How Can We Control Fomes Root and Butt Rot?

A Decision Support System

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The Scientific name of the fungus causing Fomes Root and Butt Rot is:

Heterobasidion annosum

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What Determines the Spread of *Heterobasidion* through a Stand?
1. Soil and Climate (Hazard)
2. Management Decisions (Risk)

HAZARD is Determined by Site Factors

Heterobasidion grows:

- fastest in stumps in soils that are well-drained and warm.
- so slowly where soil is cold and waterlogged that the fungus poses minimal risk

RISK is Determined by Management Decisions

1. High-Risk Decisions:

- thin susceptible species regularly and hard
- no stump treatment

2. Low-Risk Decisions:

- no thinning
- use stump treatment
- plant hardwoods

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How Do We Assess Hazard?

1. Climate

Britain has been divided into a number of climatic zones which reflect:

- soil warmth (accumulated temperature)
- dryness (moisture deficit)

Such information is available in GIS form in ESC (Ecological Site Classification).

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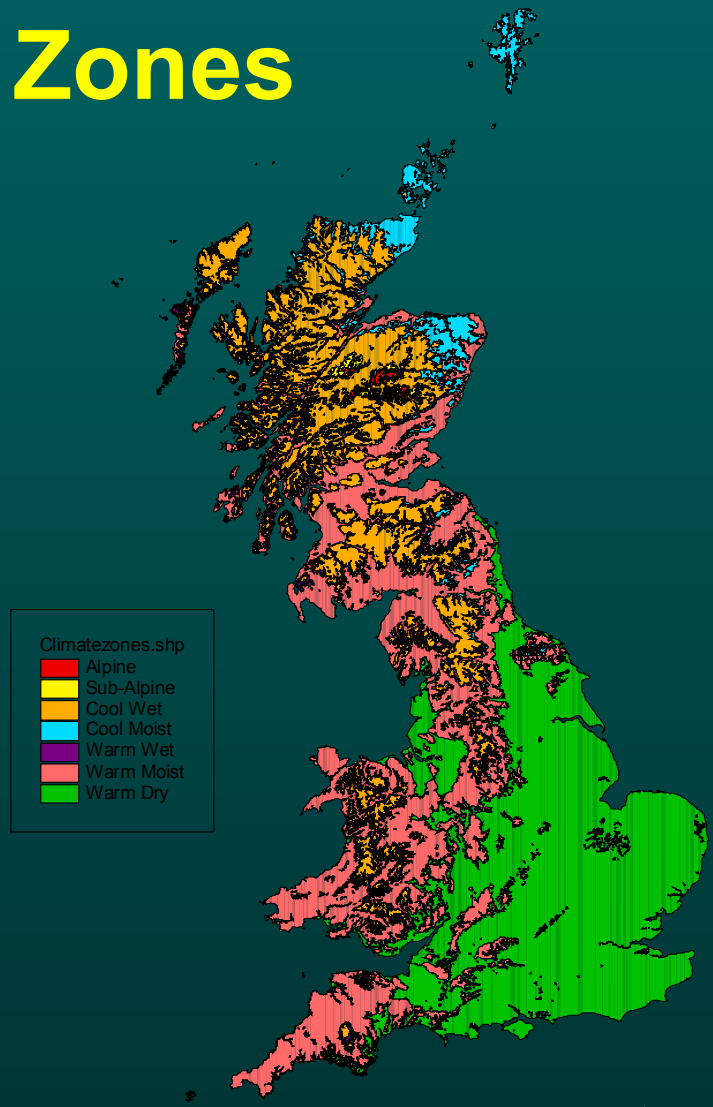
UK Climatic Zones



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Our Forest Area Is Distributed As Follows:

- Cool Wet 40
- Cool Moist 17
- Warm Wet 06
- Warm Moist 27
- Warm Dry 10

(% Total High Forest Area)

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How Do We Assess Hazard?

2. Soils

Hazard Rating:

- Brown earths and podsols (**High**)
- Less well drained mineral soils surface and ground-water gleys, ironpans (**Medium**)
- Shallow peaty gleys (**Medium/Low**)
- All peats (deeper than 15 cm) (**Low**)

Hazard Determined By Climate And Soil

H. annosum Hazard	Climate			
	Cool Wet	Cool Moist	Warm Wet	Warm Dry
High	Nil	Nil	BE, Podzol	BE, Podzol, Ironpans, SWG, GWG
Medium	Nil	BE, Podzol, SWG	Ironpan, GWG, SWG	PG (shallow)
Low	BE, GWG, Podzols, Ironpan, SWG, PG, Peat	Ironpans, GWG, PG, Peat.	PG, Peat	Peat, PG (deep)

The following maps show how HAZARD is affected by CLIMATE in a forest where SOIL has been fully mapped

Soils were combined into 4 classes:

- Well-drained mineral (BE, podsol)
- poorly-drained mineral (SWG, GWG, ironpan)
- Shallow peat (PG, peat <25cm)
- Peat (all other peats)

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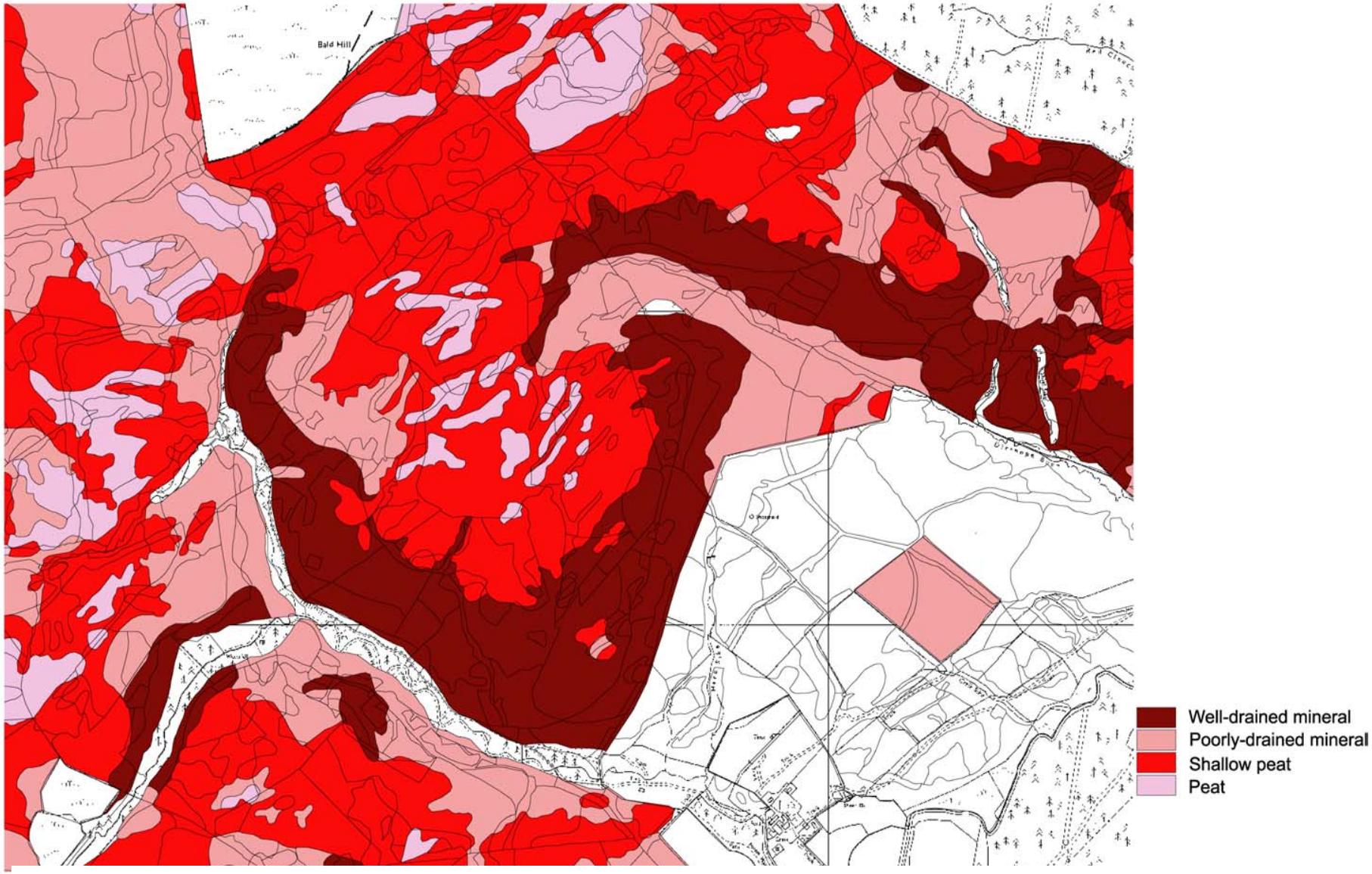
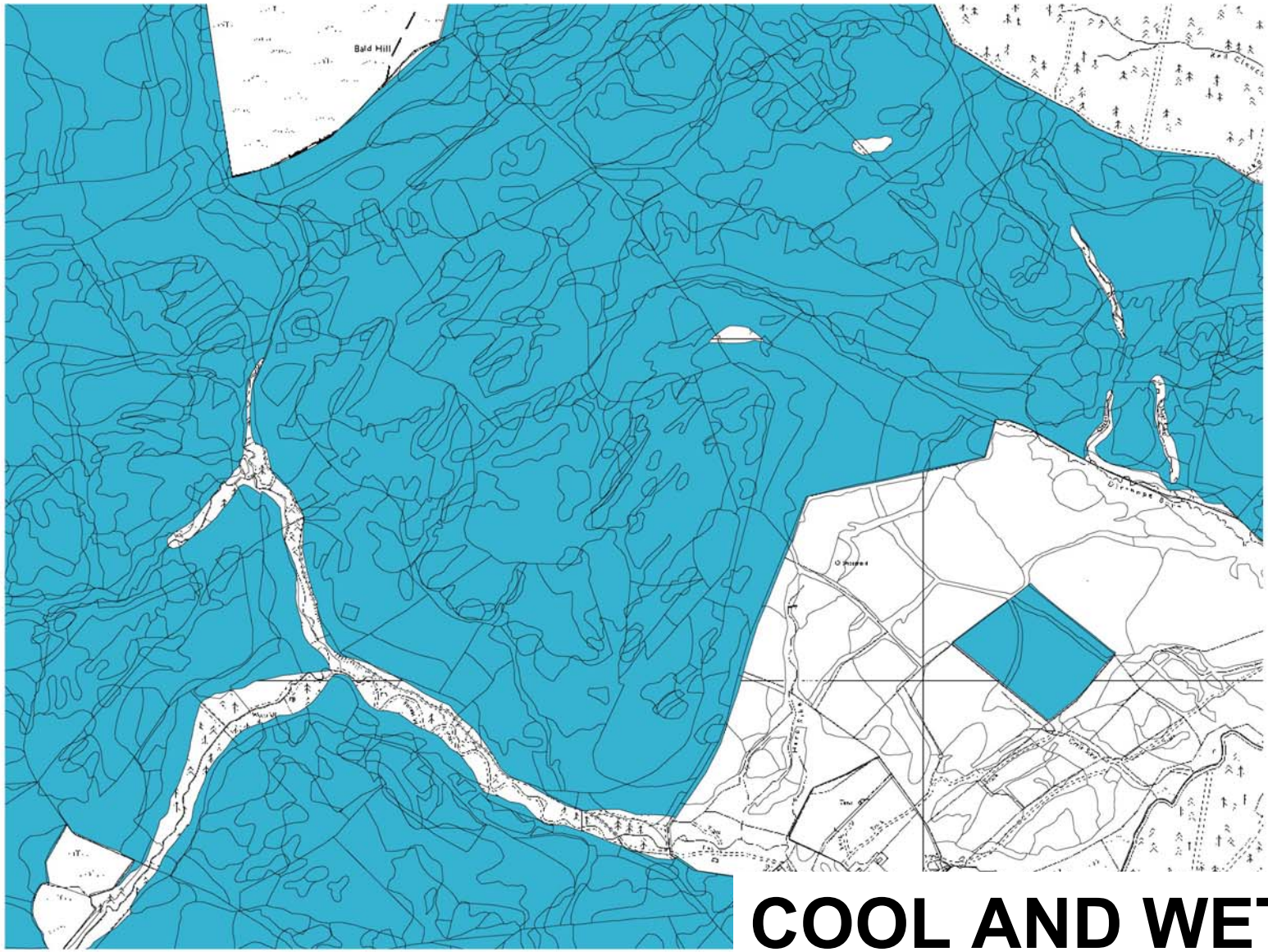
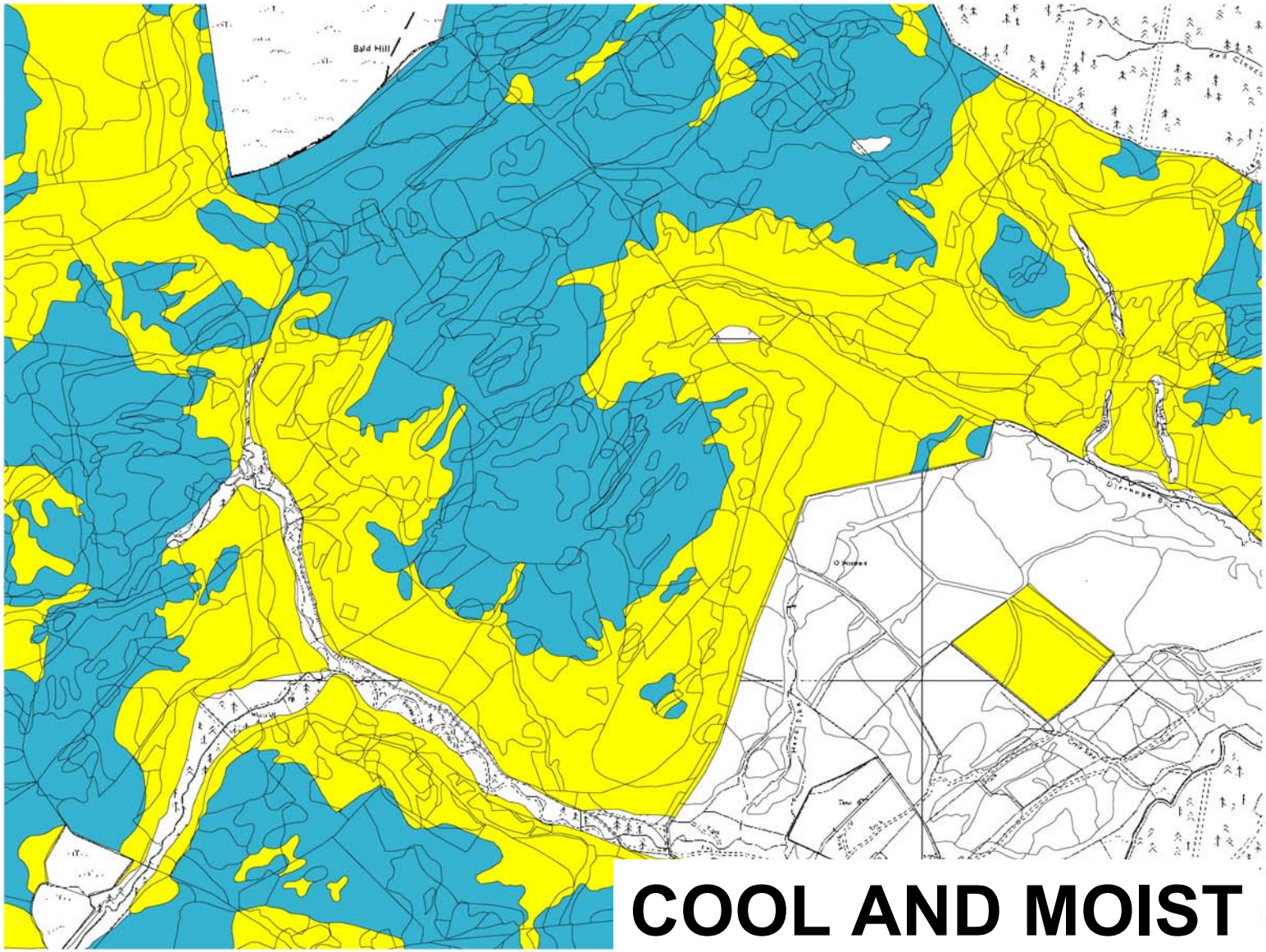


Basic Soil Map showing well and poorly drained mineral, and shallow and deep peat soils



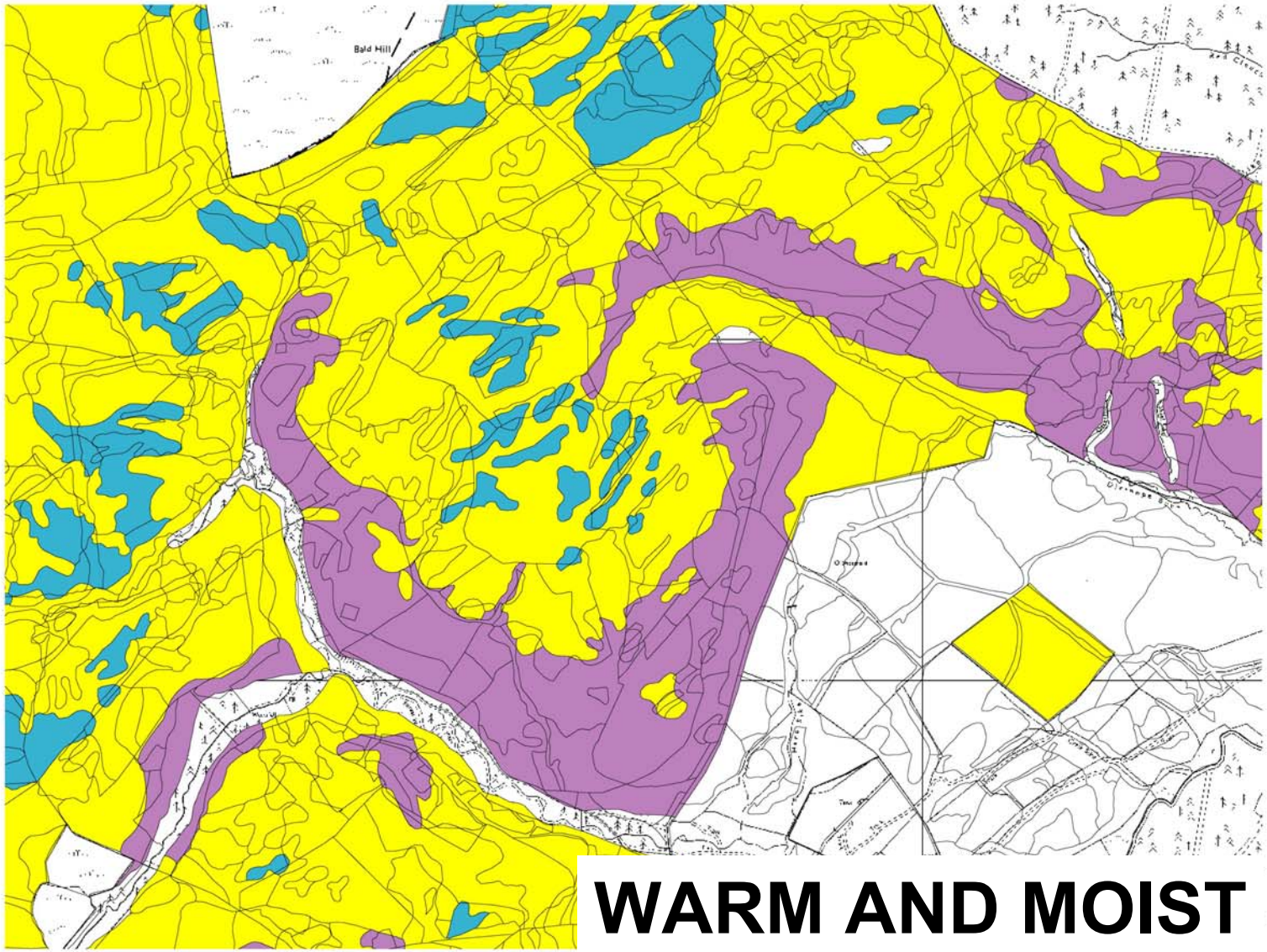
COOL AND WET

100% Low Hazard



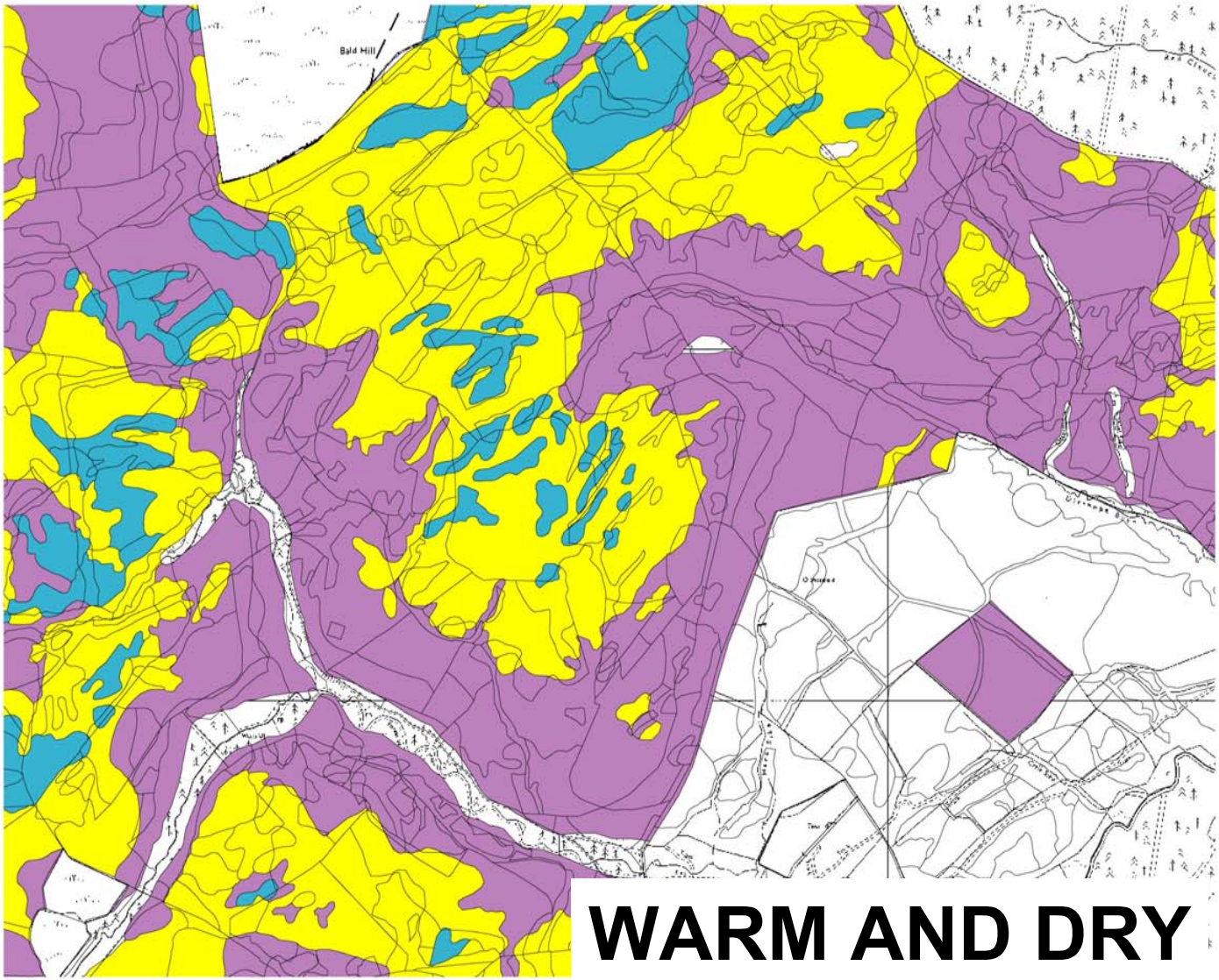
COOL AND MOIST

51% Low **49% Medium**



WARM AND MOIST

12% Low 56% Medium 32% High



WARM AND DRY

12% Low 23% Medium 65% High

When Should You Treat Stumps?

Cost-Benefit Analysis suggests treatment of stumps is:

- Not justifiable on Low Hazard sites
- Nearly always necessary on High Hazard sites
- ***Personal judgement is needed for sites of Medium Hazard***

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Medium Hazard Site

- Regular Thinning
- No Stump Treatment (High Risk Management)

Potential for High *H. annosum*

- Reduced Thinning
- Stump Treatment (Low Risk Management)

Low *H. annosum*

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Overview of Risks

Operation	Low Risk Strategies	Medium Risk Strategies	High Risk Strategies
Thinning	No Thinning	Reduce Thinning	Frequent Thinning
Stump Treatment	Treat Stumps well	Allow poor practice	No treatment
Stump removal	Remove all stumps	Remove rotted stumps	No stump removal
Species selection following *Pinus*	*Pinus, Abies grandis*, hardwoods, agriculture	*Pinus* mixed with *Picea, Larix* or *Pseudotsuga*	Pure *Picea*, *Larix, Pseudotsuga*
Species selection following *Picea*	*Pinus, Abies grandis,* hardwood	*Picea, Larix* or *Pseudotsuga*	*Tsuga heterophylla*

Still Can't Decide Whether You Have A Potential Problem?

To get a crude estimate multiply:

Hazard Rating x Risk Rating
(Low = 1; High = 3)

Scores of 6 or above justify stump treatment!

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Using this system, a manager can create a map or a data-base which contains information about the area of forest for which he has to take decisions on stump treatment.

Summary

Decisions on stump treatment can be made based on a scientific appreciation of *Heterobasidion*, using mapping routines that are already linked into the Forestry Commission management system.