

Pests and Climate change

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Pests and climate change

Climate is one of the major factors limiting the distribution of plants and cold-blooded animals.

Climate change is therefore expected to change the distribution of current pests, and

Climate change may make NZ more suitable to external threats

Climex



Using climate information CLIMEX enables you to assess the risk of a pest establishing in a new location and the potential success or failure of a biological control agent with no knowledge of the species, except for knowing the current locations they do occur.

CLIMEX helps you understand the impact of climate change on species distribution and the potential risk from invasive species to an agricultural region.

Ecoclimatic index (EI)

- The Ecoclimatic Index (EI) integrates the Annual Growth Index (GIA), which **describes the potential for population growth, with the annual stresses that limit survival during the unfavourable season and with any limiting factors, ie PDD, diapause.**
- As few climates are 100% suitable throughout the year, the value of GIA rarely reaches its potential, thereby limiting the maximum value of EI. The EI thus gives an overall measure of the potential of a given location to support a permanent population.
- The EI is scaled between 0 and 100, with an **EI close to 0 indicating that the location is not favourable** for the long-term survival of the species.
- An EI of more than 30 represents a very favourable climate for a species, as it means that during the (say) six months suitable for growth, the species has achieved 60% of the potential population growth. Limiting factors are daily fluctuating temperatures and the likely absence of continuous optimal rainfall values.
- Sutherst, Maywald and Skarratt 1995

Representative Pests

Pest	Sector or Impact	Pest	Sector or Impact	Pest	Sector or impact
Acantholybas brunneus		Alternanthera philoxeroides Alligator Weed	Waterways Invasive	Amorbus robustus Clown bug	
Anastrepha obliqua West Indian fruit	Hort	Asparagus aethiopicus Bushy Asparagus	Indig Invasive	Baccharis halimifolia Groundsel Bush	Agriculture
Bactrocera correcta Guava Fruit fly	Hort	Ceratitis rosa Natal fruit fly	Hort	Hypericum tetrapterum St. Peter's wort	Wetlands
Bactrocera cucumis Cucumber fruit fly	Hort	Cerotoma trifurcate Bean leaf beetle	Hort	Lantana camara	Indigenous
Bactrocera cucurbitae Melon fly	Hort	Clematis vitalba Old Man's beard	Indigenous Invasive	Latrodectus hasseltii Redback spider	
Bactrocera dorsalis Oriental fruit fly	Hort	Cortaderia selloana Pampas grass	Forestry	Lymantria dispar Gypsy moth	Forestry
Bactrocera musae Banana fly	Hort	Cytisus scoparius Broom	Forestry	Lythrum salicaria purple loosestrife	Wetlands
Bactrocera neohumeralis	Hort	Dothistroma spp Fungi	Forestry	Melaleuca quinquenervia Paper bark tree	Forestry Indigenous

Representative pests ...

Bactrocera tryoni Queensland Fruit Fly	Hort	Essigella californica Monterey pine aphid	Forestry	Nassella neesiana Chilean needle grass	Agriculture
Bactrocera zonata Peach fruit fly	Hort	Fusarium circinatum Pitch Canker	Forestry	Passiflora tripartite Banana passionfruit	Forestry Indigenous
Buddleja davidii Butterfly bush	Forestry Indigenous	Gymnocoronis spilanthoides Senegal tea plant	Wetlands	Pennisetum clandestinum kikuyu grass	Agriculture
Rhagoletis indifferens Western Cherry fruit fly	Fruit Fly	Sirex noctilio Sirex Woodwasp	Forestry	Solenopsis Invicta Red Imported Fire Ant	
Thaumastocoris peregrinus Bronze bug	Forestry (Eucalypts)	Thaumetopoea pityocampa Pine processionary moth	Forestry	Thrips palmi Melon thrips	Hort
Uraba ludens Gum leaf skeletoniser (moth)	Forestry (Eucalypts)				

Analyses

Niwa supplied climate data, from **6 regional climate models** at **4 different levels of CO₂** (RCP - Representative concentration pathways)

Data is on a 5km grid (0.05 degrees)

Two analyses

1) Each species is modelled at 5 yrs intervals (2015 – 2120), for each RCM and RCP, capturing the inter-annual variation in potential distribution. ($40 * 20 * 6 * 4 = 19,200$ data sets)

2) 20 year normal data centred on 2005, 2050, 2090, for each species, RCM and RCP.

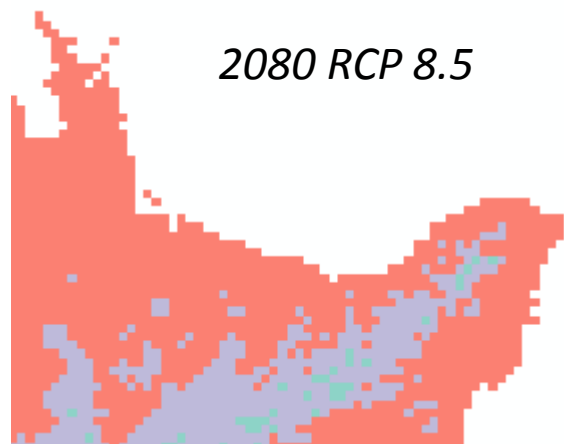
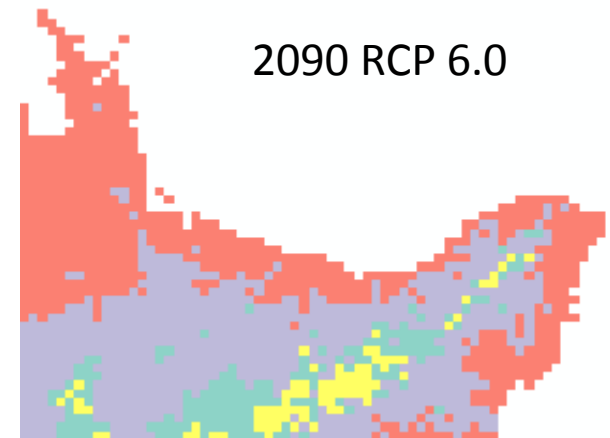
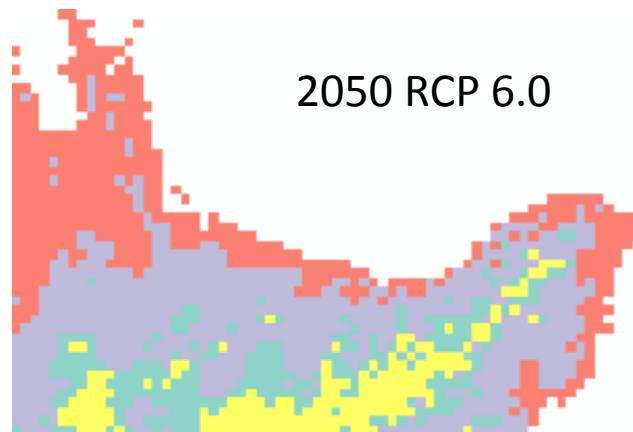
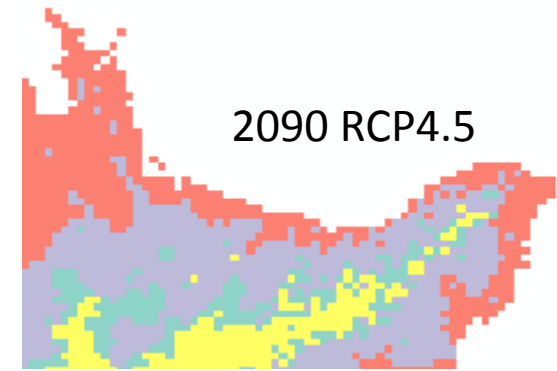
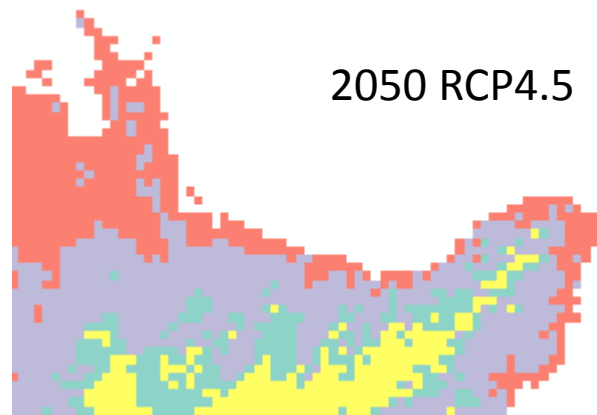
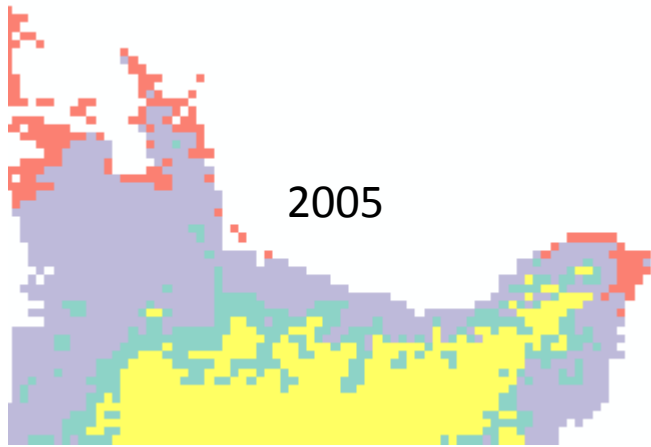
This data was reduced by using the maximum EI for each cell from each RCM.

Alligator Weed

- One of the greatest threats to rivers, wetlands and irrigation systems in the world.
- extremely difficult to control, is able to reproduce from plant fragments and grows in a wide range of climates and habitats, including terrestrial areas.
- In aquatic habitats alligator weed has deleterious effects on other plants and animals, water quality, aesthetics, vector populations, water flow, flooding and sedimentation.
- In terrestrial situations, it degrades pasture, turf and crop production producing massive underground lignified root system penetrating up to 50-60 cm deep.



Alligator Weed



Pitch canker

A highly virulent pathogen damaging pines, causing damping-off in nurseries and pitch canker in forests.

Considered the most important pathogen affecting *Pinus* seedlings and trees globally.

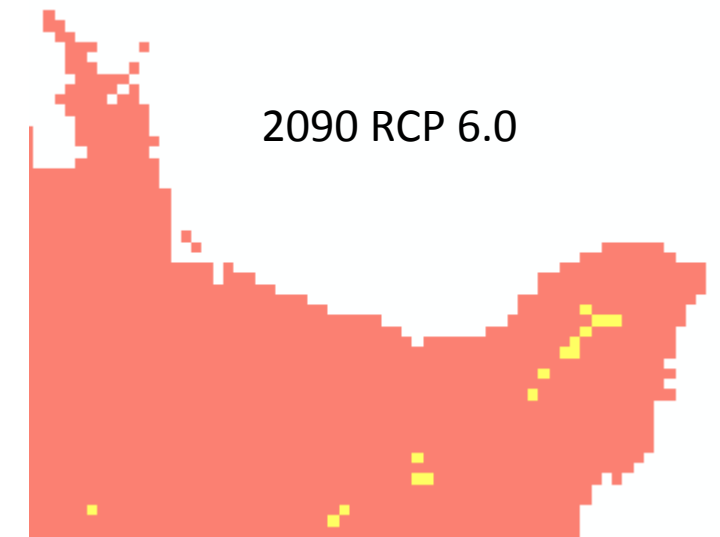
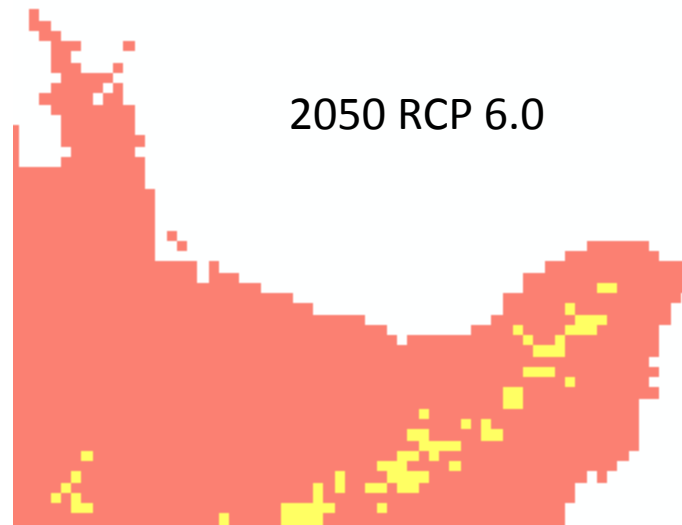
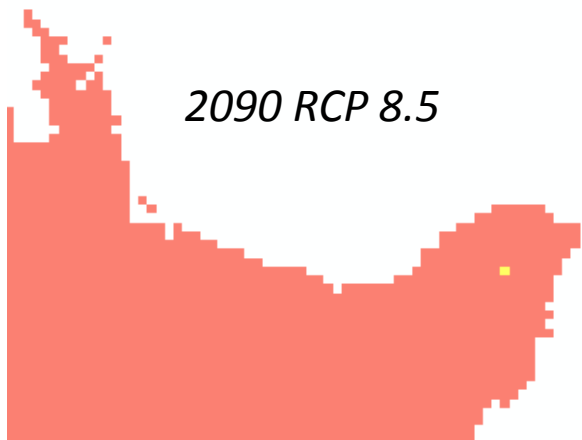
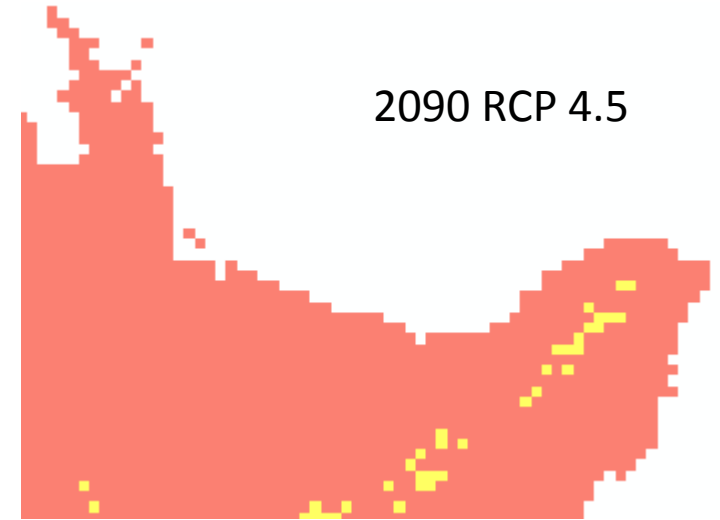
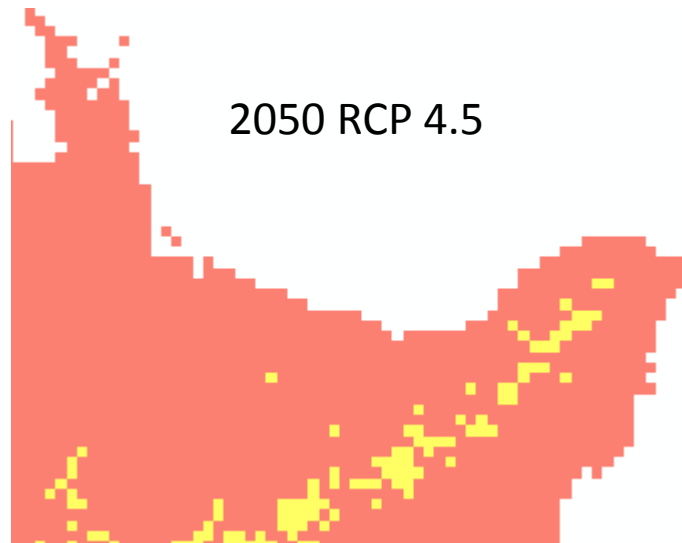
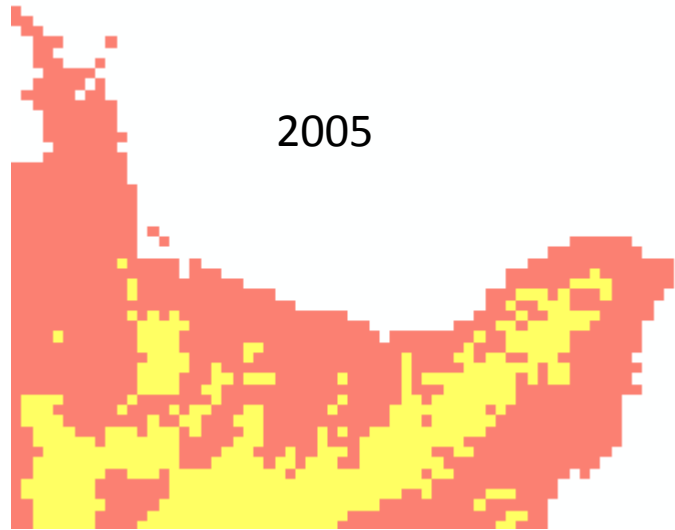
Asymptomatic seedlings may be planted out, resulting in very serious losses in forests.

It requires a moist substrate for infection

It is spread by insects or water splash, or by the wind infecting wounded trees (insect attack, strong winds or pruning)



Pitch Canker



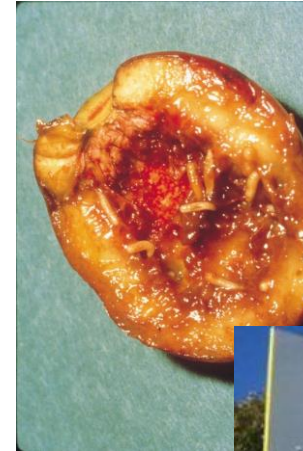
Bactrocera Tryoni – Queensland Fruit Fly

Queensland fruit fly is one of the most damaging fruit fly pests

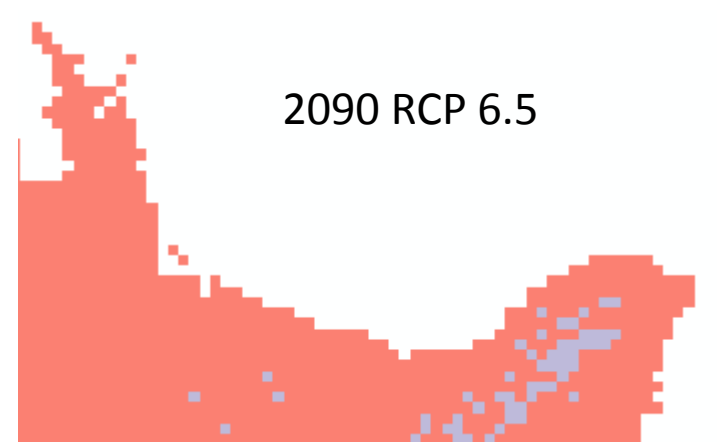
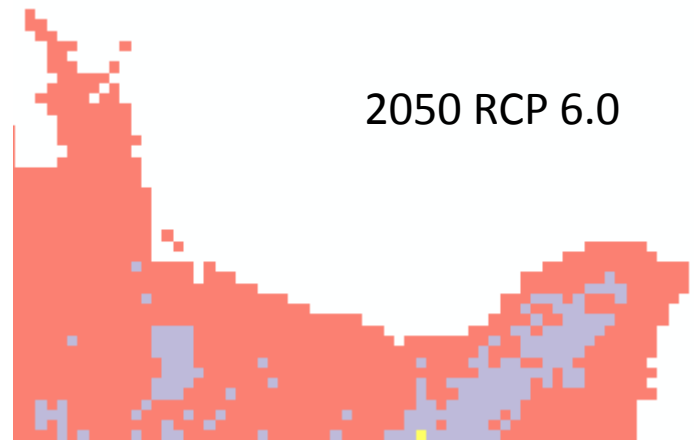
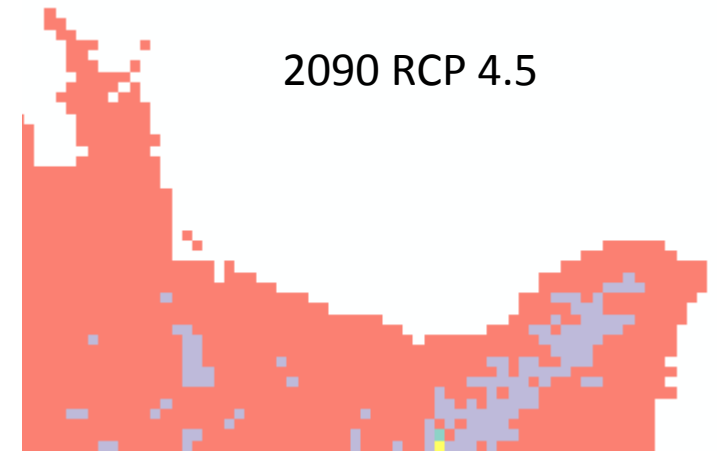
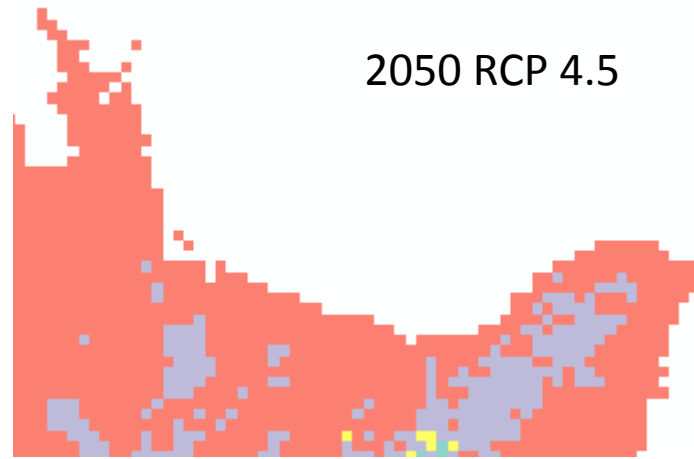
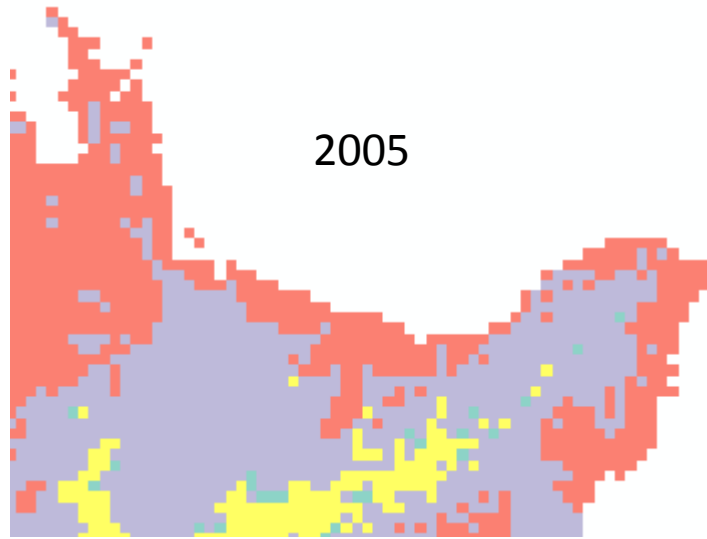
It infests more than 100 species of fruit and vegetables.

Hosts include commercial crops such as avocado, citrus, feijoa, grape, peppers, persimmon, pipfruit, and summerfruit.

If this fly were to establish in New Zealand, it would have serious consequences for New Zealand's horticultural industry.



Queensland Fruit Fly



Contact

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