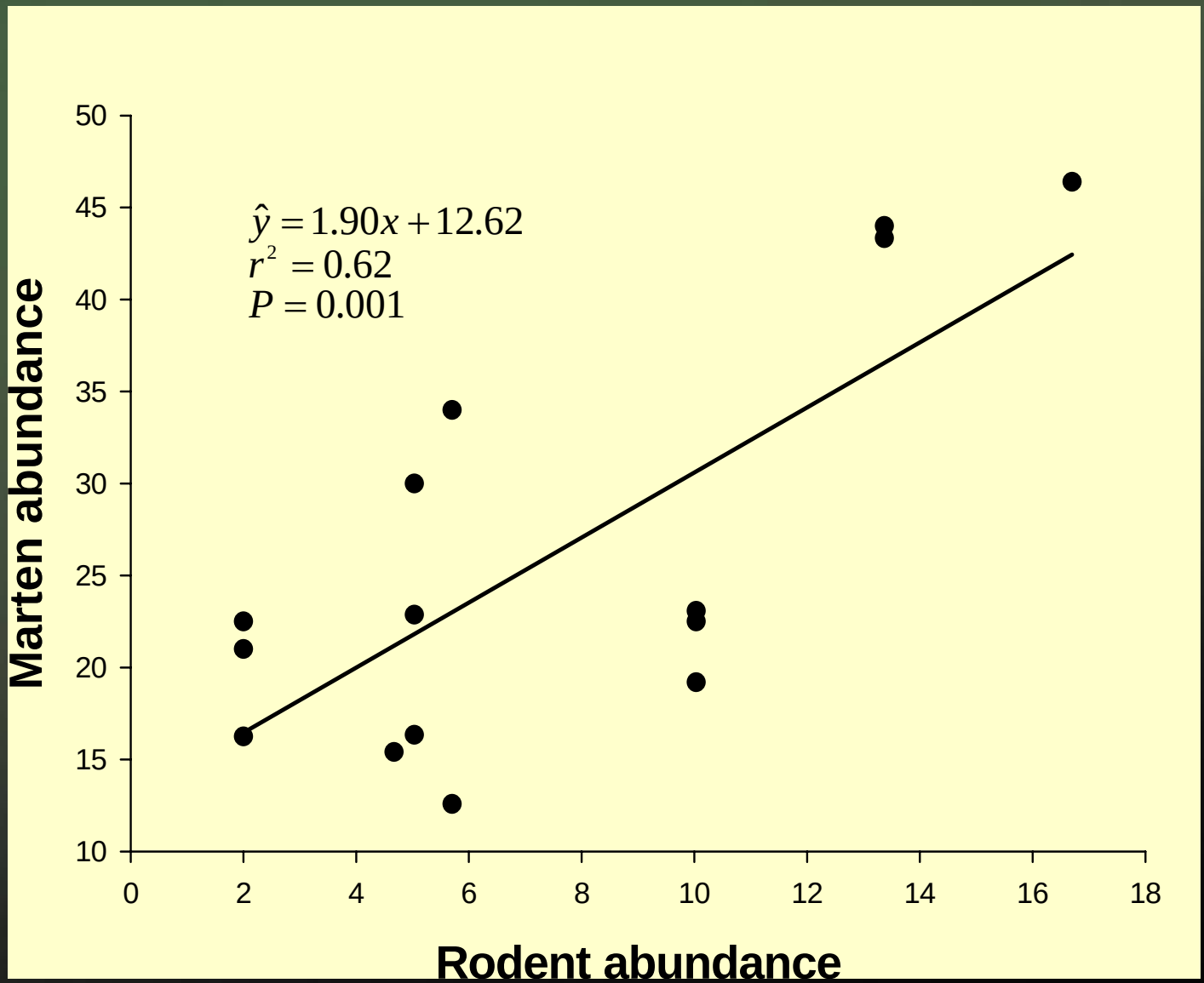
Population characteristics

• Marten numbers fluctuated greatly over time.
- Response to food availability & human take.
- Highly vulnerable to trapping.
- Trapper catch dependent on fur price ($100/pelt now), weather, and access.



Mark-recapture estimates using radiocollared animals.

Relationship with prey



Important habitats

Key concept: interaction of food, cover,climate and predation

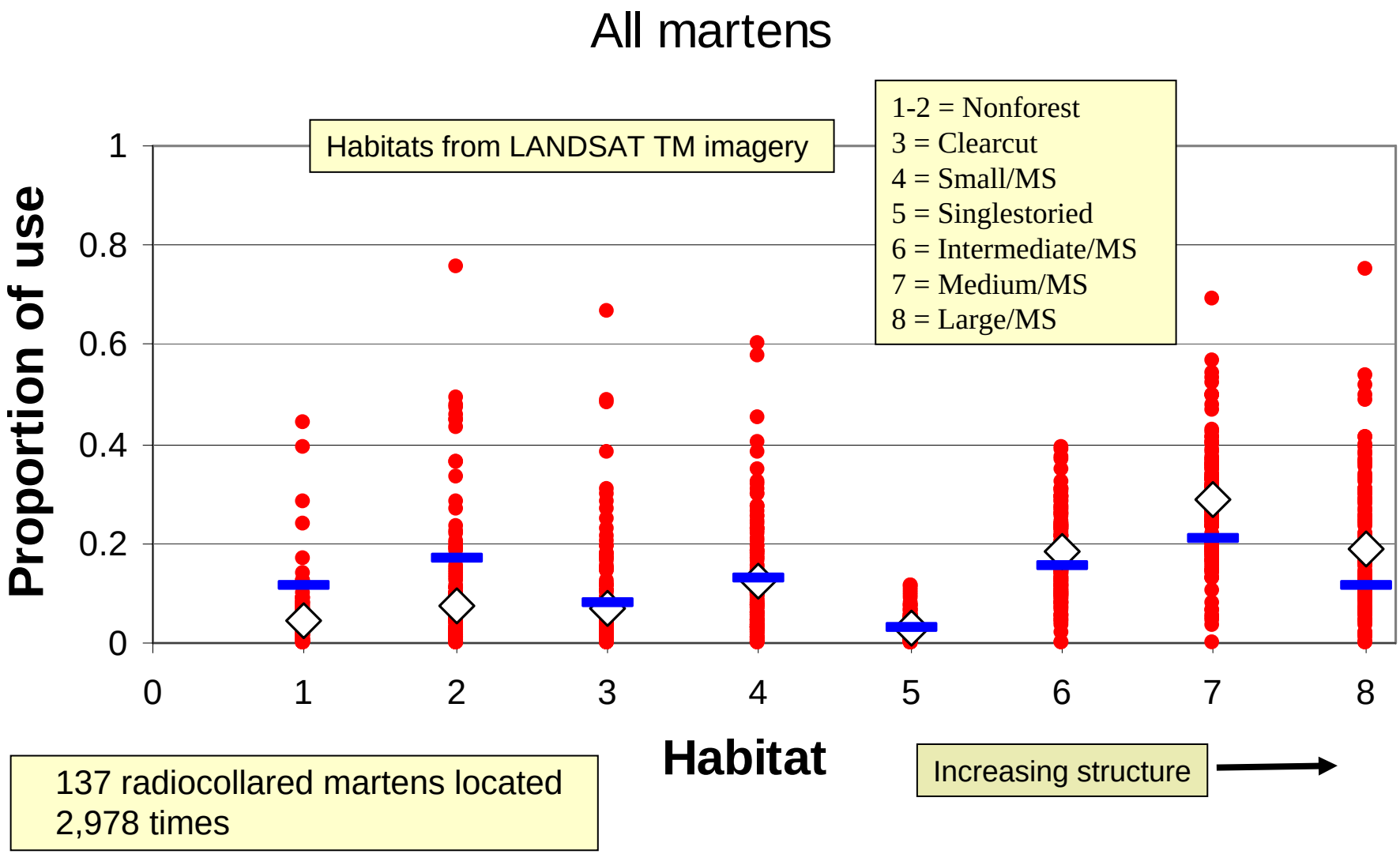
Shelter: travel, dens & resting sites, hunting, & avoiding predation (staying dry)

Food - Productive habitat for small mammals, deer, etc

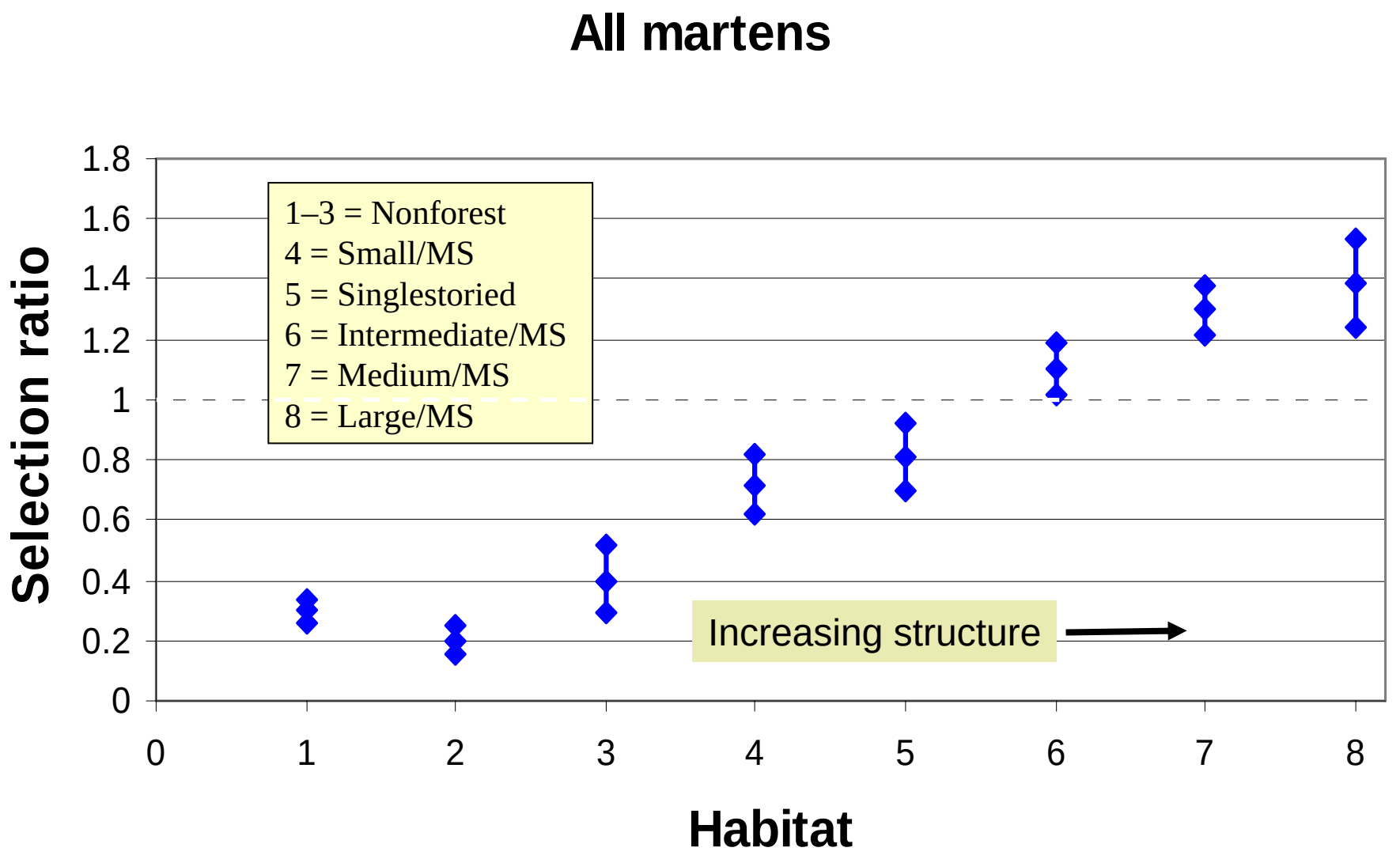
Large woody structures and closed canopy cover

Nearly all studies have found that martens select the largest structures available in closed-canopy forest.

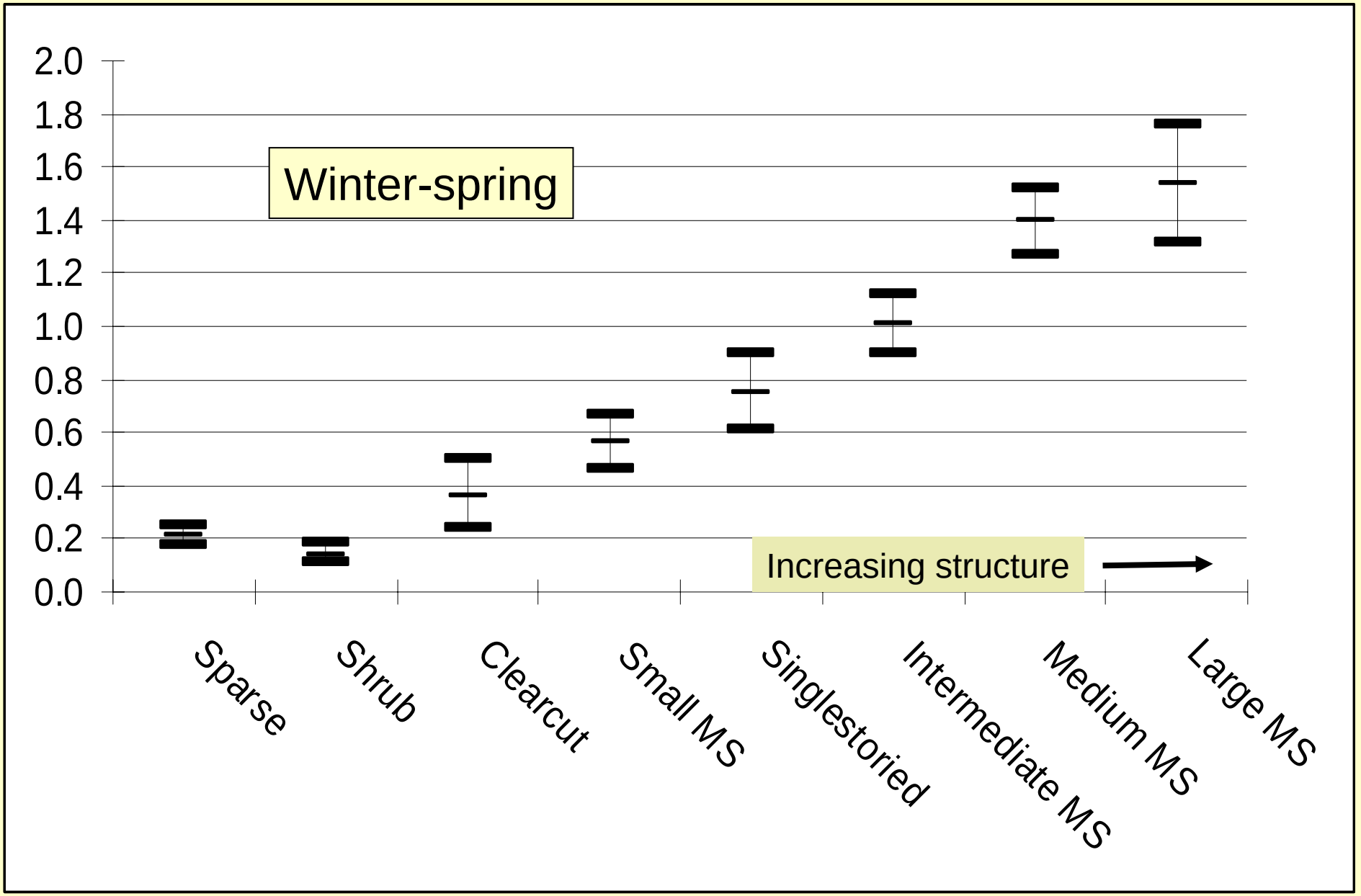
Habitat use


All martens
Habitats from LANDSAT TM imagery
1-2 = Nonforest
3 = Clearcut
4 = Small/MS
5 = Singlestoried
6 = Intermediate/MS
7 = Medium/MS
8 = Large/MS
Proportion of use
1
0.8
0.6
0.4
0.2
0
0
1
2
3
4
5
6
7
8
Habitat
137 radiocollared martens located 2,978 times
Increasing structure

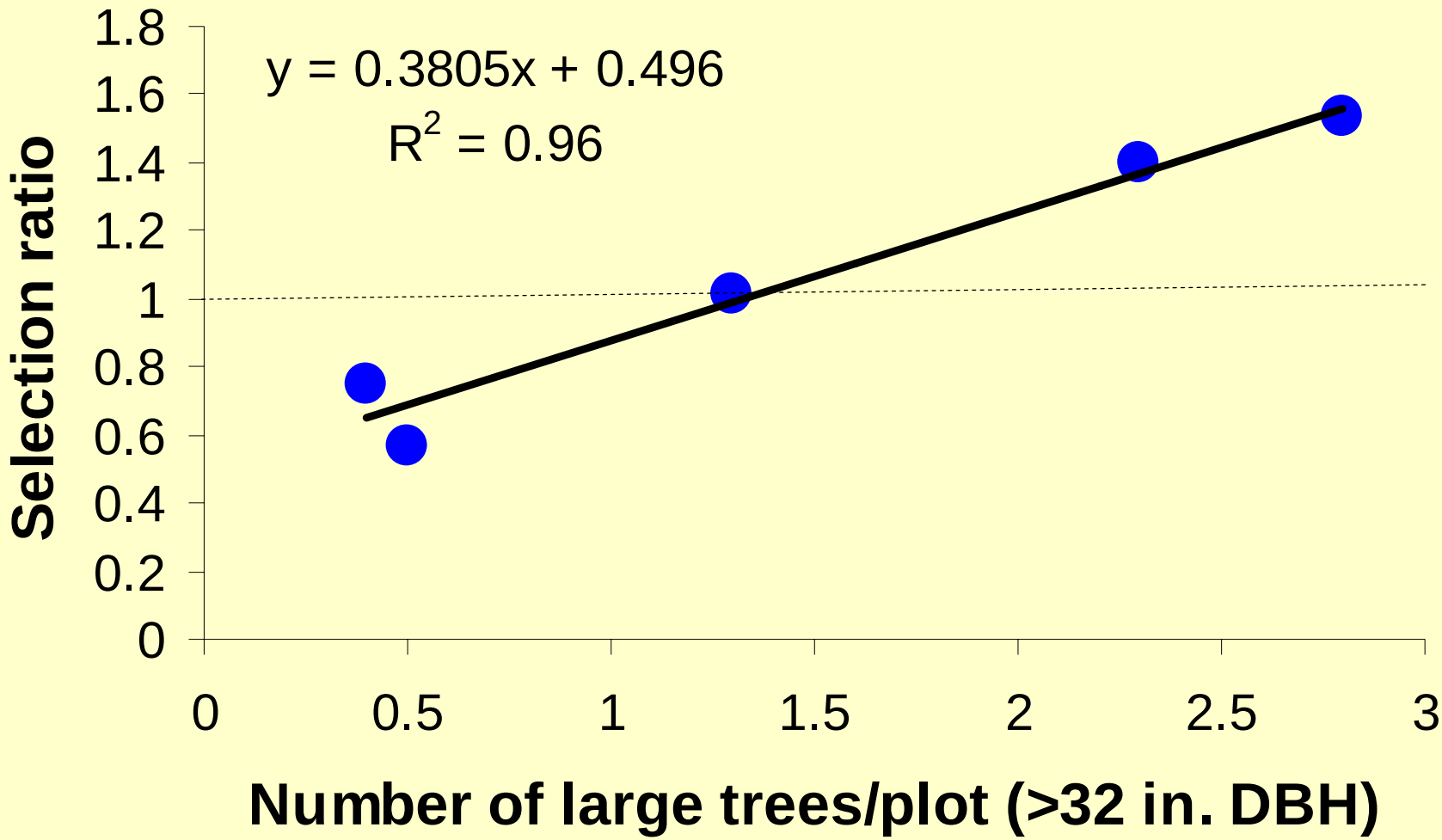
Habitat selection



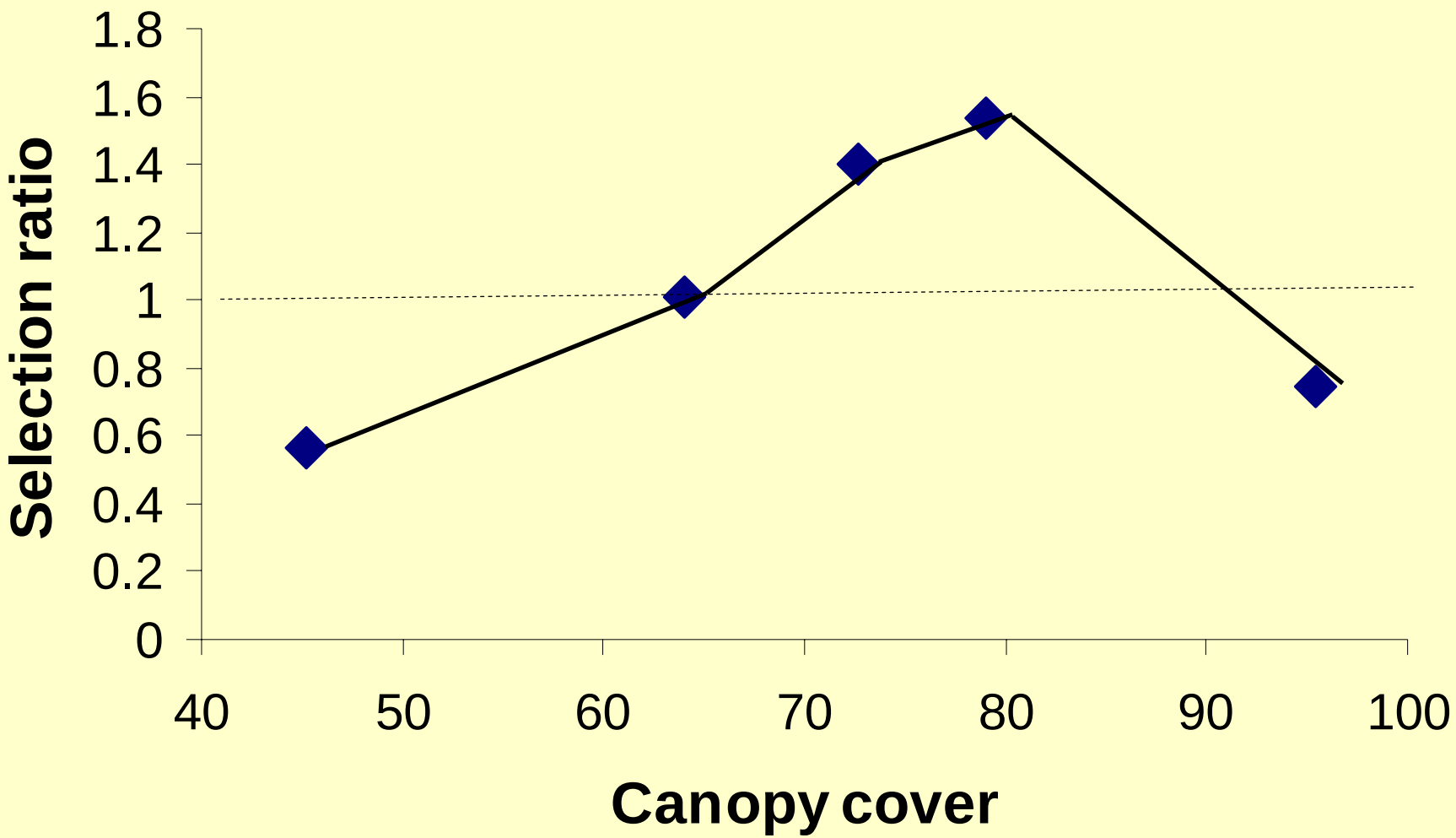
Habitat selection



Stand structure



Stand structure

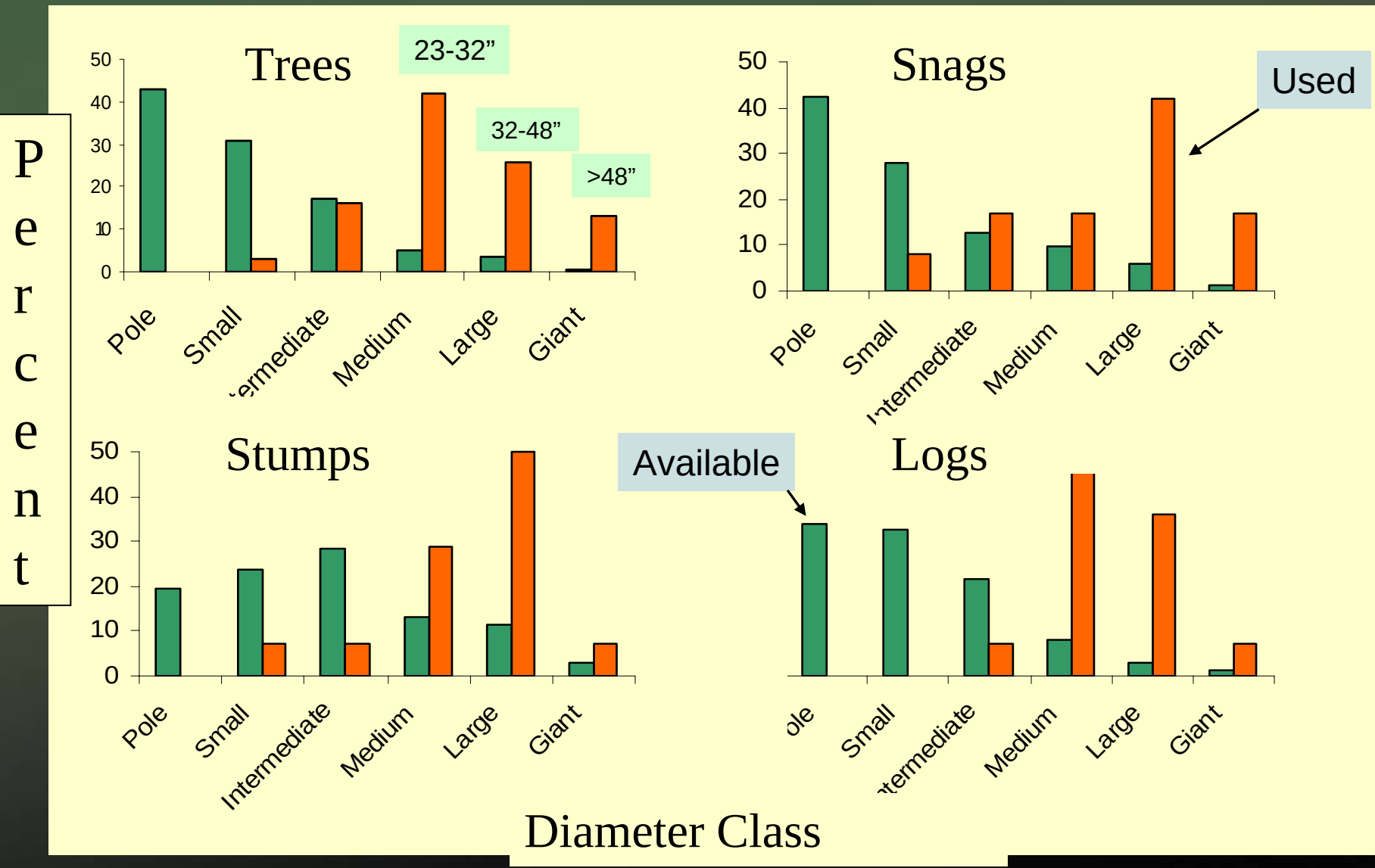


Micro-site habitat structures- Schumacher

Dens & resting sites

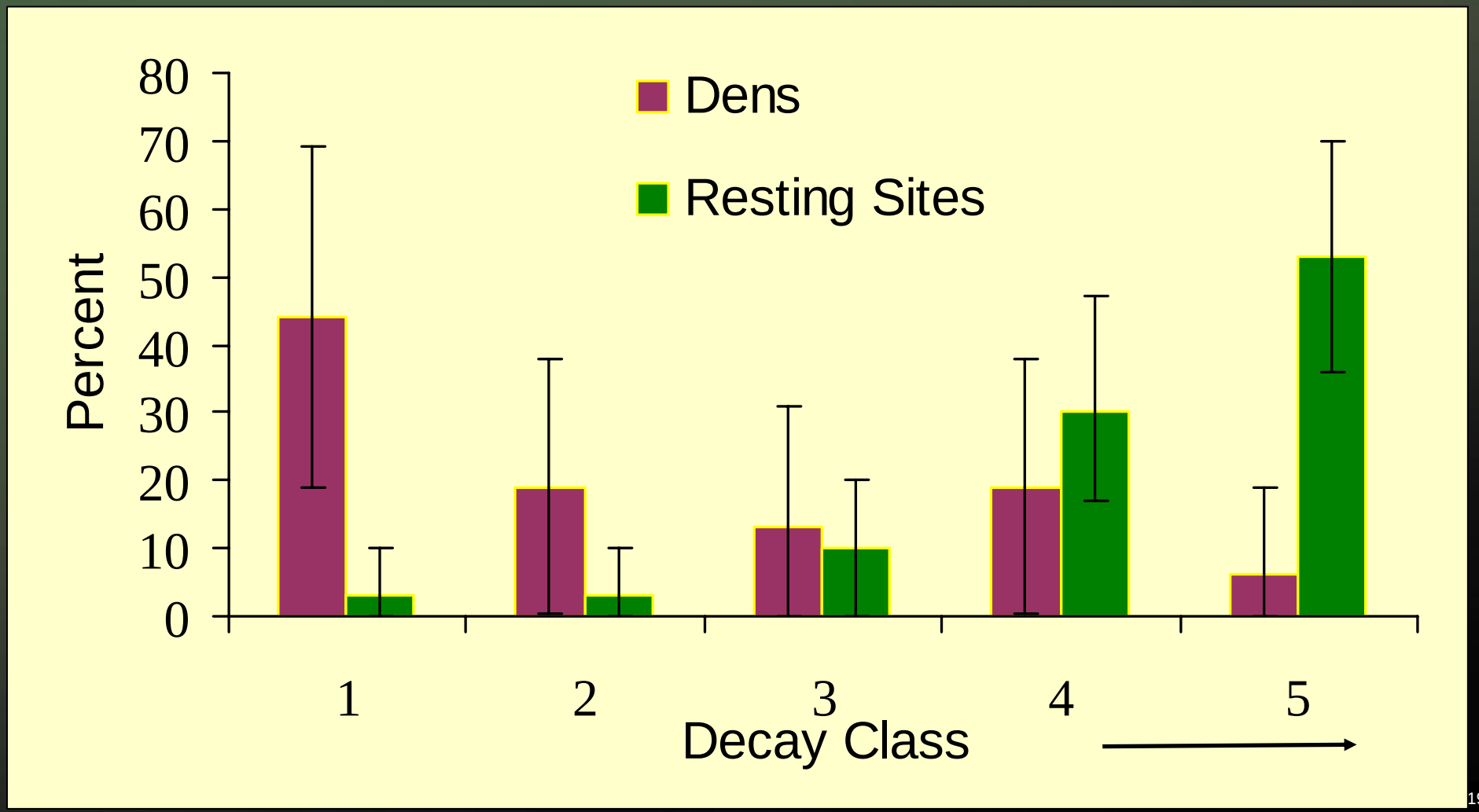
Mean dbh = 36.6 inches with 68% of the used live trees >24 inches.

Diameter classes for used and available structures



Decay classes of dead wood

Dens and Resting Sites



Habitat Capability Index model

Comparison of habitat selection coefficients and the coefficients in the Habitat Capability Index model for marten including a crosswalk between landcover maps.

Landcover strata	Selection ratios[a]		HCI model[b] categories	HCI model coefficients
Large/MS	1.00	0.86-1.12	>30, 000	1.0[c]
Medium/MS	0.91	0.83-0.98	20-30,000	0.9[c]
Intermediate/MS	0.66	0.58-0.72	8-20,000	0.7[c]
Small-pole/MS	0.37	0.30-0.42	<8,000	0.3[c]
Clearcuts	0.23	0.16-0.30	Seedling/sapling	0.2[c]
Singlestoried	0.49	0.39-0.57	Young growth	0.1

[a] Selection ratios scaled to range from 0-1.0

[b] Habitat category crosswalk. HCI model categories based on timber-type volume classes (board-foot/acre net inventory volume).

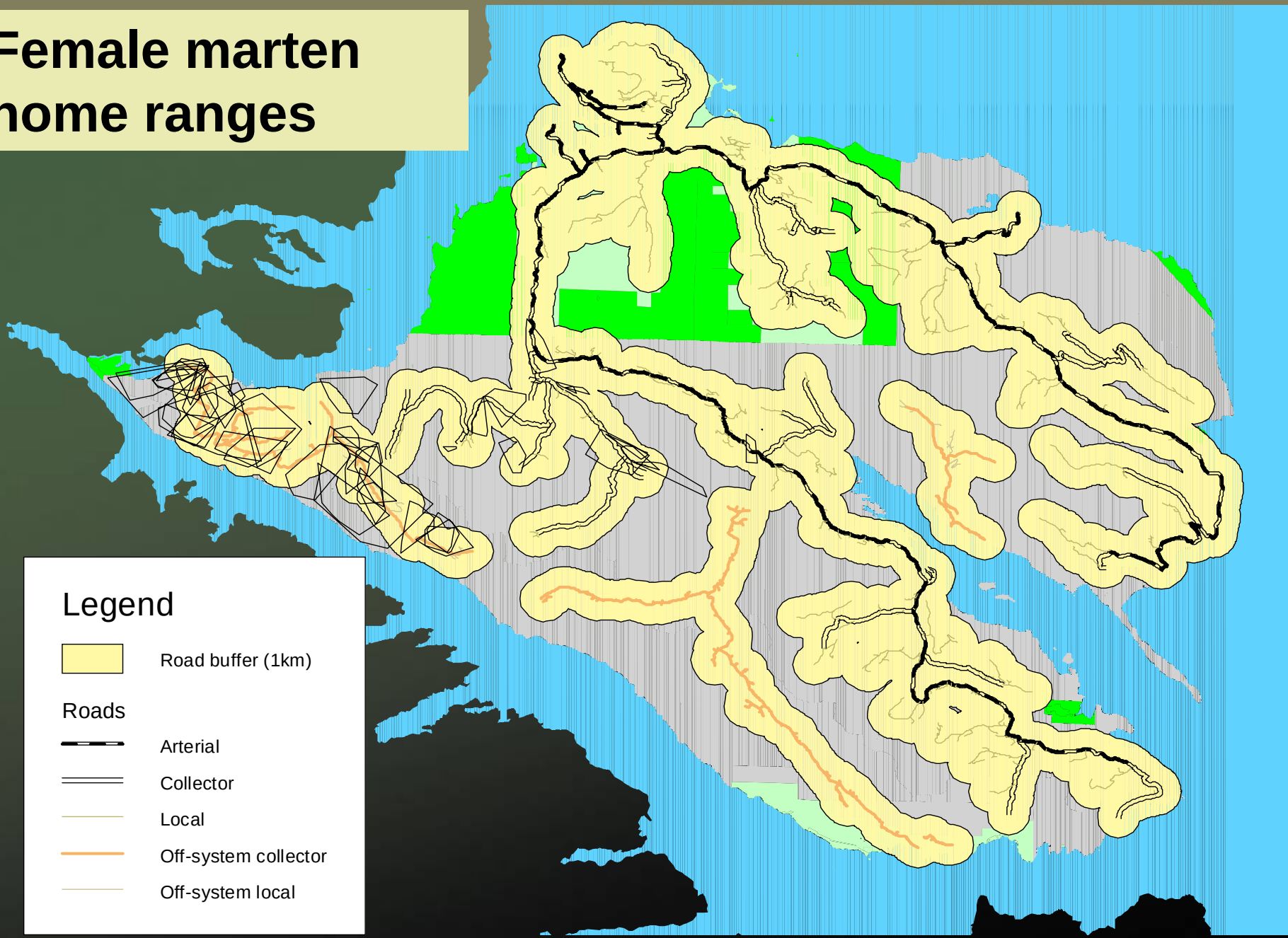
[c] 95% CIs of selection ratios overlap with model coefficients.

Data consistent with definition of high value habitat in TLMP

Landscape-level needs

- Numerous studies have found martens sensitive to fragmentation (e.g., Snyder and Bissonette 1987, Hargis and Bissonette 1997, Chapin et al. 1998, Potvin et al. 2000)
- Contiguous habitat blocks (i.e., fewer patches)
- Connectivity (travel corridors)
- Human access management

Female marten home ranges

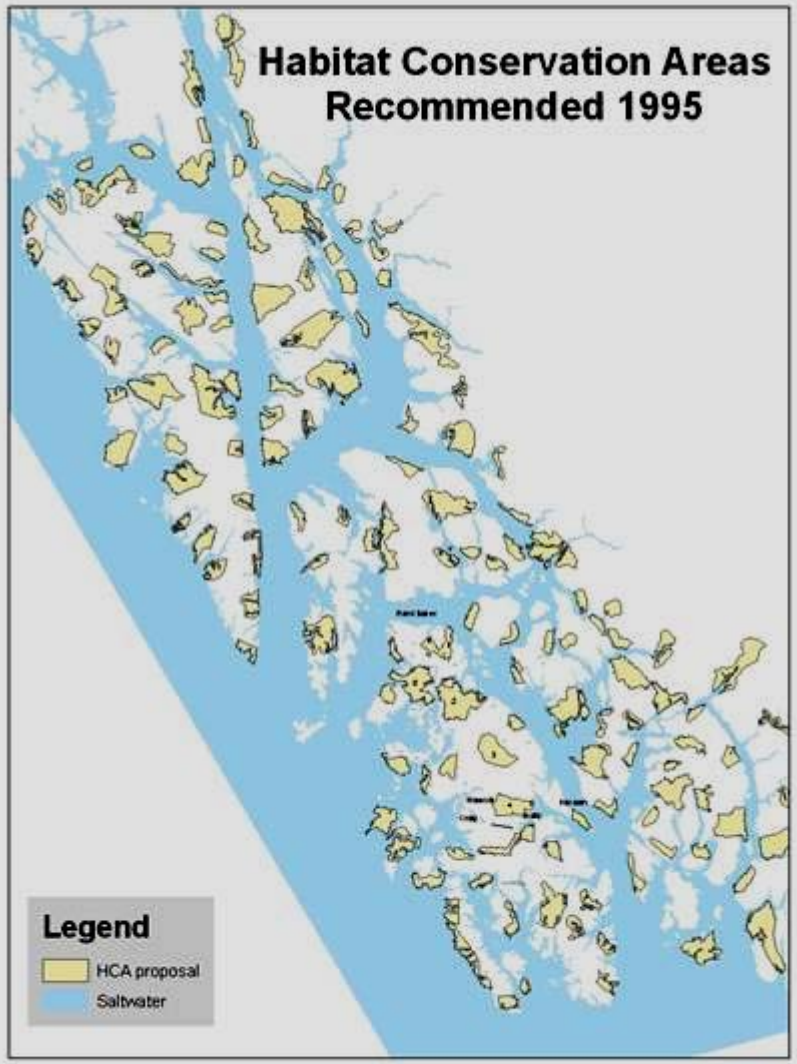


Martens & Old-growth Reserves

Based on metapopulation theory

- Spatially isolated populations will persist in suitable habitats if regularly recolonized
- Extirpations not synchronized
- Connectivity needed

Specific size, habitat composition, and spacing requirements



New information

Are the conservation assumptions for marten populations (based primarily on Chichagof data) applicable across the entire Tongass NF?

Specifically, we hypothesized:

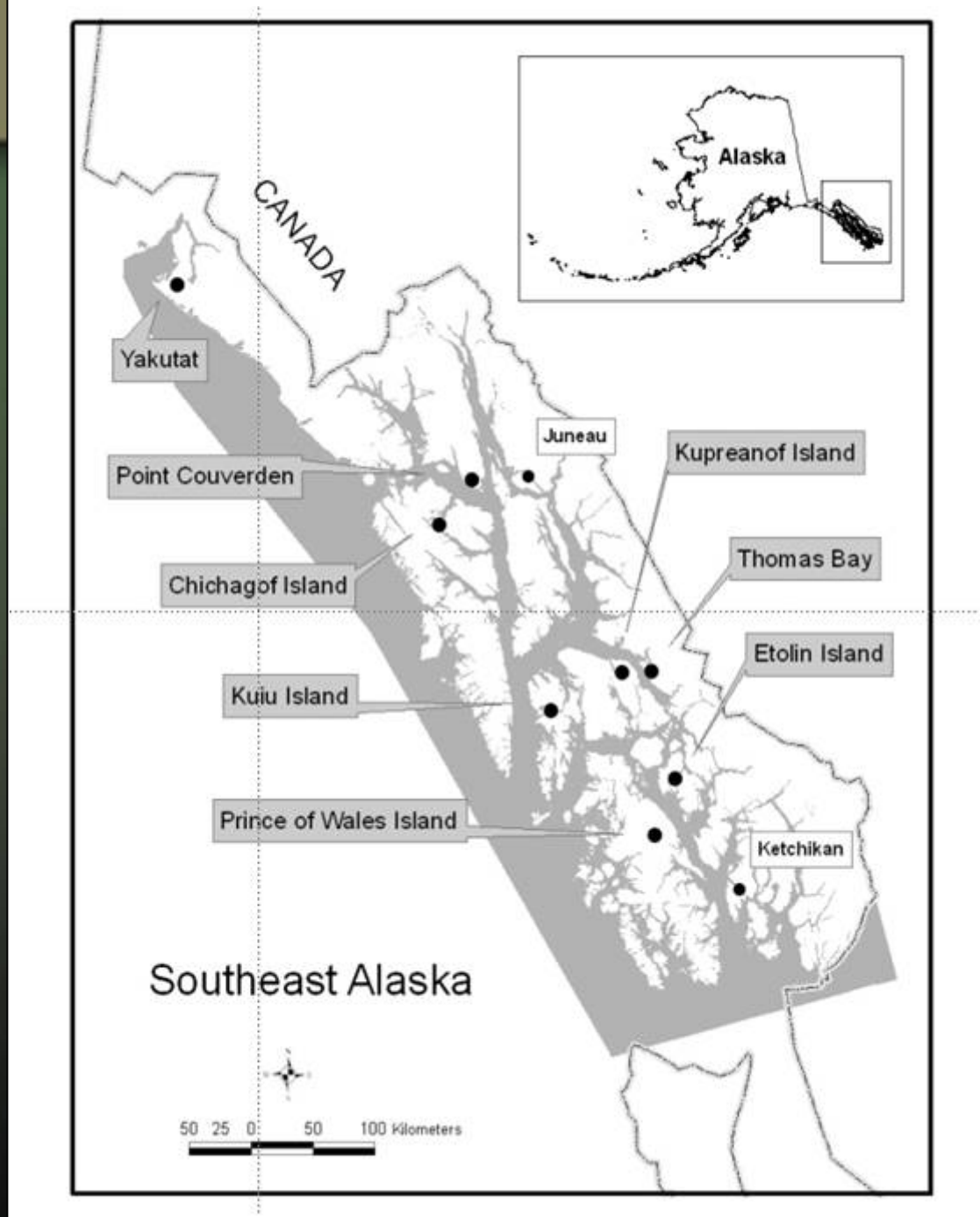
Marten abundance $\geq$ 25 adult females/large OGR.

Marten densities would be greater on areas with similar habitat composition, but with more diverse and abundant food resources.

Would marten food-diet relationships be similar across populations?

Study areas

- 8 study areas across Southeast Alaska representing different populations
- Minimum habitat composition as OGR
- Accessible
- No trapping for at least 1 year



Methods

Marten density estimate

Incorporated capture probability (0.64) and mean home range size (5.3 km)

Diet composition

Stable isotope ratios for martens and prey (Isosource mixing model)

Food availability

Small mammal abundance

Biomass per 100 TNs by species

Ungulate index (deer pellet counts)

$$\hat{d} = \frac{C}{(p * A)}$$

where:
d = density of male or female martens per hectare,
C = number of unique males or females captured,
p = probability of capture (0.64),
A = the mean effectively trapped area for either sex,

with variance estimated by:

$$\text{var}(\hat{d}) \cong (\hat{d})^2 [\frac{1}{C} + \frac{\text{var}(A)}{A^2} + \frac{\text{var}(p)}{(p)^2}]$$

Marten abundance (females per OGR & 80% CI)

Study area	Year	Captures	Number	Lower	Upper
Chichagof Is.	2002	7	**31**	**14**	**48**
	2003	6	**27**	**11**	**42**
Etolin Is.	2002	1	5	0	11
Kuiu Is.	2001	2	10	1	19
	2002	1	5	0	11
Kupreanof Is.	2002	1	5	0	10
	2003	1	5	0	10
Point Couverden	2003	4	19	6	**32**
Prince of Wales Is.	2001	2	8	1	16
	2002	1	4	0	9
	2003	2	8	1	16
Thomas Bay	2001	3	15	3	**26**
	2002	3	15	3	**26**
Yakutat	2003	3	10	2	18

Chichagof Is. was the only site with point estimates ≥ 25.

Point Couverden & Thomas Bay only sites with upper CI ≥ 25.

Food abundance

Study area	Year	Keen's mice	Long-tailed voles	Red-backed voles	Ungulate index
Chichagof Is.	2002	4.7	9.3		1.00
	2003	3.3	3.8		1.00
Etolin Is.	2002	3.7	0.0	3.4	0.30
Kuiu Is.	2001	4.7	0.4		0.32
	2002	7.7	0.0		0.32
Kupreanof Is.	2002	4.7	0.0		0.56
	2003	3.5	0.0		0.56
Point Couverden	2003	0.2	0.0	16.9	0.21
Prince of	2001	6.7	0.0		0.69
Wales Is.	2002	3.7	0.0		0.69
	2003	7.0	0.2		0.69
Thomas Bay	2001	0.4	0.4	4.4	0.59
	2002	1.0	0.0	6.7	0.59
Yakutat	2003	0.0	0.7	12.7	0.41

- Large variation in the abundance of small mammals.
- Long-tailed voles abundant on only Chichagof Is.
- Keen's mice common except on mainland.
- Red-backed vole numerous where occured.

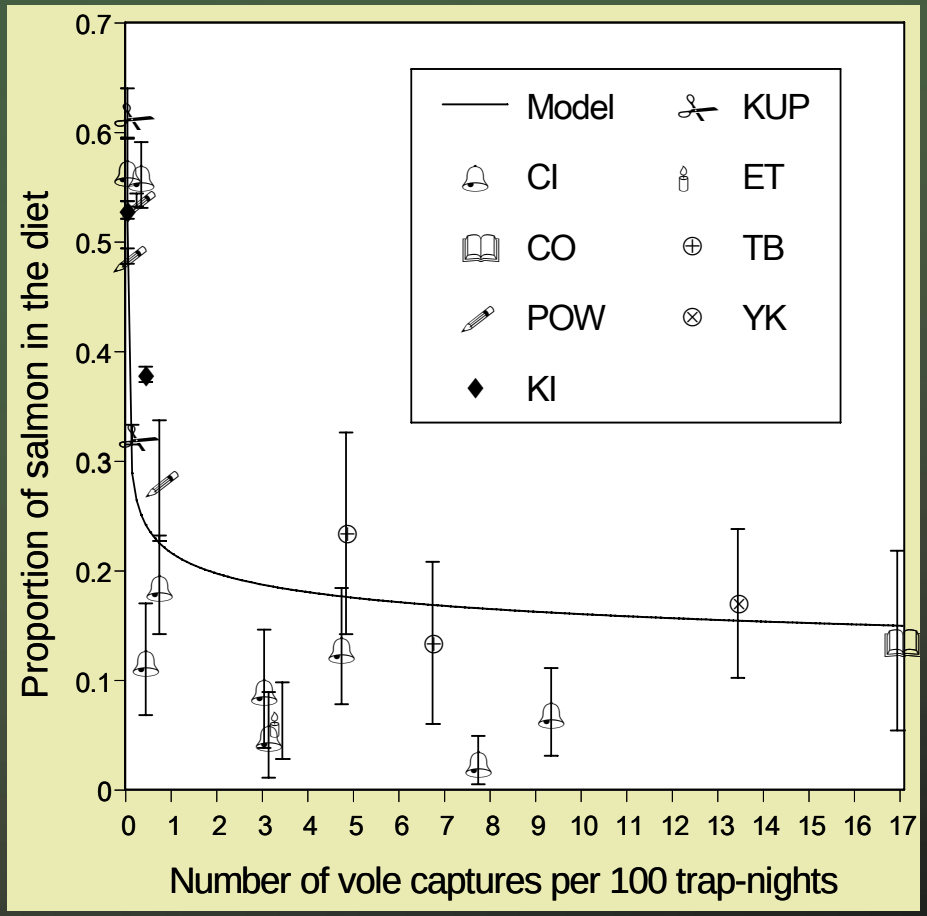
Marten diets

Study area	Year	Keen's mice	Long-tailed voles	Red-backed voles	Salmon
Chichagof Is.	2002	21.1%	25.1%		7.1%
	2003	27.6%	23.2%		13.1%
Etolin Is.	2002	13.1%	20.2%	7.0%	4.0%
Kuiu Is.	2001	19.2%	9.4%		37.9%
	2002	2.2%	29.5%		52.9%
Kupreanof Is.	2002	22.3%	15.3%		32.4%
	2003	8.5%	6.5%		62.6%
Point Couverden	2003	19.9%	12.8%	20.0%	15.6%
Prince of Wales Is.	2001	24.0%	13.8%	0.0%	40.2%
	2002	21.5%	12.4%	0.0%	46.1%
	2003	27.3%	16.5%	0.0%	28.3%
Thomas Bay	2001	16.2%	10.7%	23.2%	23.4%
	2002	15.5%	18.8%	21.3%	13.4%
Yakutat	2003	12.4%	32.2%	35.5%	13.7%

Martens fed on long-tailed voles when available.

Keen's mice and red-backed voles usually avoided.

Marten diet switching



But martens switched to salmon when vole numbers where low.

Relation between percent salmon in the diet and number of voles captured per 100 trap-nights.

Marten abundance predictors

Marten density best predicted by long-tailed vole (+) and Keen's mice (-) abundance (r^2 = 0.44, P = 0.02)

Ungulate index marginally significant (P = 0.19)

Red-backed voles not significant factor

Indices of fragmentation correlated with marten density (i.e., number of patches and Shannon diversity index) (r^2 = 0.58, P = 0.003)

Implications for OGRs

- High value marten habitat consistent with assumptions in TLMP and Conservation Strategy
- Marten population numbers vary greatly spatially
  - Below target of 25 adult females/16,200 ha in most areas.
- Marten numbers strongly affected by food abundance, especially long-tailed voles.
- Marten numbers higher is less fragmented habits.
- Martens switched to more salmon when vole numbers low.

Considerations

OGRs an appropriate model for marten conservation.

Management needs to be tailored to specific populations (island).

OGRs may not provide enough habitat by themselves to maintain healthy populations and additional conservation measures needed.

Matrix lands need to be managed as productive habitat with adequate corridors among OGRs.

Consider more partial cutting (light touch), especially adjacent to OGRs.

OGRs should contain a salmon-spawning stream.

Considerations

Additional modeling on population dynamics in a metapopulation setting. Is the 25 females/large OGR the appropriate number for all populations?

Long-term monitoring of the relationships among food and population dynamics.

Additional studies on dispersal in a fragmented landscape.

Additional studies on the dynamics of long-tailed vole populations across Southeast Alaska.

Considerations: Mitkof studies

• Martens selected for productive old growth (POG) and used a wide variety of (if not all) POG types.

• Use of some clearcuts 26-40 years of age. On Mitkof, these clearcuts in general still have a lot of understory forage (at least during our study) and small mammals.

• Home ranges of the marten in our study area were well-distributed across the matrix landscape, occupying areas with timber harvest and roads. Although they selected against it, they seemed to readily travel across areas of noncommercial forest as well as POG and clearcuts with established conifer cover.

• Each island should be treated as a metapopulation unless evidence that different parts of the island are clearly isolated with respect to marten movements.

Considerations: Mitkof studies

- Concerned about the effect of trapping on marten viability.
- High vulnerability of marten to trapping in our study area.
- Do not favor a road density standard to assess marten vulnerability, but rather an island-wide assessment of areas large enough to contain marten home ranges that are free from trapping (i.e., refugia).
- Trapping refugia model very useful at evaluating new roads and determining to what degree they could expose marten to new trapping pressure.

Considerations: Marten Standard and Guideline

Amount and distribution of legacy in clearcut patches >2 acres.

No ecological basis for distributing forest structure (legacy) in a uniform fashion across the clearcut.

Consider eliminating the requirement to distribute the structure uniformly across the clearcut.

Consider revising the S&G to explicitly describe the anticipated benefit of this S&G.

Biologists have assumed that it was to provide connectivity across clearcuts and adequate resting sites to encourage martens to use clearcuts.

Considerations: Marten Standard and Guideline

How much legacy to leave?

- Evidence exists that 50% forest cover may represent a threshold.
- However, this evidence comes from studies conducted at broader spatial scales than the S&G prescription applies.
- Unclear whether one can extrapolate this information to stand-scale patterns of forest cover.
- The best data may come from studies that describe marten behavior. Previous studies suggest that individuals will not (or rarely) cross openings greater than some minimum distance.
- Depending on the spatial configuration of retention, meeting such an objective will vary in terms of the percentage of legacy needed. Because of little data on behavioral limitations, this perhaps should be a relatively high priority information need.

Conservation Strategy Review Consideration

Standards and Guidelines: American marten XVI. Marten populations and mortality.

Currently, USFS staff find it difficult to determine the intent of the marten Standards and Guidelines in Section XVI.

Difficult to maintain marten mortality rates within sustainable levels without an accurate population estimate for the Tongass NF.

Marten Standard and Guideline Section XVI

A. 1. Where marten mortality concerns have been identified, cooperate with the Alaska Department of Fish and Game to assist in managing marten mortality rates to within sustainable levels. Consider both access management on National Forest lands and hunter/trapper harvest regulations administered by the Alaska Department of Fish and Game.

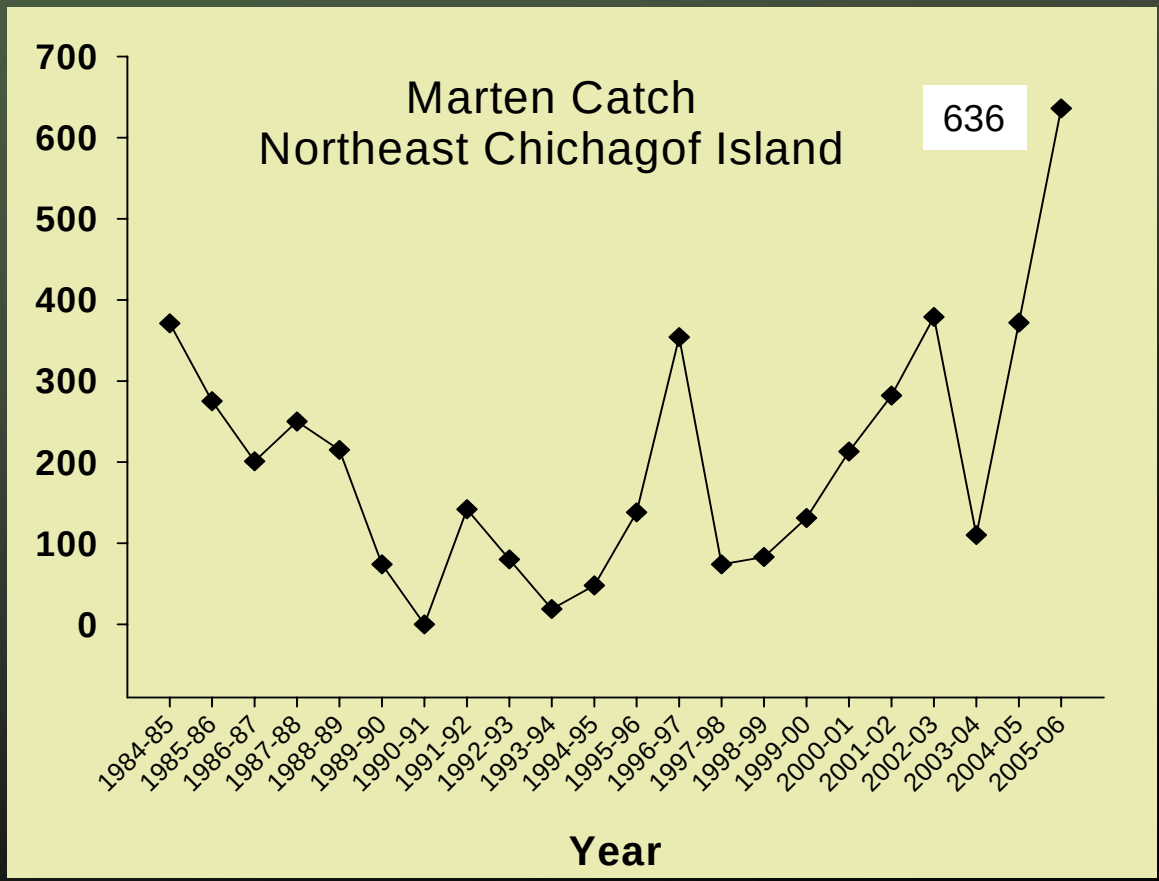
a) Participate in interagency monitoring of marten populations on the forest.

b) Where marten data suggest that mortality exceeds sustainable levels, work with the Alaska Department of Fish and Game to identify probable sources of mortality. In an interagency analysis, examine the relationship between hunter/trapper marten harvest and human access.

c) Where road access has been determined, through the analysis, to significantly contribute to unsustainable marten mortality, implement effective road closures to reduce mortality. Effective road closure prohibits motorized traffic (e.g., may include removing culverts or bridges versus only signing). Off-Highway Vehicle travel restrictions may also be necessary. To meet this direction, develop and implement road management objectives through an interdisciplinary process (see Transportation Forest-wide Standards & Guidelines).

Marten Monitoring on the Hoonah Ranger District

1. The past 3 years martens have been collected and necropsies performed on harvested animals in the Hoonah area in an attempt to determine if a conservation concern exists by using sex & age ratios.



Considerations

1. The Tongass NF consider completing a rigorous population estimate for marten on the Tongass NF.
2. The Tongass NF consider validating population estimate techniques against the monitoring protocol currently used on Chichagof Island (or other techniques) to determine protocols that could be used as reliable and cost effective methods to monitor marten.