SIMULATING AVIAN WEED SPREAD AND CONTROL STRATEGIES: RHAMNUS ALATERNUS ON RANGITOTO ISLAND, NZ.

David Moverley

2010 CAL-IPC SYMPOSIUM

Ventura, California

U.S.A

THE UNIVERSITY OF AUCKLAND
NEW ZEALAND
Te Whare Wānanga o Tāmaki Makaurau

Te Ngahere
Native Forest Management
Ecological Restoration • Vistor Asset Management

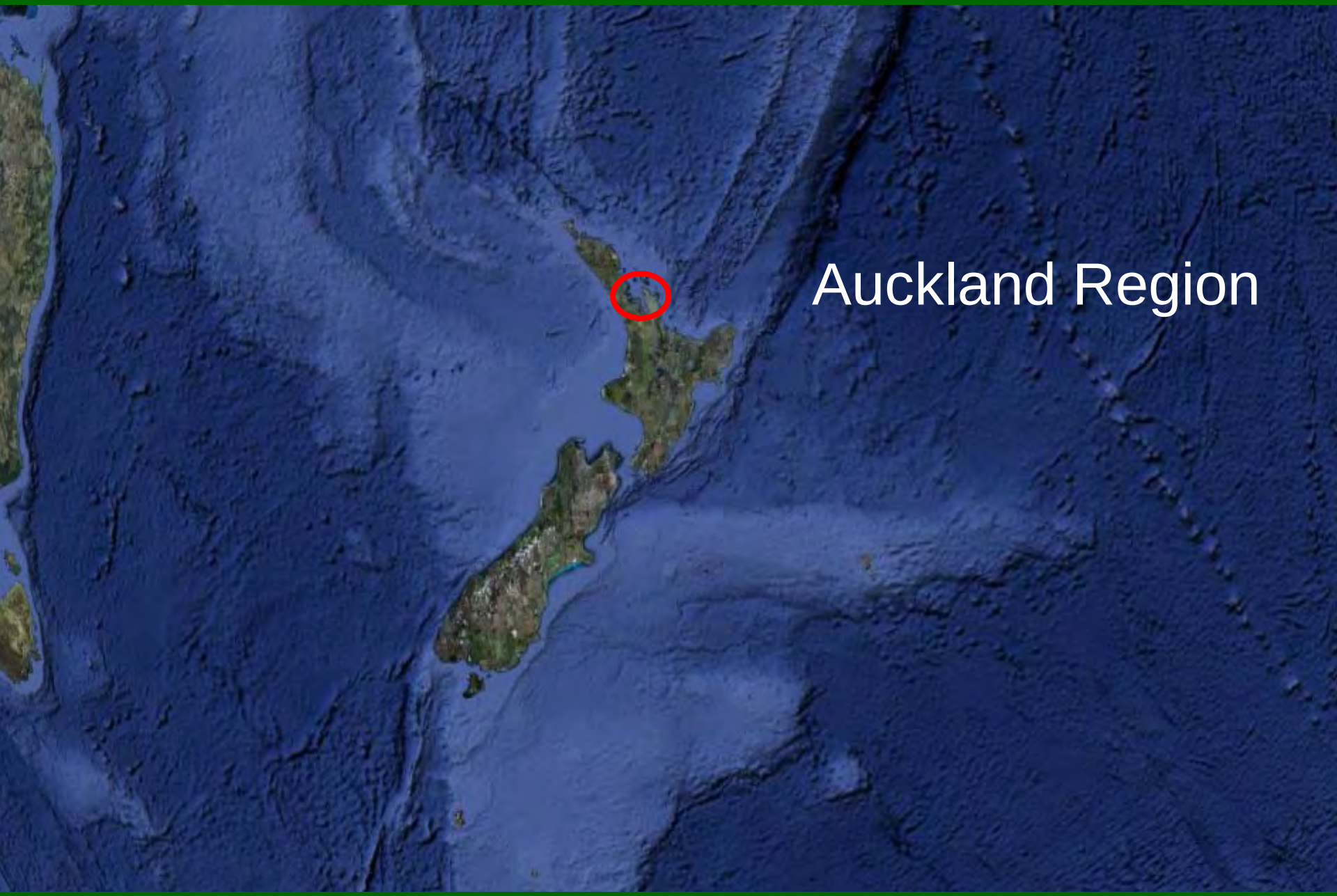
Department of Conservation
Te Papa Atawhai

A complex species-led problem within a commercial environment

Needs to offer transparency and flexibility for all parties

A need to close the “knowing-doing” gap

Needs to be simple, understandable and objective


Auckland Region


Approx. 600 years old


CONTEXTUALLY RICH RANGITOTO ISLAND
AN ISLAND OF A MILLION ISLANDS
Approx 2300 hectares (5,700 acres)

LARGE EXPANSES
OF
LAVA

IRREGULAR SHAPED
VEGETATION ISLANDS

DENSE MATURE FORESTS

DEEP CRACKS AND CREVICES

IRREGULAR SHAPED GROUND

VARYING DEGREES OF VISIBILITY

EVERGREEN BUCKTHORN AS AN INVASIVE PLANT

Medium sized evergreen tree

Imported to NZ as an ornamental plant 1880's

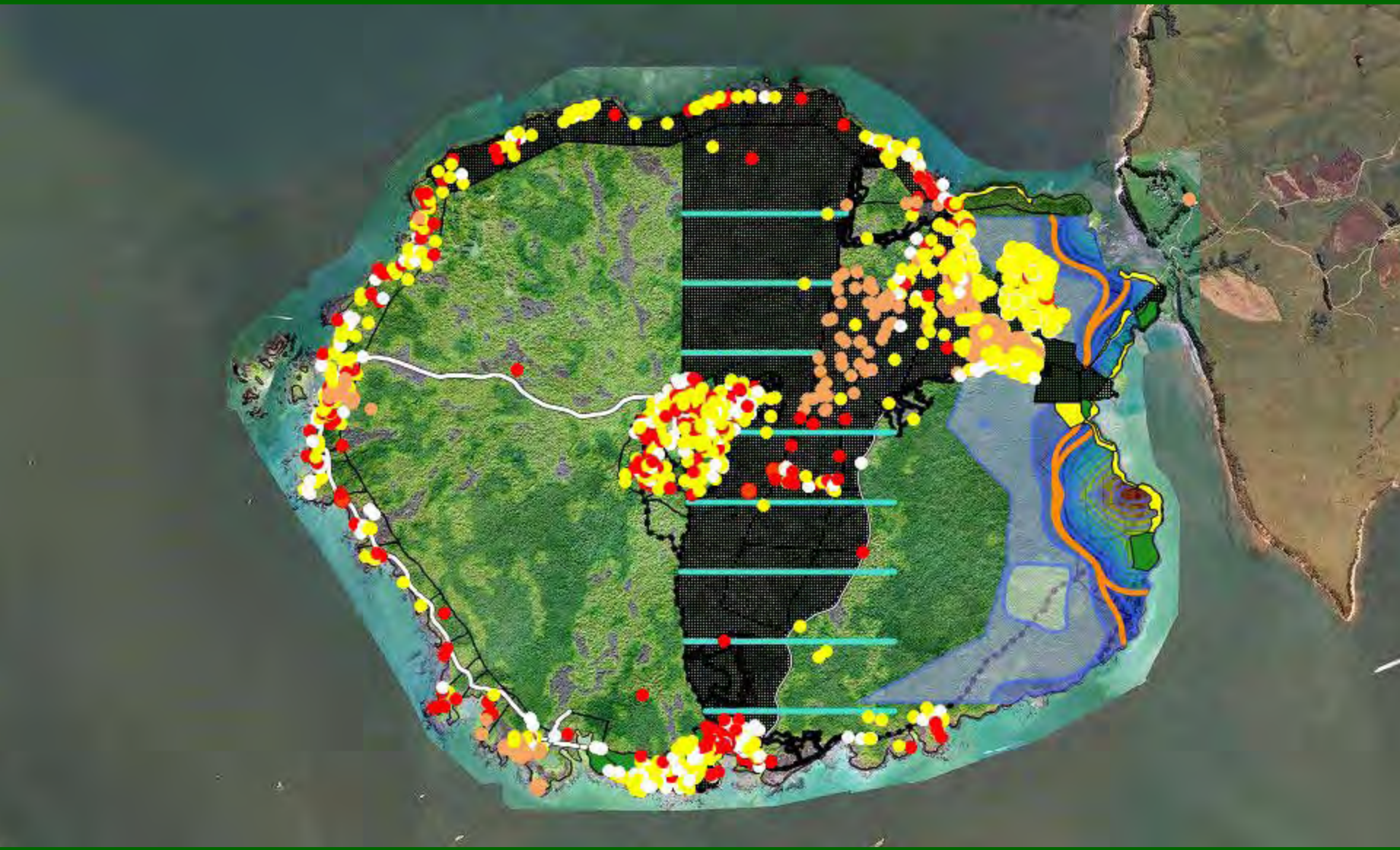
First recorded on Motutapu 1930's

dioecious

matures 3-12 years

low germination rate if uneaten

SPATIAL DATA OVERLAY



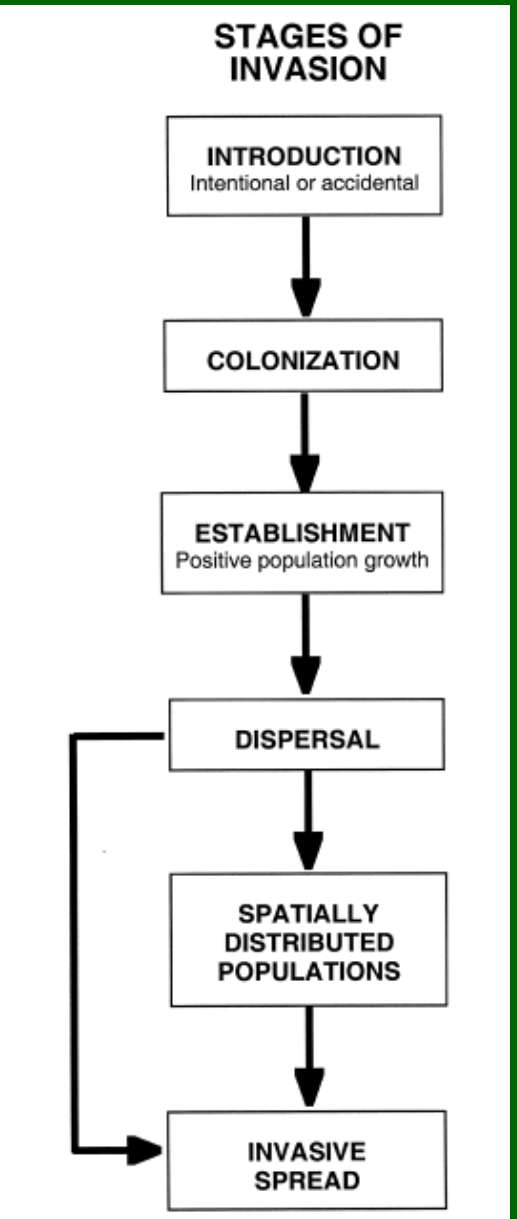
DEVELOPING A CONTEXTUAL DATA SET

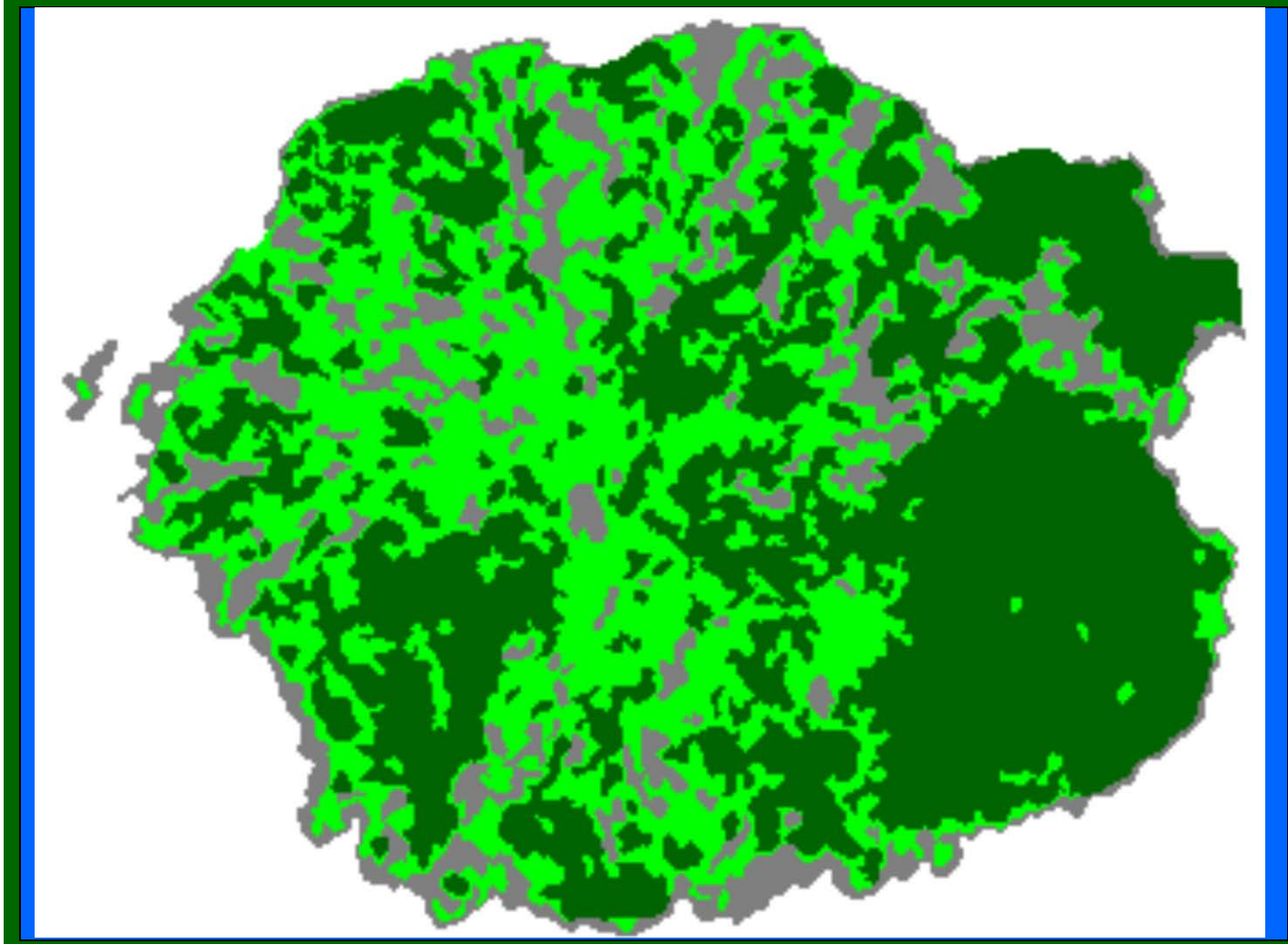

HOW CAN WE DEAL WITH SUCH A LARGE AND COMPLEX INVASION EFFICIENTLY AND EFFECTIVELY ?

“Predictions about invasions must be context-specific. The search for all-encompassing rules for invasions is therefore futile”

Higgins,S.I., and D.M. Richardson (1998). Pine invasions in the southern hemisphere: modelling interactions between organism, environment and disturbance. *Plant Ecology* 135,79-93.

EFFECTS OF SPATIAL PATTERN / LANDSCAPE STRUCTURE





With, K.A. (2002) The Landscape Ecology of Invasive Spread. *Conservation Biology.* Vol. 16,No. 5 pp.1192-1203

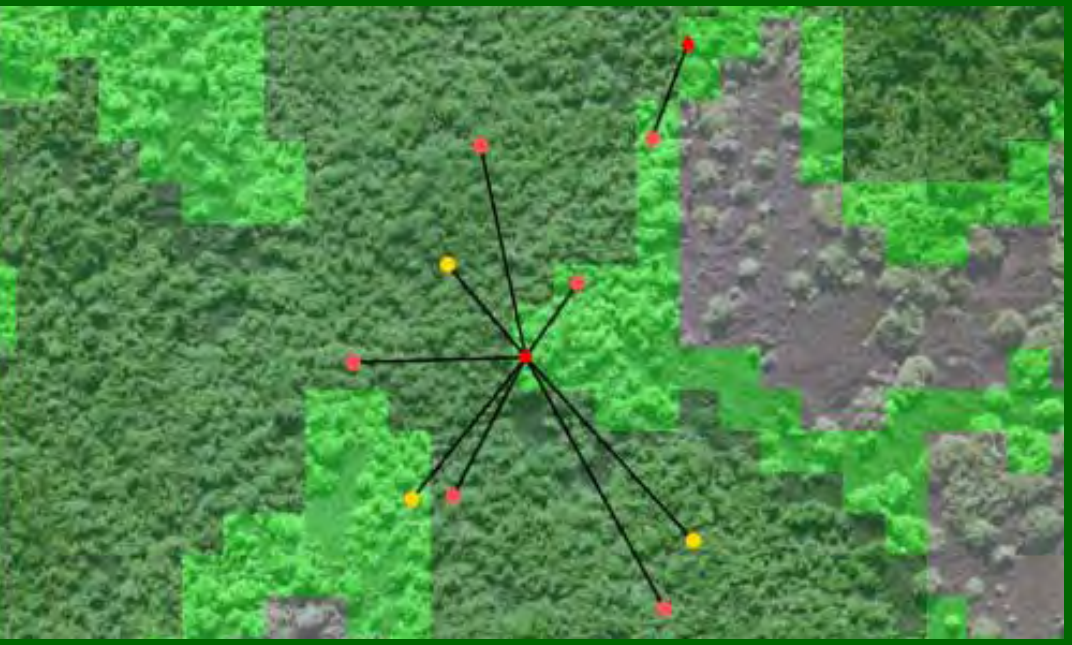
DISPERSAL KERNELS

Blackbird

(*Terdus merula*)

Silvereye, Waxeye

(*Zosterops lateralis*)



Song thrush

(*Turdus philomelos*)

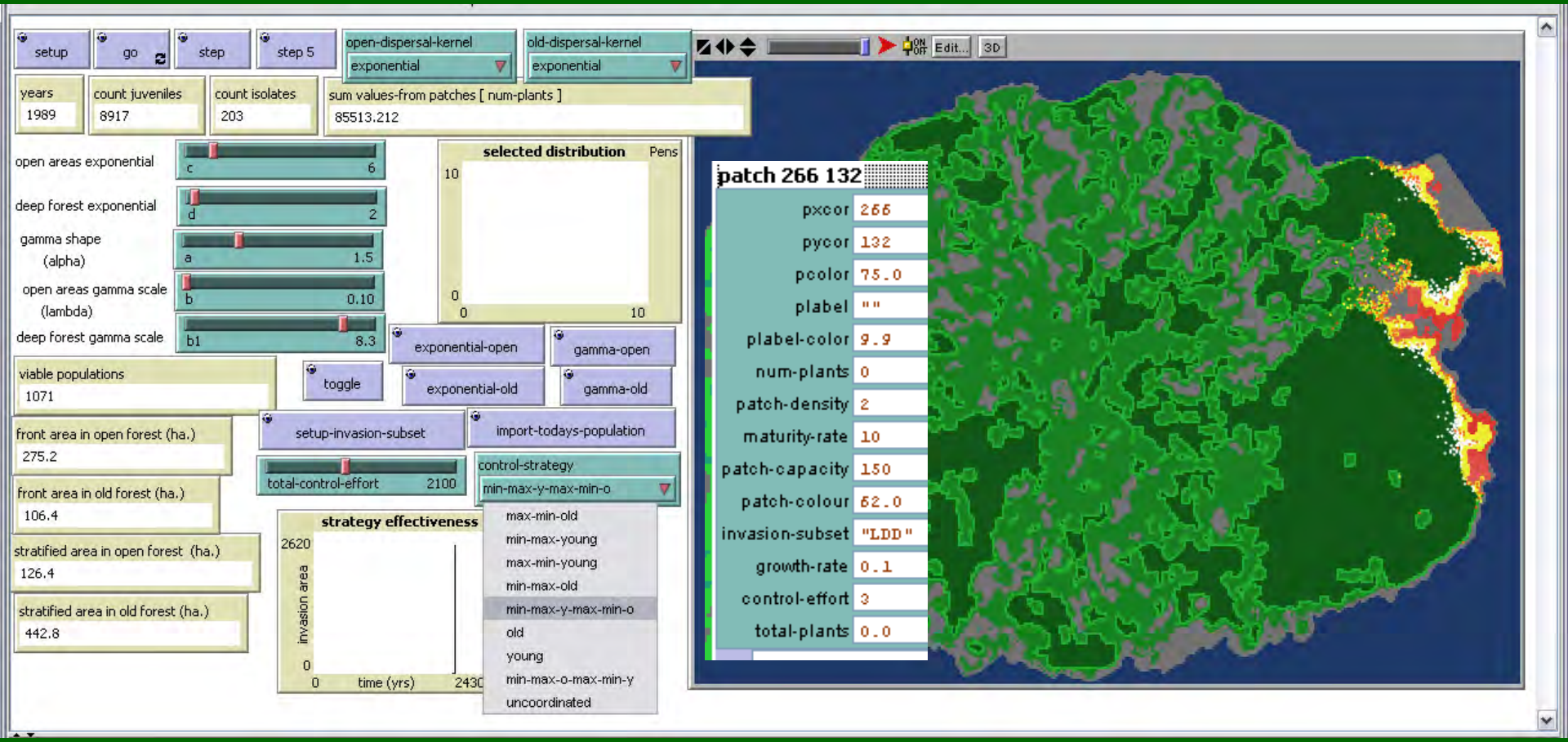
Rattus spp.

Williams,P.A. The role of blackbirds (*Turdus merula*) in weed invasion in NewZealand. *New Zealand Journal of Ecology (2006) 30(2): 285-291*

Popay (unpublished) Rhamnus and its germinatin, rhamnus and rats and birds and so on.

Internal document. Department of Conservation.

MODELING THE SPREAD

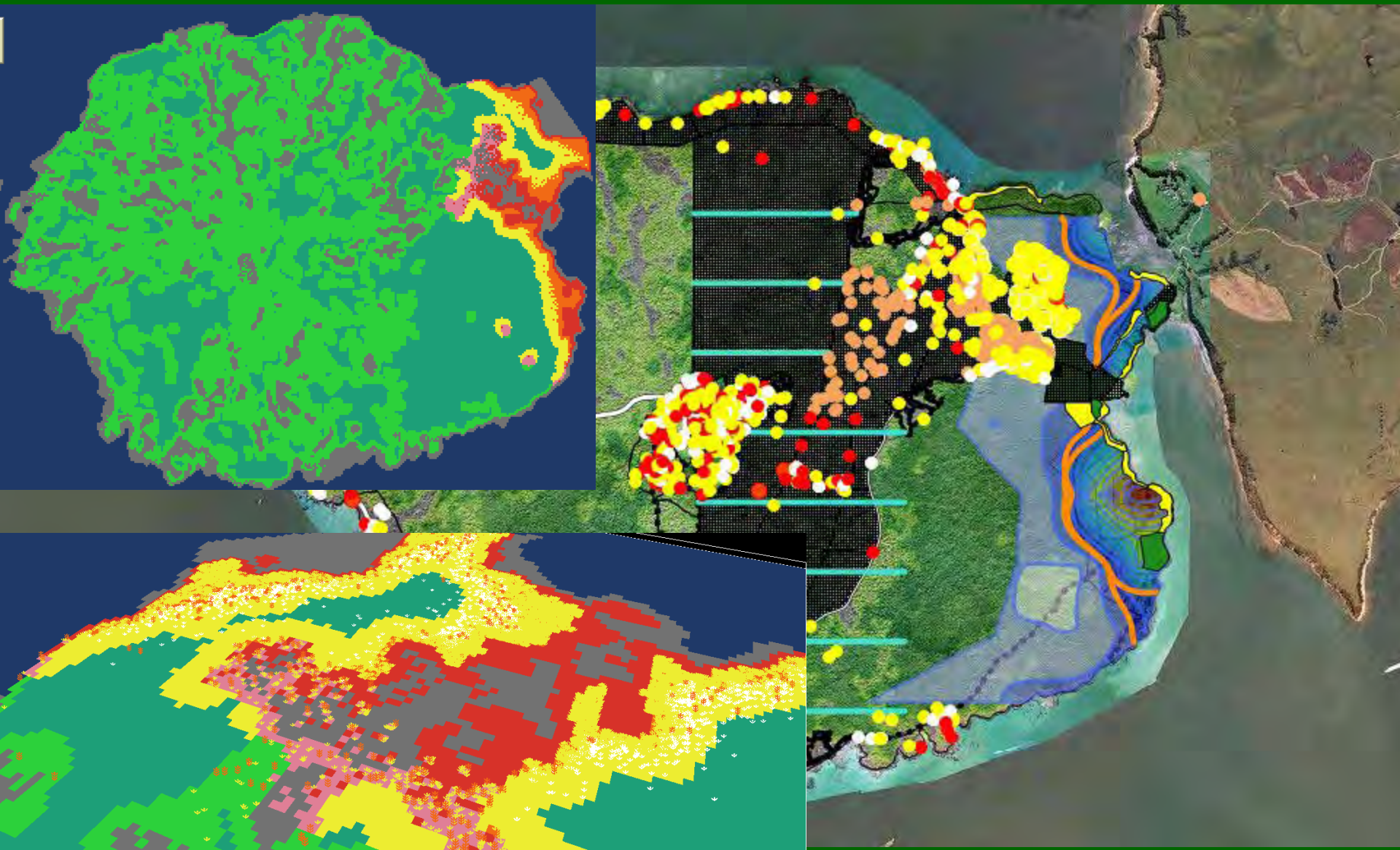


Context specific landscape, vector and plant variables provide environmental flexibility that effects invasion characteristics.

Cellular automata- pixels used for storing variables

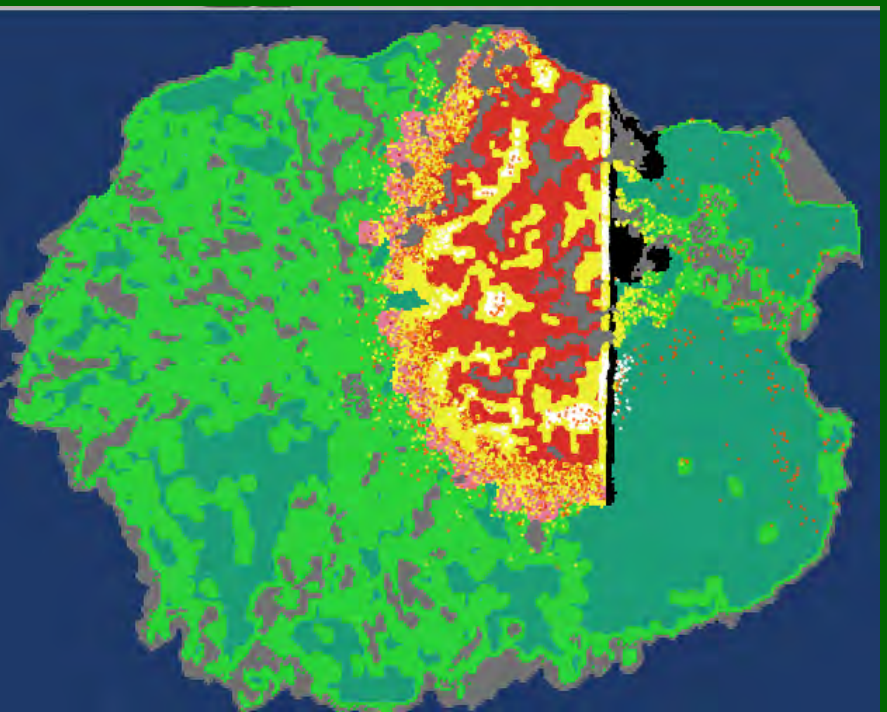
- simultaneous neighbourhood related actions

INVASION CLASSIFICATION

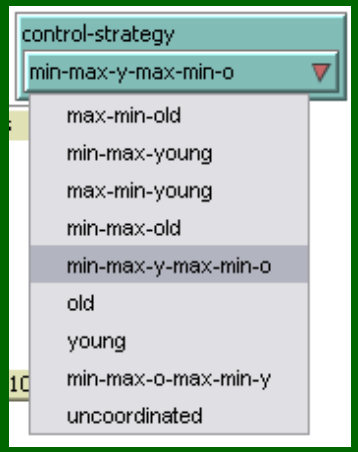


CONTROL STRATEGIES

"the art of projecting and directing the larger military movements and operations of a campaign" as opposed to "the art of handling forces in battle or in the immediate presence of the enemy"



Variations between forest type and invasion zones



Moody,M. & Mack,R. (1988) Controlling the spread of Nascent Foci.

Journal of Applied Ecology 25,1009-1021.

MEASURING CONTROL EFFORT

I=L+D+B+C

Where I=impedance

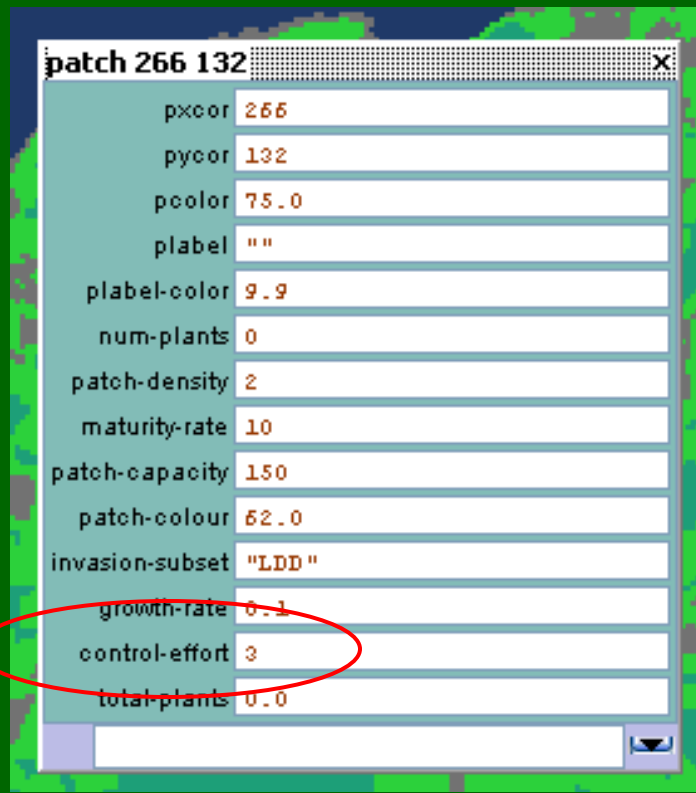
L= logistic considerations

D= weed detect ability

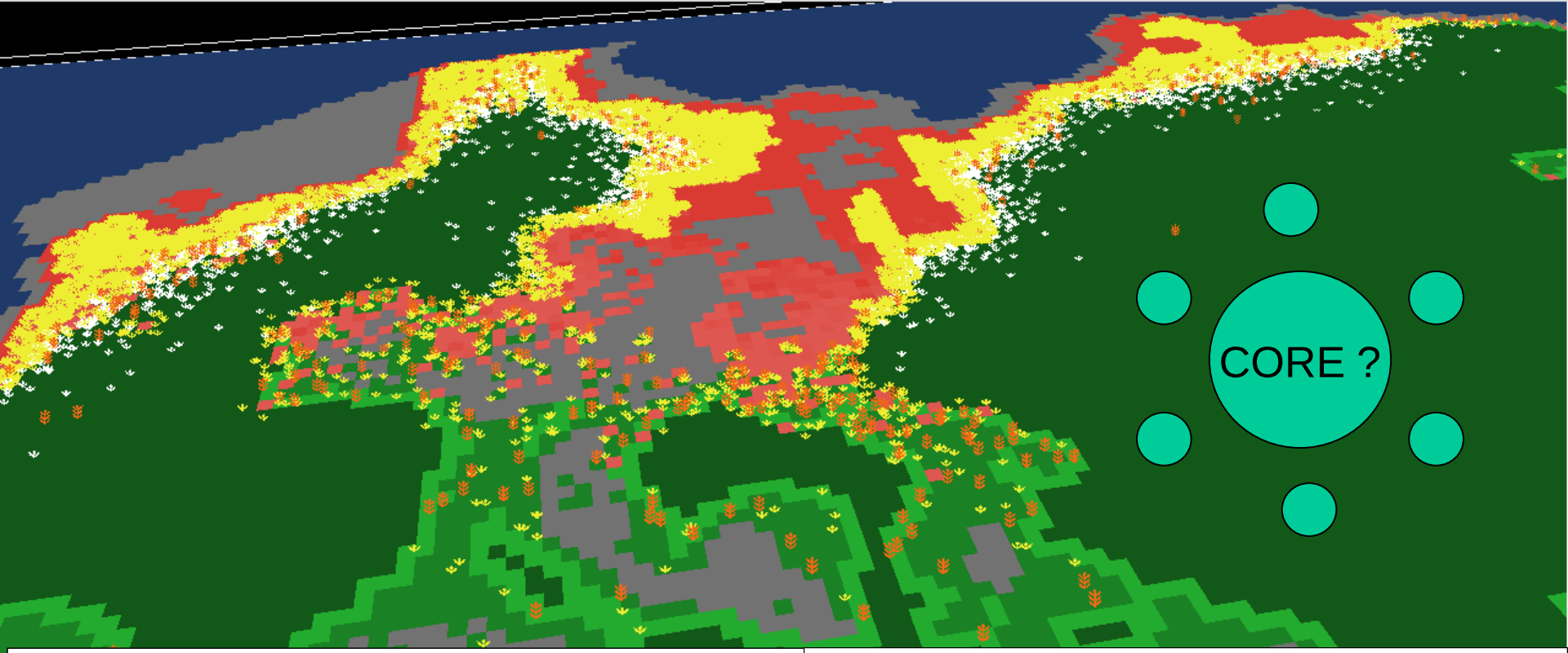
B= weed biological characteristics

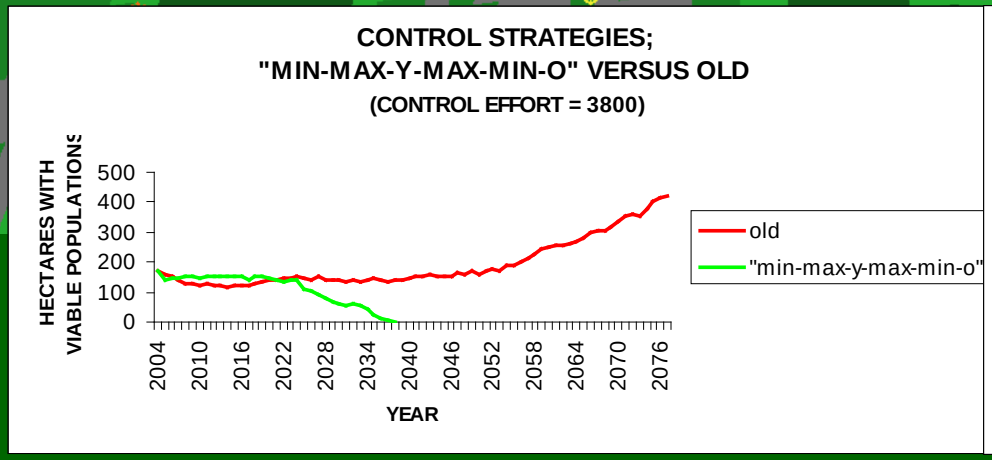
C= control effectiveness

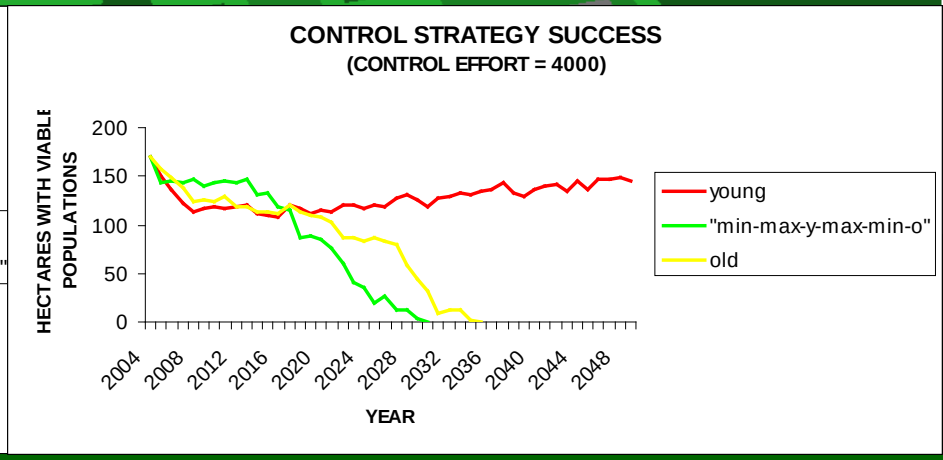
Adjusted for high incidence using operational data



Panetta, F.D.; Timmins, S.M. (2004). Evaluating the feasibility of eradication for terrestrial weed incursions. *Plant Protection Quarterly* 19(1): 5-11.

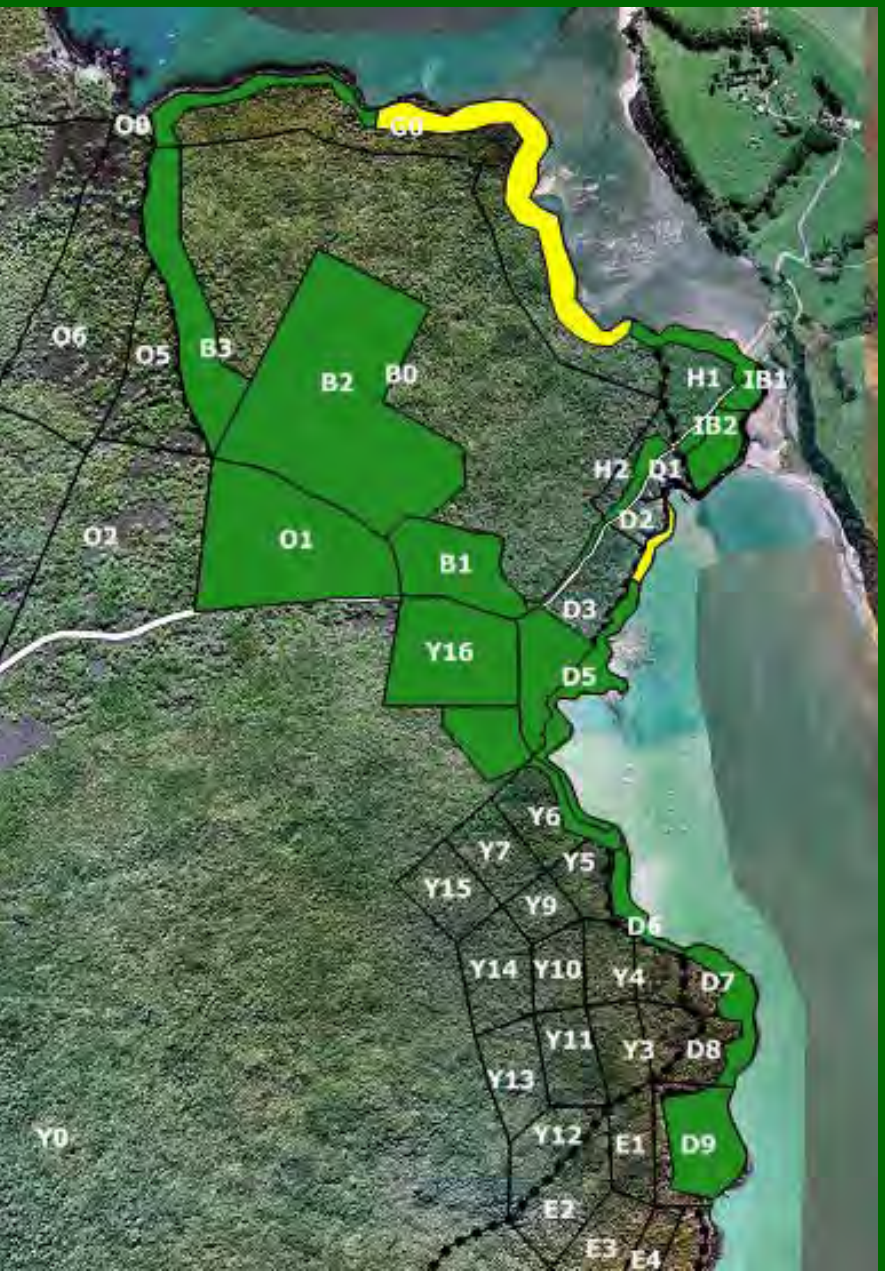






BEST MANAGEMENT SCENARIO WITH BUDGET CONSTRAINTS

IMPLEMENTATION FOCUS ONE



FOCUS ON AREAS CONDUCIVE TO:

High growth rate

High dispersal rate

Shorter maturation rate

Higher pollination rate

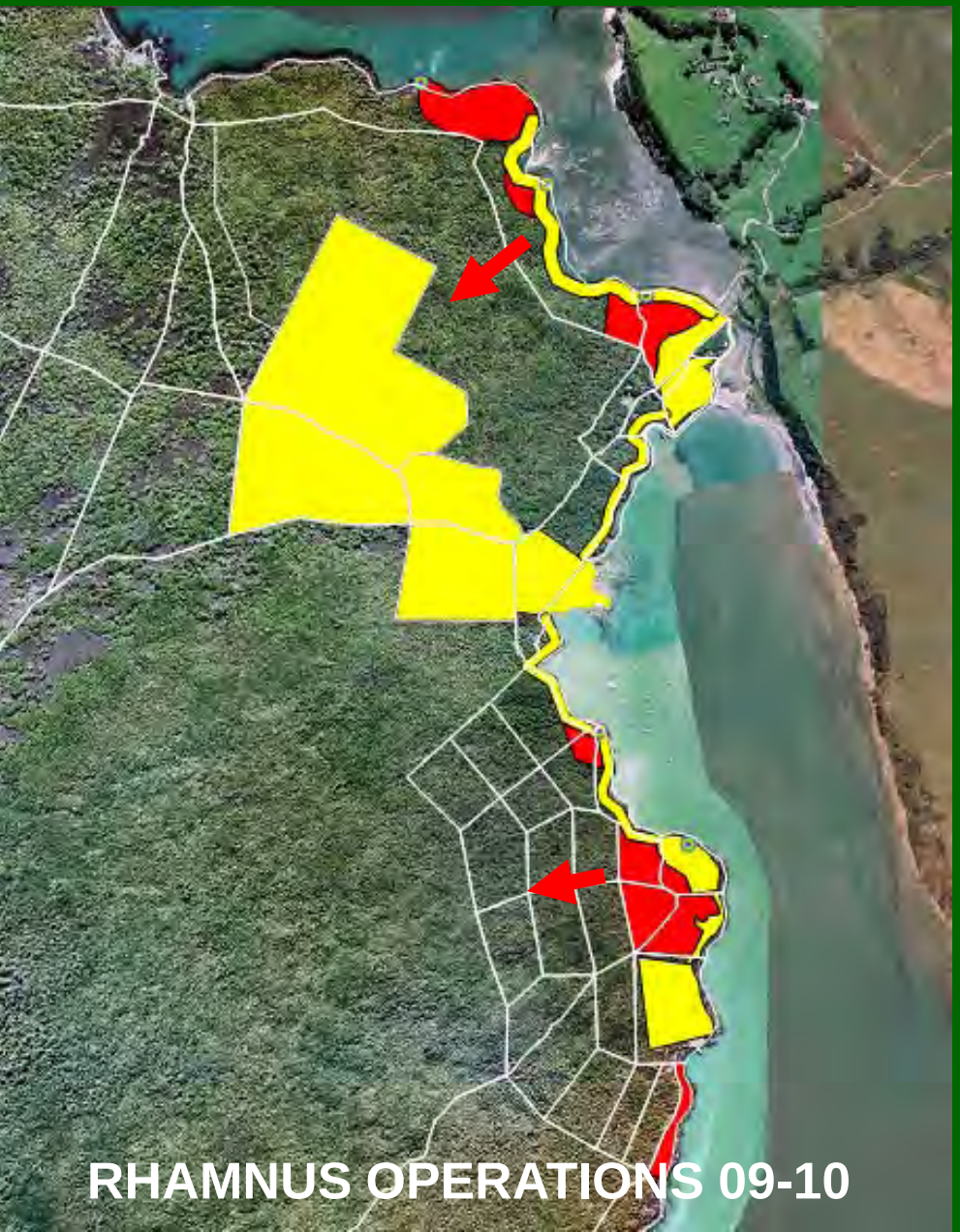
Greater habitat fragmentation

Low impedance score

AND:

Adjacent to pest free areas with these properties

IMPLEMENTATION FOCUS TWO



FOCUS ON AREAS CONDUCIVE TO:

Low growth rate

Low dispersal rate

Longer maturation rate

Lower pollination rate

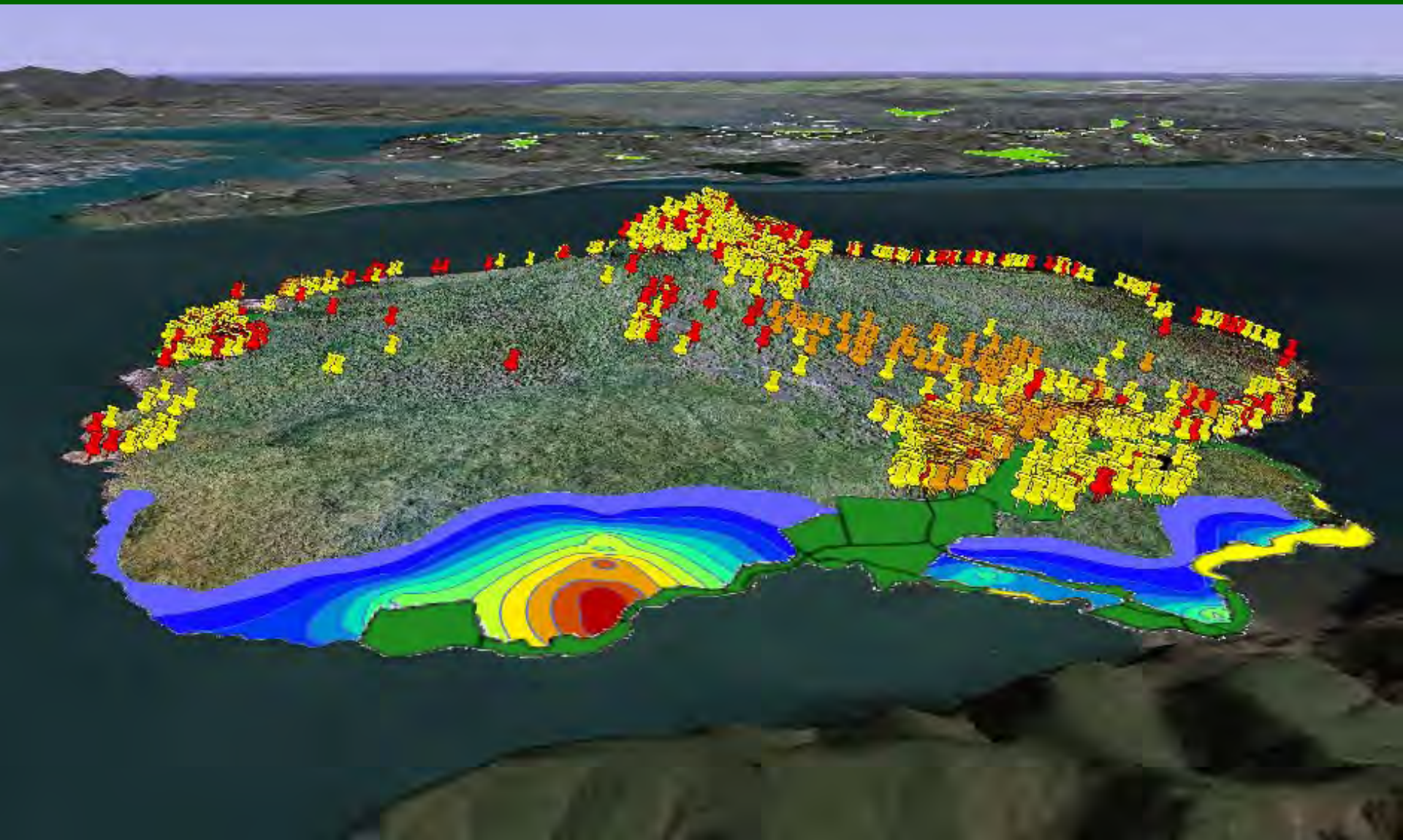
Low habitat fragmentation

High impedance score

AND:

Starting with areas adjacent to previously controlled areas during focus one

Where are we at operationally ?



Thinking about pest plants in context…

Helps determine an efficient strategy of control

(it may be different to what you would expect)

This model has provided us with guidance to a solution to a complex problem

And is assisting the efficiency and effectiveness of the control operation

A big thanks to everybody