Manaaki Whenua
Landcare Research

Overview of Invasive species Management

What is an invasive alien species?

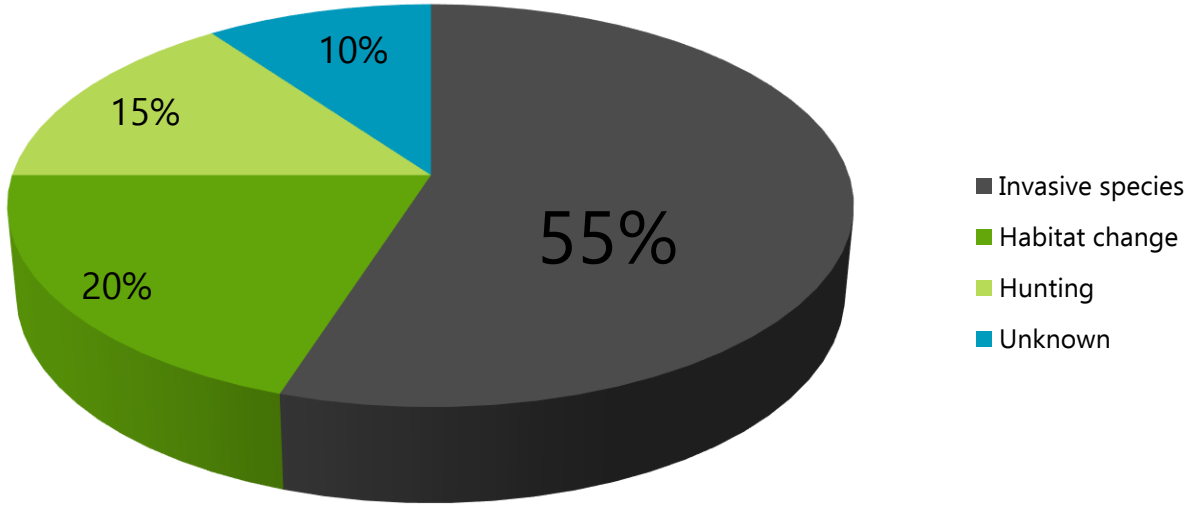
A non-native species
that harms (or is likely to harm):

- the environment,
- the economy,
- people's health, and/or
- people's their way of life.

Impacts of IAS on biodiversity

- Declines in species populations
- Local extirpations
- Extinctions
- Changes to ecosystem functioning

Impacts of IAS on bird species



Causes of recent bird extinctions on Islands (source: Bird Life International)

Impacts of IAS on economies

- Losses to production systems (agriculture, forestry, fisheries)
- Damage to infrastructure
- Damage to trade
- Management costs

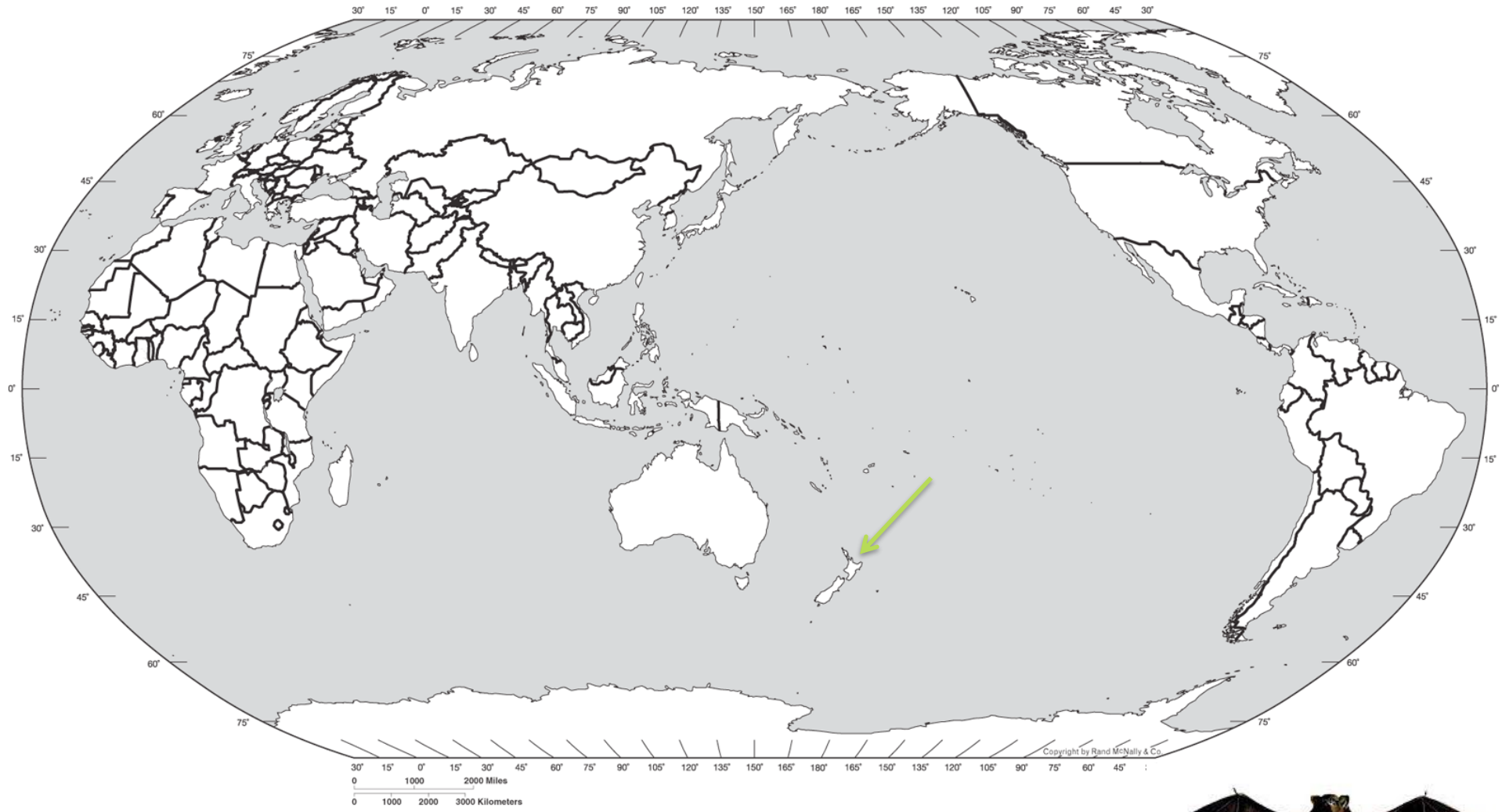
Impacts of IAS on people's health and way of life

- Increased incidence of injury/disease
- Decreased access to food
- Changes to cultural practices (religious, recreational, cropping)
- Decreased/loss of access to natural resources
- Increased hardship especially to rural communities

Economic Impacts of IAS

- Global: $1.4 trillion US per year
- USA: $120 billion/yr
- UK, Aus, S. Africa, India & Brazil: $48 billion/yr
- SE Asia: $33.5 billion/yr
- Canada: $12-31 billion/yr
- Great Britain: $2.5 billion/yr
- New Zealand: $3+ billion US per year (2.3% of GDP)

New Zealand: Biodiversity



New Zealand: Biodiversity

- Highest rate of endemism in the world

- 80% of all vascular plants
- 70% of all native terrestrial & freshwater birds
- All bats
- All native amphibians
- All reptiles
- 90% of freshwater fish

New Zealand: Biodiversity

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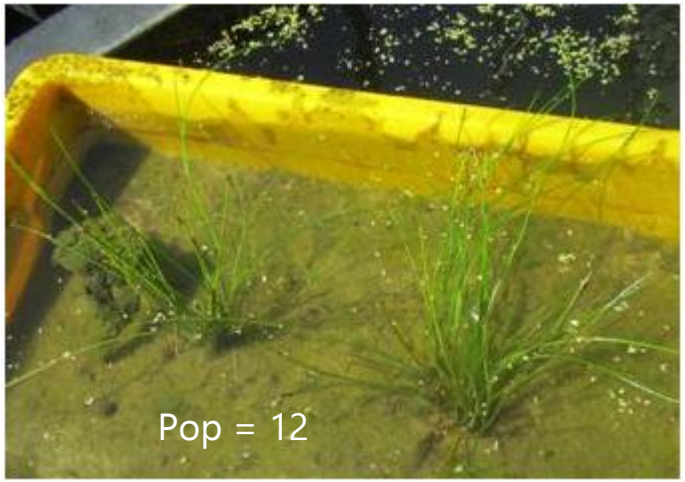


New Zealand: Biodiversity

Chatham Island Black Robin

- Population of birds in 1980:
- Population of females in 1980:
- Population of birds in 2018:

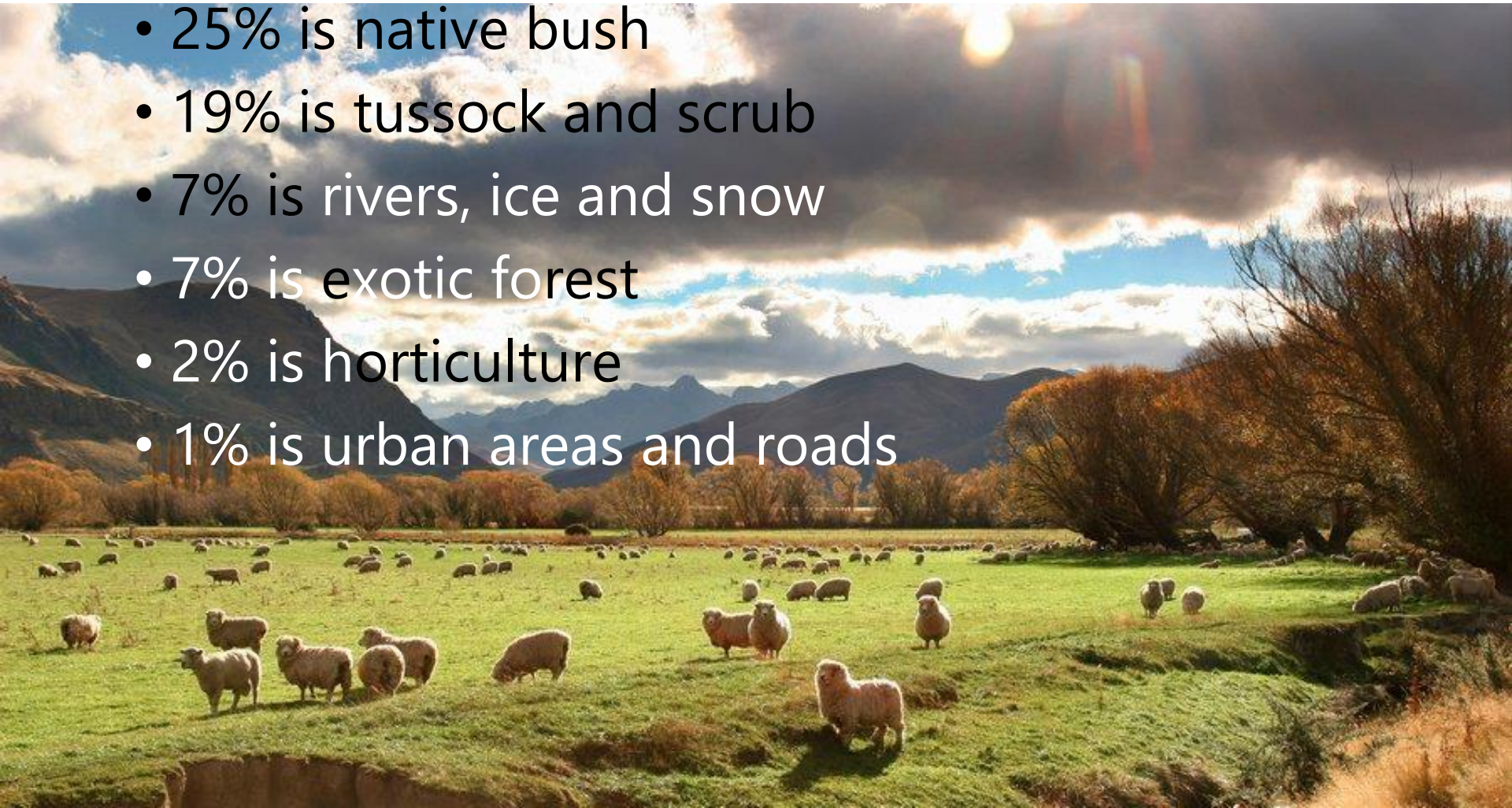
New Zealand: Biodiversity

Pennantia baylisiana

- Discovered on one offshore island in 1945
- Known wild population:
- Cutting taken to Manaaki Whenua grounds and grown into a tree
- 40 years later, hormones applied to young flowers, and the tree fruited
- 140 trees recently planted on the mainland

New Zealand: Primary industry

- 39% of the country is covered in grass
- 25% is native bush
- 19% is tussock and scrub
- 7% is rivers, ice and snow
- 7% is exotic forest
- 2% is horticulture
- 1% is urban areas and roads



New Zealand: Primary industry

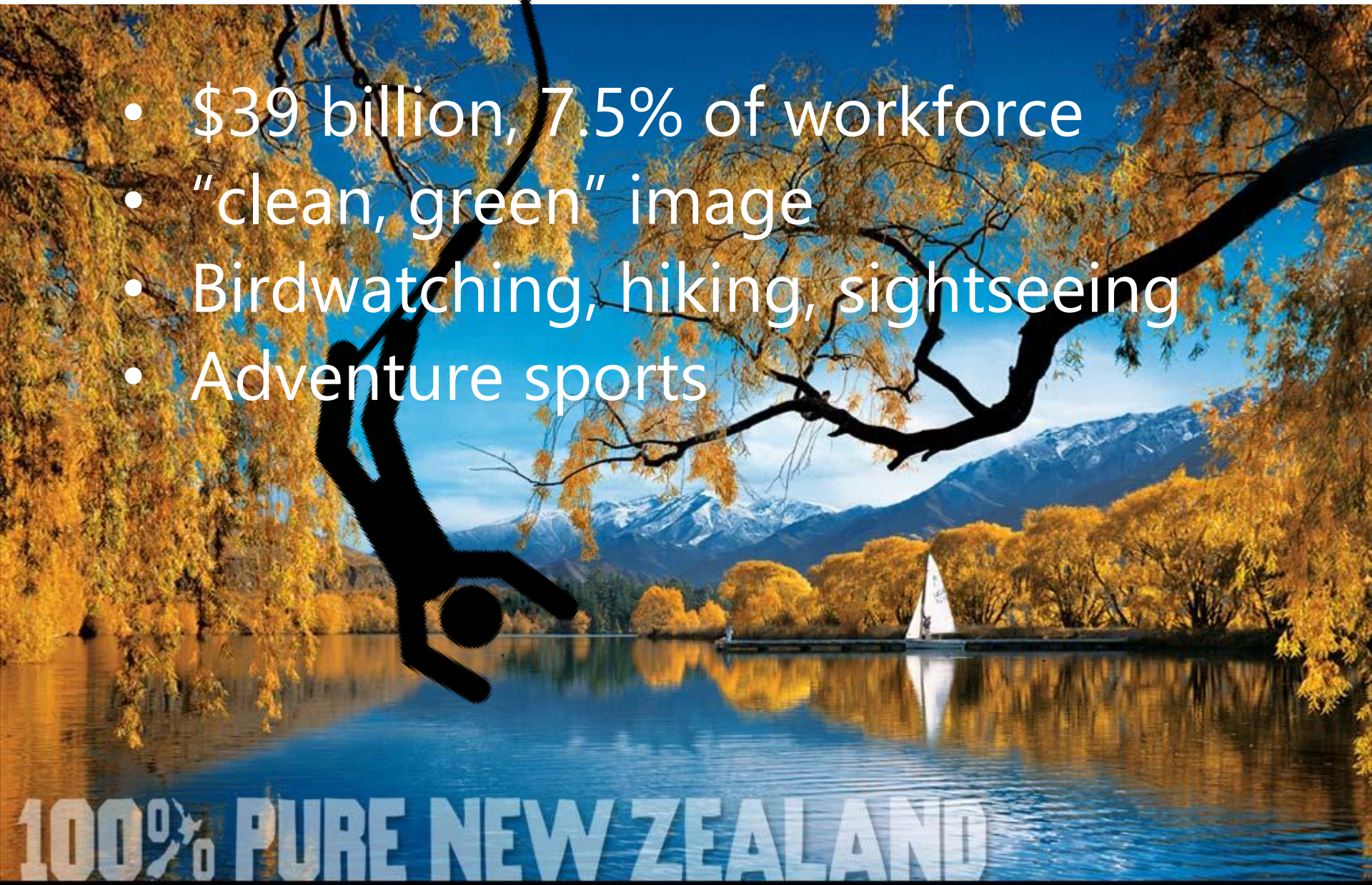
- 5% of GDP
- 15% of the workforce
- 50% of exports

New Zealand: Tourism

- 6% of international visitors (150,000 people) cited The Lord of the Rings as one of the main reasons that they visited New Zealand in 2004
- 1% cited the film as their only reason
- This 1% spent $32.8 million

New Zealand: Tourism

New Zealand: Tourism



- $39 billion, 7.5% of workforce
- "clean, green" image
- Birdwatching, hiking, sightseeing
- Adventure sports

New Zealand

For all of these reasons…

IAS are a major threat to New Zealand

Costs/Impacts: Weeds

- 25,000 exotic plants
- 2500 are naturalised
- 300 are of conservation concern
- Pastoral weeds are conservatively estimated to cost the economy $1.2 billion per year in lost animal production and control costs
- Weeds pose a threat to 1/3 of nationally threatened plant species
- Could potentially degrade 7% of the conservation estate in next 10 years

Costs/Impacts: Invertebrates

- Direct economic cost of invertebrate pests to the primary sector is $1-$3.3 billion per year
- Annual production losses to aquaculture from a single species of sea squirt were estimated to be $15 million per year in 2005

Costs/Impacts: vertebrate pests

- 32 mammals and 35 birds have become established since human arrival
- Vertebrate fauna has been nearly halved
  - 1 bat
  - 3 frogs
  - 3 lizards
  - 1 freshwater fish
  - 4 plant species
  - 51+ birds
- 3 bird extinctions since 1960s
- Uncounted losses of populations and species of invertebrates

Costs/Impacts: vertebrate pests

What should be done?

Prevention

Pre-border	At the border	Post-border
Permits/certification (Risk assessments)	Permits/certification (Risk assessments)	Preparedness (Risk assessments)
Inspection (e.g. visual)	Inspections (e.g. profiling, visual, X-ray machines, dogs)	Surveillance/Detection
Intervention (e.g. fumigation, cleaning, invasive-proof packaging, etc.)	Interventions (e.g. seizing and disposal, cleaning, fumigation, fines)	Response (i.e. immediate eradication, if feasible)
Pre-quarantine for live plants and animals	Post-quarantine for live plants and animals	Monitoring
Audit	Audit	Audit

Eradication

- Removing every individual of an invasive species population
  (continent, country or island level)
- Permanent solution, permanent benefits
- One-off cost for operation(s)
- Requires on-going biosecurity (and associated costs)

Control

- Keeping the invasive species population to a prescribed level
- On-going solution, benefits will last as long as control is maintained
- Control can be targeted to get maximum benefit from specific timing (pulsing)
- On-going costs, forever

Interventions & investments

- “Border Patrol” is currently in it’s 15th season
- Usually has 500,000+ viewers

- https://www.youtube.com/watch?v=Py2JASaRtpM

Interventions & investments

- $500 million spent annually on biosecurity
  - 65% response
  - 13% prevention
  - 11% surveillance
  - 5% research
- Bertram (1999): *NZ's experience on border controls and quarantine systems are akin to payment of insurance premiums for catastrophic events*

BIOSECURITY NEW ZEALAND

Interventions & investments

- In 2014, New Zealand faced a 1-in-15 year beech mast, expected to drop around a million tonnes of seed
- This triggered a plague of an additional 30 million rats and tens of thousands of stoats, which threatened to annihilate endangered bird populations
- Department of Conservation spent $21 million toward this programme alone

Interventions & investments

- Public education campaigns to prevent spread of aquatic weeds
- Bans on felt-soled waders

CHECK CLEAN DRY

BETWEEN WATERWAYS

Interventions & investments

- Predator-free islands
  - 11,200 hectare Campbell Island
- Inland “island” preserves
  - 47 km of predator-proof fencing
  - 3400 hectares

Interventions & investments

- Deer introduced for sport in the mid 19th century
- The environment proved ideal and wild populations grew uncontrolled, becoming a pest by 1950
- Export of venison from wild deer started in the 1960s, turning this pest into an export earner
- In the 1970s, DOC caught live deer from the wild to begin farms
- A new industry was born
- Today, 1.1 million farmed deer

Interventions & investments

- NZ is world's largest user of sodium fluroacetate (1080)
- NZ pioneered helicopter hunting of ungulates
- NZ developed traps used worldwide
- NZ has developed traps that achieve same effectiveness as 1080

Interventions & investments

https://youtu.be/vUhSVViFSEc

Decision Maker

What species should they target?
What tools should they use?
Pre-border or post-border?
Control or eradication?