

Marten Habitat Modelling in Newfoundland

Brian Hearn, Canadian Forest Service

Kathy Knox, Jacques Whitford Environment

Joe Brazil, Dept. Forest Resources and
Agrifoods

Jason Pond, Dept. Forest Resources and
Agrifoods



Background

- ✍ Marten commercially harvested in 18th, 19th and early 20th century
- ✍ Trapping season closed in 1934, population failed to recover
- ✍ Species listed "threatened" in 1986 - estimated 630-875 animals
- ✍ Species listed "endangered" in 1996 - estimated 300 animals

Background

- ✍ Conflicts between commercial timber harvesting and marten conservation objectives have been ongoing since the early 1980s
- ✍ Attempts to incorporate objectives into forest management plans have been ad hoc and inconsistent because of the difficulty in identifying “how much”, “what type”, and “where”

Background

- ✍ Address these concerns by developing a tool that can assess a defined landscape area for its capacity to support marten
- ✍ Allow timber harvesting while still maintaining viable marten populations in an area

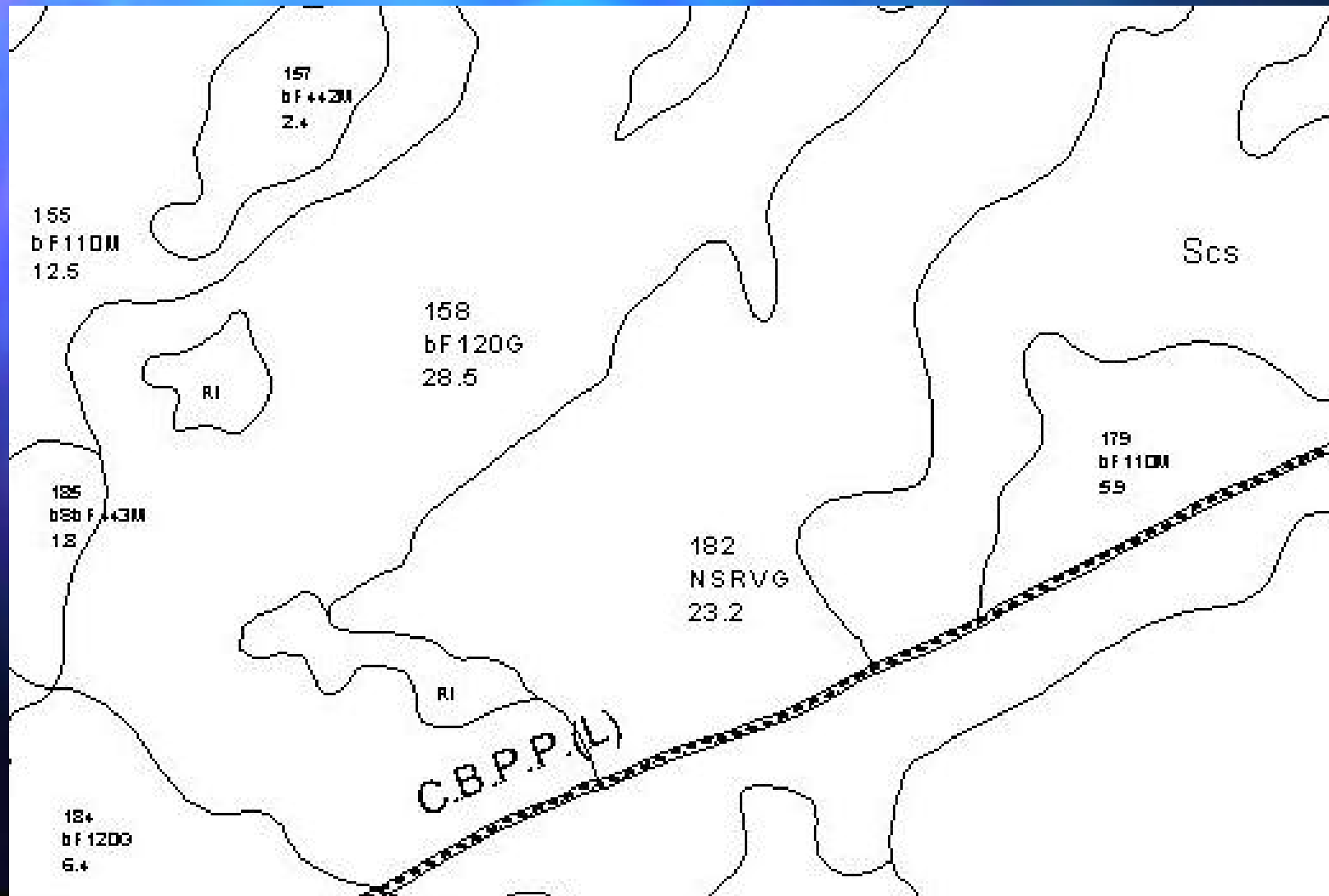
Background

- ✍ Achieved by assessing characteristics of vegetation using defined non-spatial and spatial rules to determine how many martens a particular landscape can support

Forest Inventory Database

- ✍ Model parameters based on NFS Forest Inventory Database
- ✍ The database has been created based on interpretation of aerial photography and permanent sample plot data collected since ???

Typical Forest Inventory Data



Model Rules

- ✍ Stand types, specifically tree height
- ✍ Buffering
- ✍ Spatial or landscape rules
- ✍ Grid overlay and population assessment

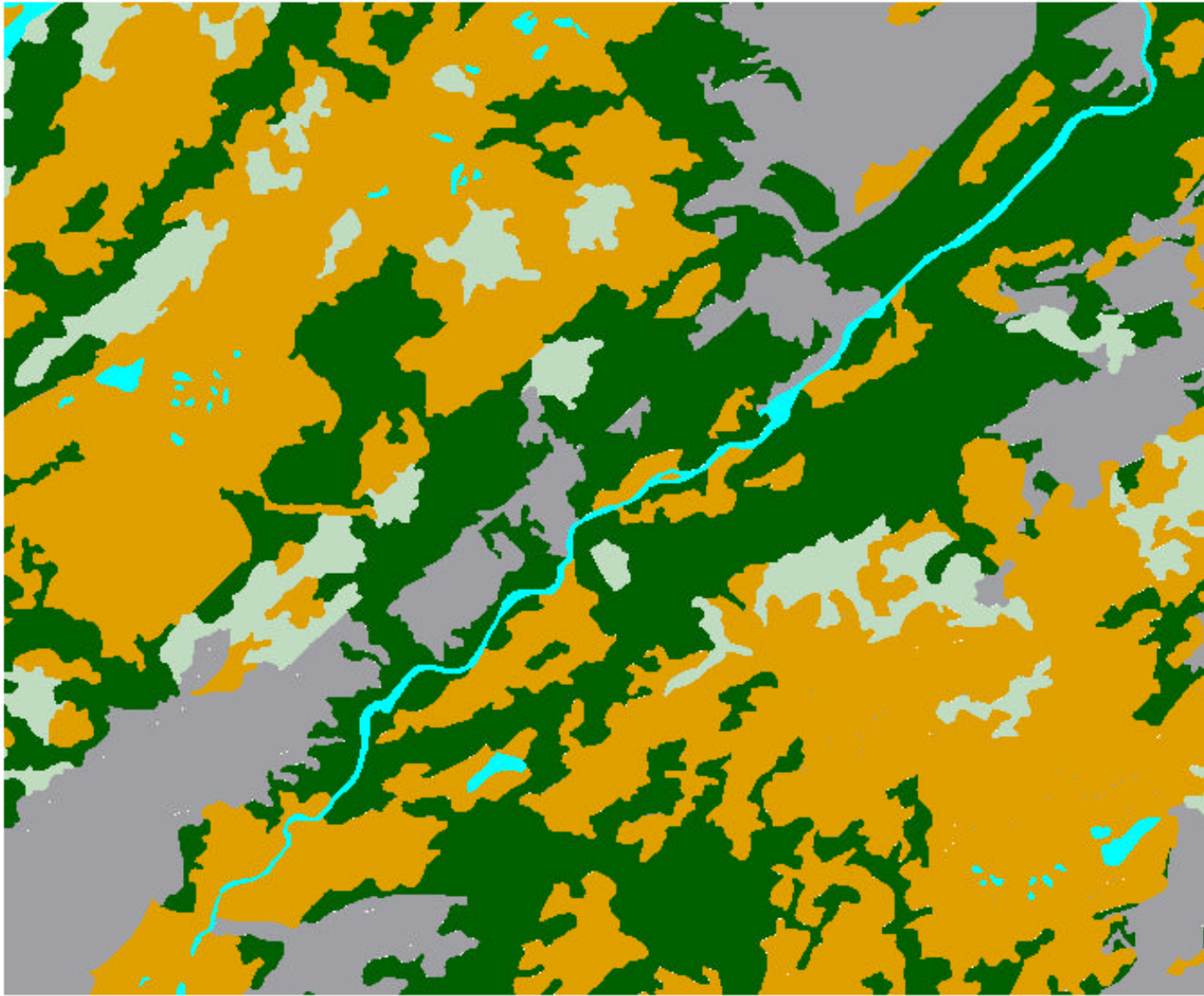
Where Did We Get These Rules?






- ✍ Brainstorming - based on what we know about marten habitat use
- ✍ Professional knowledge, literature, preliminary results of local study

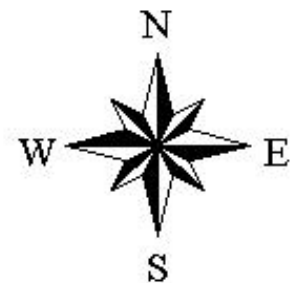
Model Rules - Stand types

- ✍ Stand of 6.5 m height or better called habitat regardless of forest type
- ✍ Height class 3 (6.6-9.5 m) rated as "medium" and height classes 4 and greater rated as "high"

Habitat Quality Map



-  Water
-  Bog/Barren/Scrub
- Habitat Quality**
-  Non-Habitat (Ht < 6.6 m)
-  Medium 6.6 - 9.5 m
-  High > 9.5 m



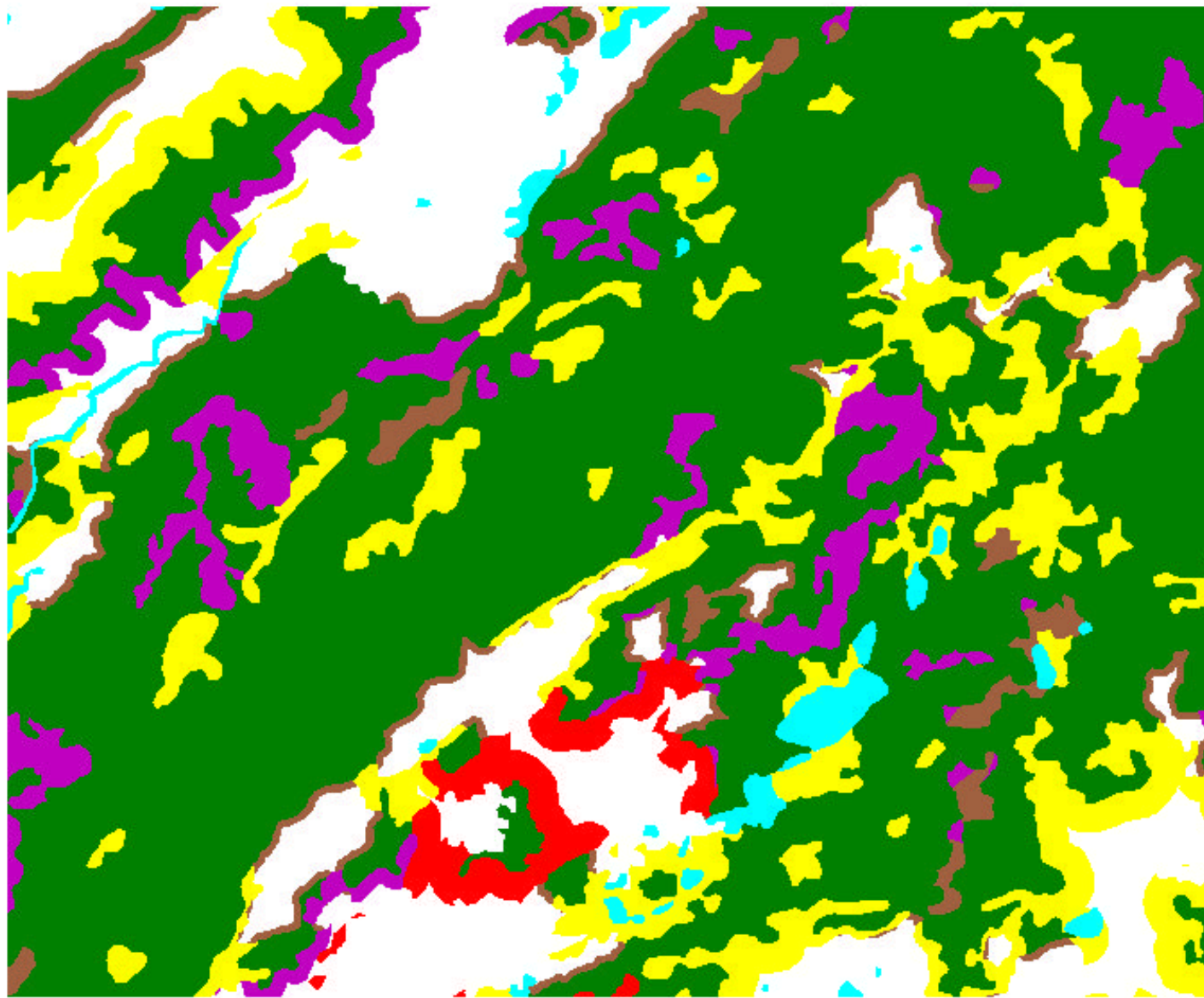
1:25000

Model Rules - Buffering

- ✍ Buffer habitat by zones when adjacent to habitat, for example:
- ✍ 50 m on bog/barren and height class 1
- ✍ 200 m on scrub
- ✍ 100 m on height class 2

Why did we buffer?

Habitat After Buffering




Water


 Water


Habitat

 Stand Structure Habitat

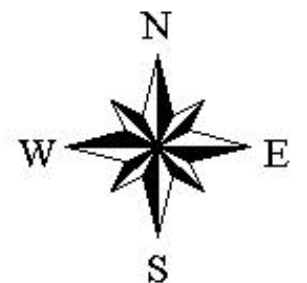
 Buffered Scrub (100m)

 Buffered Ht_Class 2 (100m)

 Buffered Ht_Class 1 (50m)

 Buffered Bog/Barren (25m)

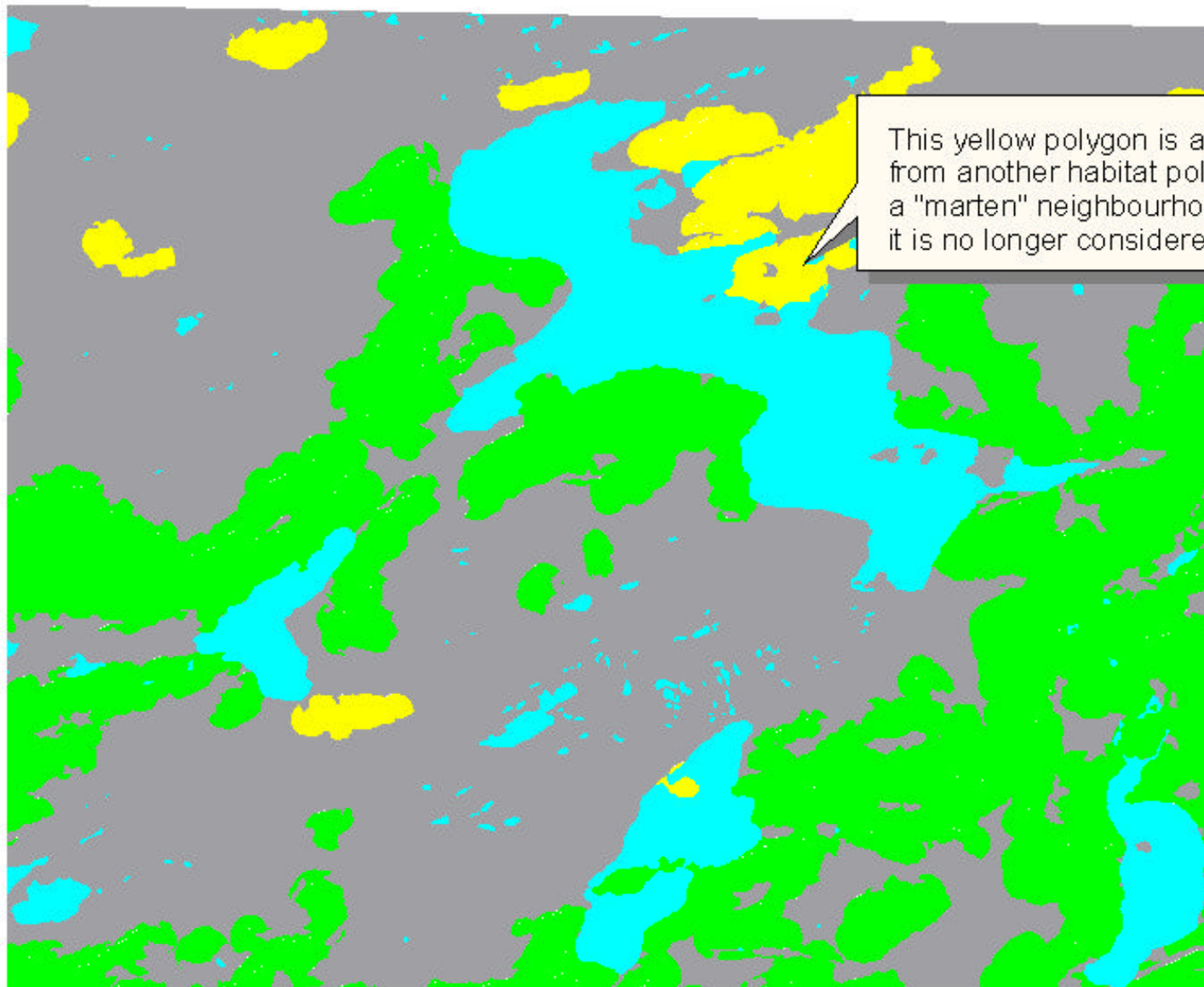
0.8 0 0.8 1.6 Miles



Model Rules - Spatial

- ✍ Apply spatial constraints
- ✍ A habitat stand must be within 100 m of another habitat stand and cumulatively, they must total the minimum habitat requirement to support one male marten

Proximity Habitat



This yellow polygon is at least 200 m from another habitat polygon that forms a "marten" neighbourhood. As a result, it is no longer considered suitable habitat.

Water

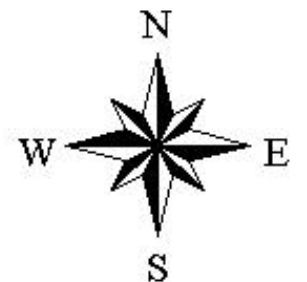
 Water

Habitat

 Non-Habitat(Stand Structure)

 Habitat

 Non-Habitat (Proximity)



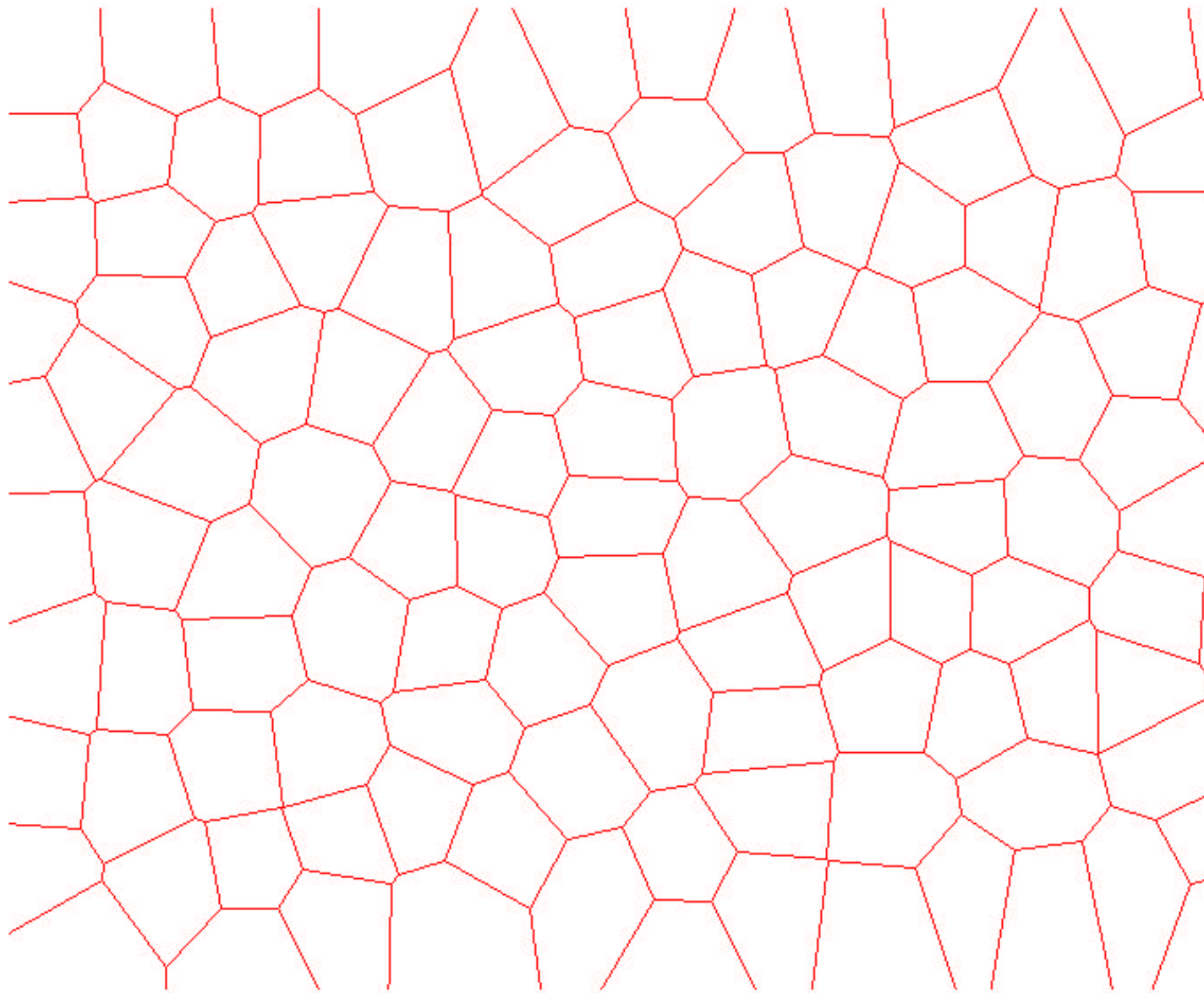
1 0 1 2 Miles




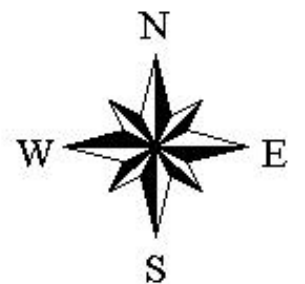
Population Assessment Approach

- ✍ Create a grid of randomly shaped home ranges that represent the average home range size of a male marten in Newfoundland
- ✍ For this example we are using home ranges sizes that approximate 30 km^2 (grid size ranges $\pm 7 \text{ km}^2$)

Simulated Home Ranges



 30 Km² Home Range



10 0 10 20 Miles

A horizontal scale bar with tick marks at 10, 0, 10, and 20 miles.

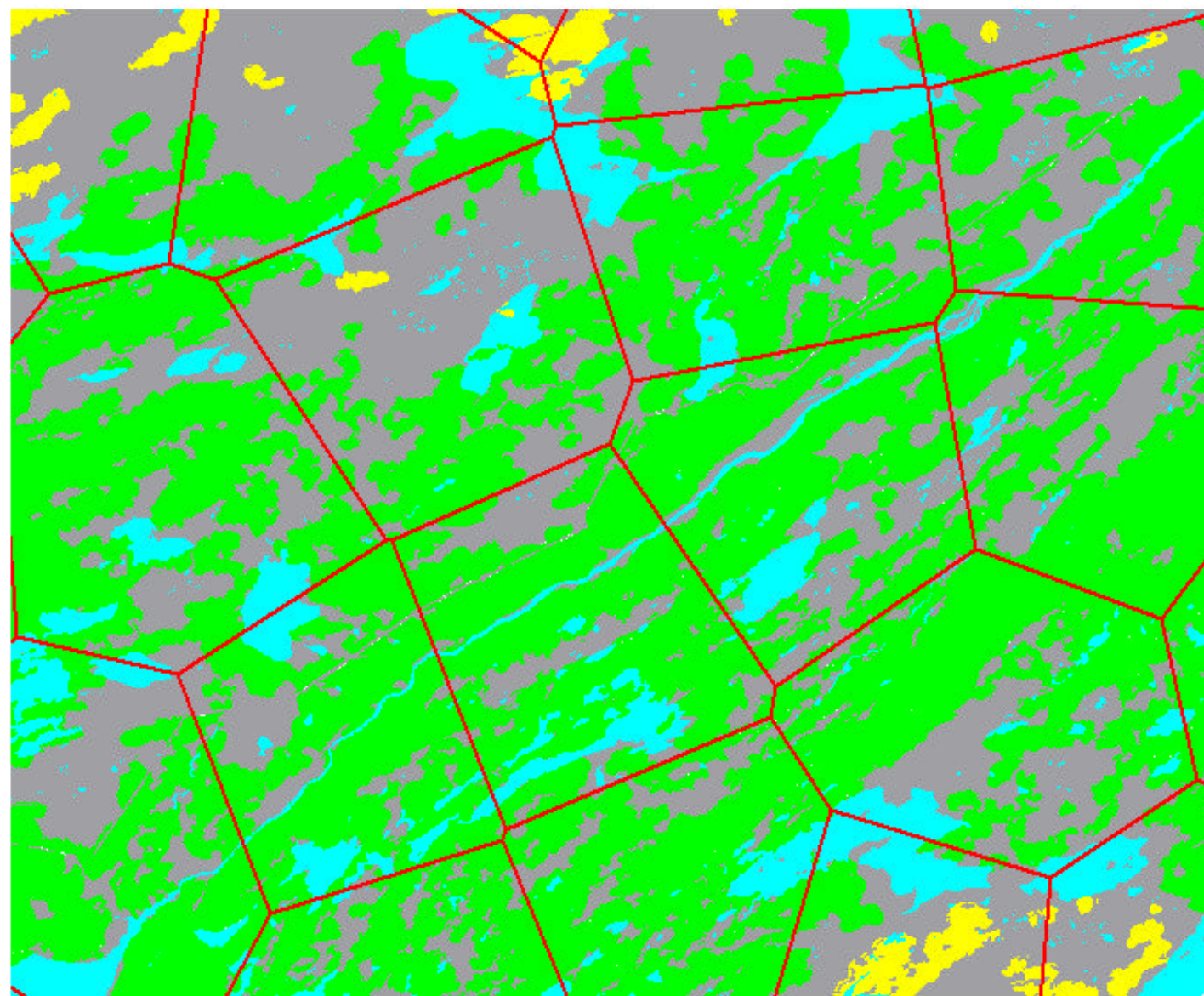
Model Rules

- ✍ The grid is overlaid on the study landscape
- ✍ Each cell is analyzed to determine if there is enough habitat to support one male marten

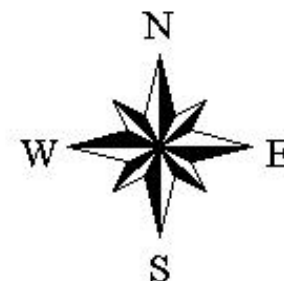
Model Rules

- ✍ User sets the percentage of habitat that must be present in each cell in order to support one male marten
- ✍ For this example, variable set at 70%, of which 40% of cell must be "high" quality habitat

Simulated Home Ranges Overlaid on Habitat



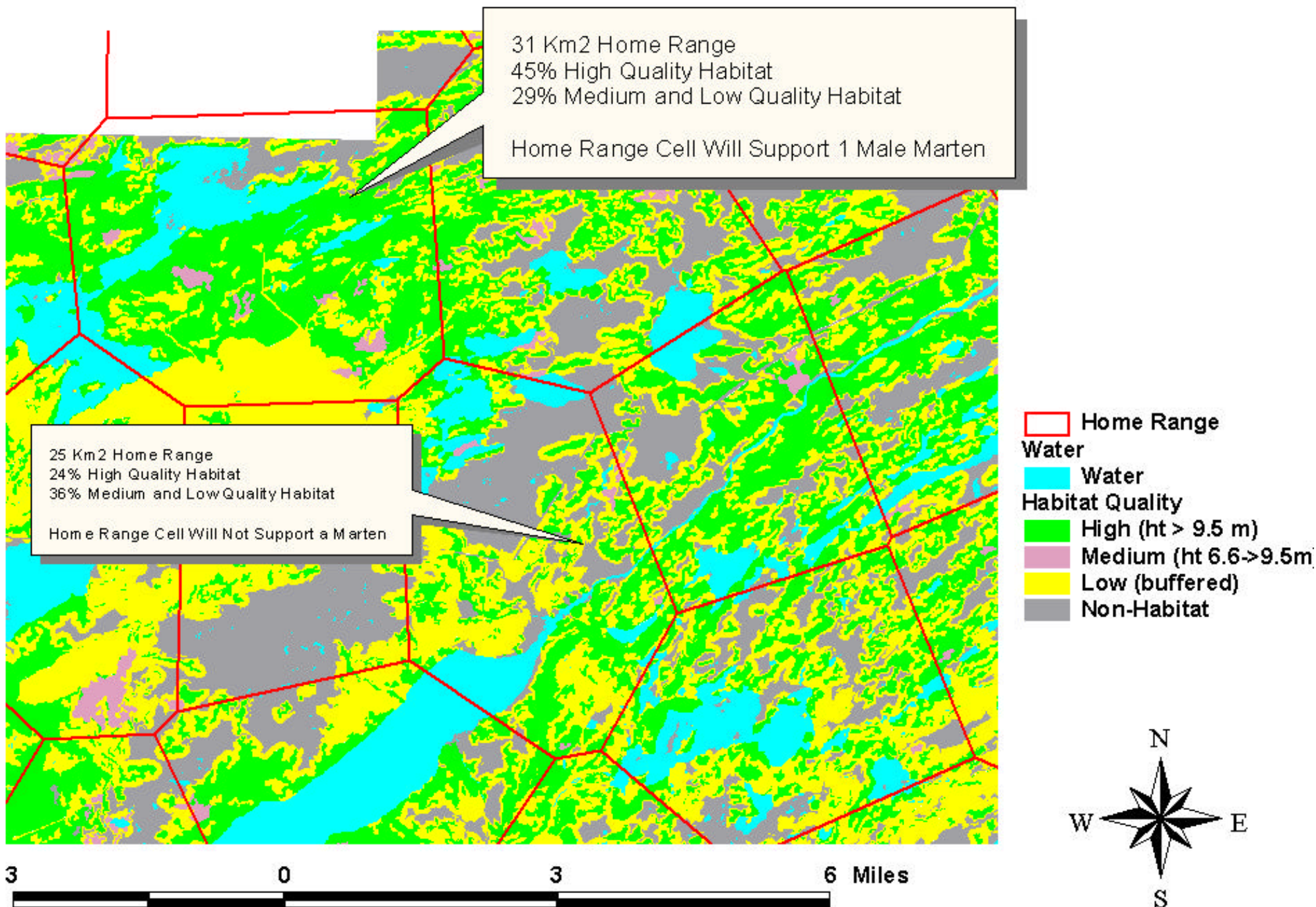
-  Home Range
-  Water
- Habitat**
-  Non-Habitat(Stand Structure)
-  Habitat
-  Non-Habitat(Proximity)



4 0 4 8 Miles



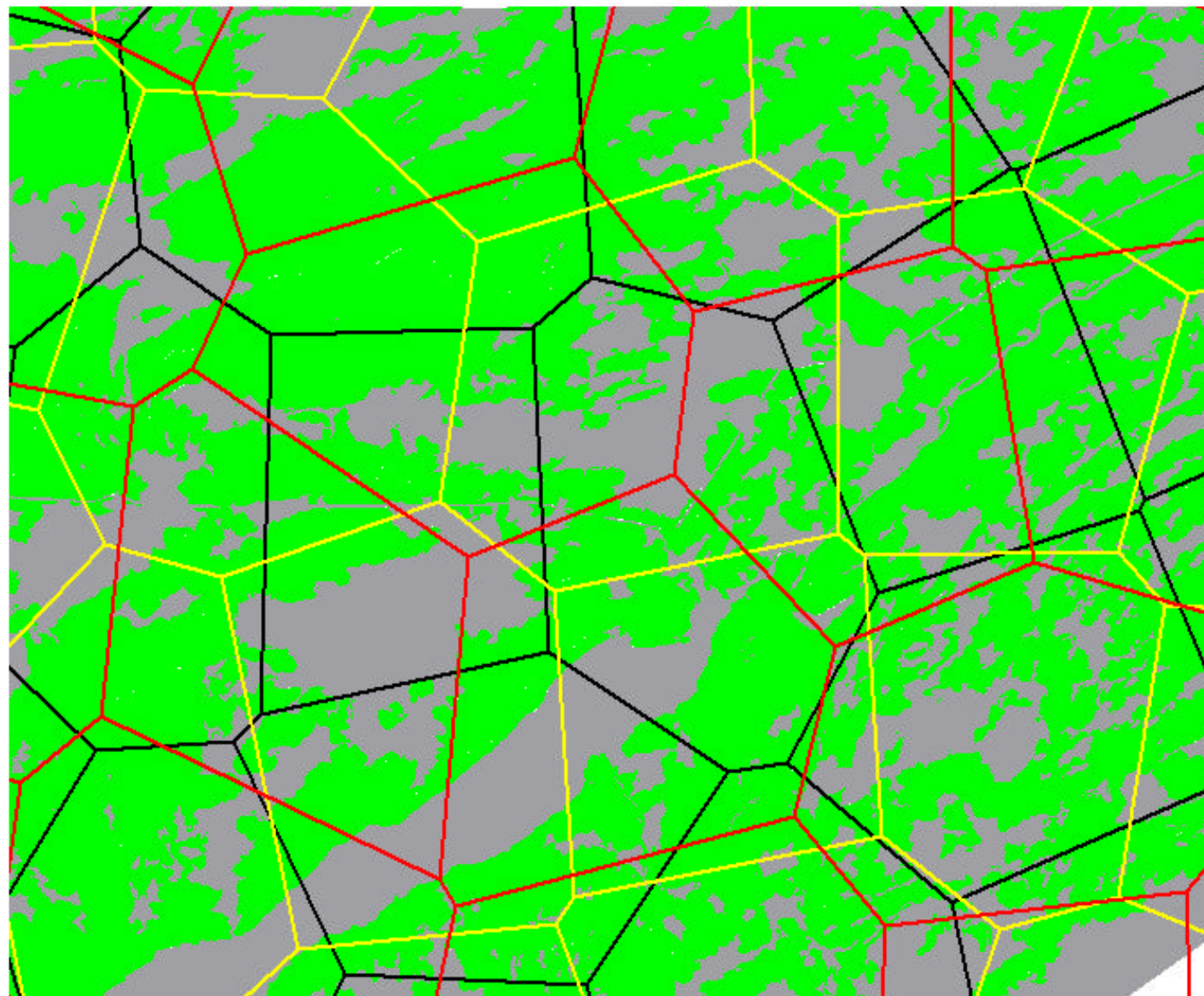
Simulated Home Ranges Overlaid on Habitat



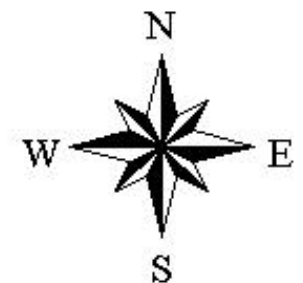
Model Rules

- ✍ The grid pattern is overlaid on the landscape numerous times and each time the pattern is randomly re-created
- ✍ This means the size, shape and pattern of the grid vary with each iteration

Habitat Map Illustrating 3 Sets of Simulated Home Ranges



-  Home Range 1
-  Home Range 2
-  Home Range 3
- Habitat**
-  Non-Habitat
-  Habitat



Model Rules

- ✍ During testing we have run the model with 20 iterations
- ✍ 20 iterations takes approximately 24 hours and 500 MB for our study area (XX sq. km)
- ✍ Further testing is required to achieve confidence in the number of iterations necessary to get a true picture of the habitat potential in the study area

Modelling Constraints

- ✍ Vector vs raster efficiency
- ✍ Limitation of forest inventory data - built as wood-supply inventory not global inventory
- ✍ Delay in updating of forest age, disturbance and harvesting events
- ✍ Characterization of scrub
- ✍ Lacking info on stand history, particularly for older stands -disturbance type and year

Future Direction

- ✍ Sensitivity analysis on all parameters - some work done on varying buffer widths and % habitat requirements
- ✍ Apply results of Hearn study as it becomes available e.g., habitat use patterns by collared marten
- ✍ Improve processing efficiency of model e.g., vector to raster

Future Direction

- ✍ Provide advice on further improvement to forest inventory database to reflect non-timber values
- ✍ Make model user friendly so that it can be adopted by resource managers for use in developing forest management plans, e.g. user interface

Acknowledgments

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Marten Habitat Management Guidelines

- ✍ Basic unit for evaluation is 30 sq km
- ✍ 70% suitable habitat
- ✍ 40% should have trees >9.5 m
- ✍ 30% can have trees 6.5 - 9.5 m
- ✍ 50% to be contiguous
- ✍ Minimum patch size = 20 ha
- ✍ Basal area > 40 cu. M

Guidelines continued

- ✍ Hardwood stands, blowdown, insect, fire with crown closure $>30\%$ - ok
- ✍ Scs ok if > 6.5 m