

# A Prototype Nutrient Trading System for Lake Rotorua

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– with much help

# What is the problem?

- Declining water quality since 1960s.
- Frequent hazardous algal blooms in summer
- Cause is excessive nutrients in the lake
- Easiest control options have already been taken
- Future reductions in nutrients need to come from land use

## **Funders**

Foundation for Research Science and Technology

Environment Bay of Plenty

Ministry of Agriculture and Forestry

Ministry for the Environment

## **Collaborators**

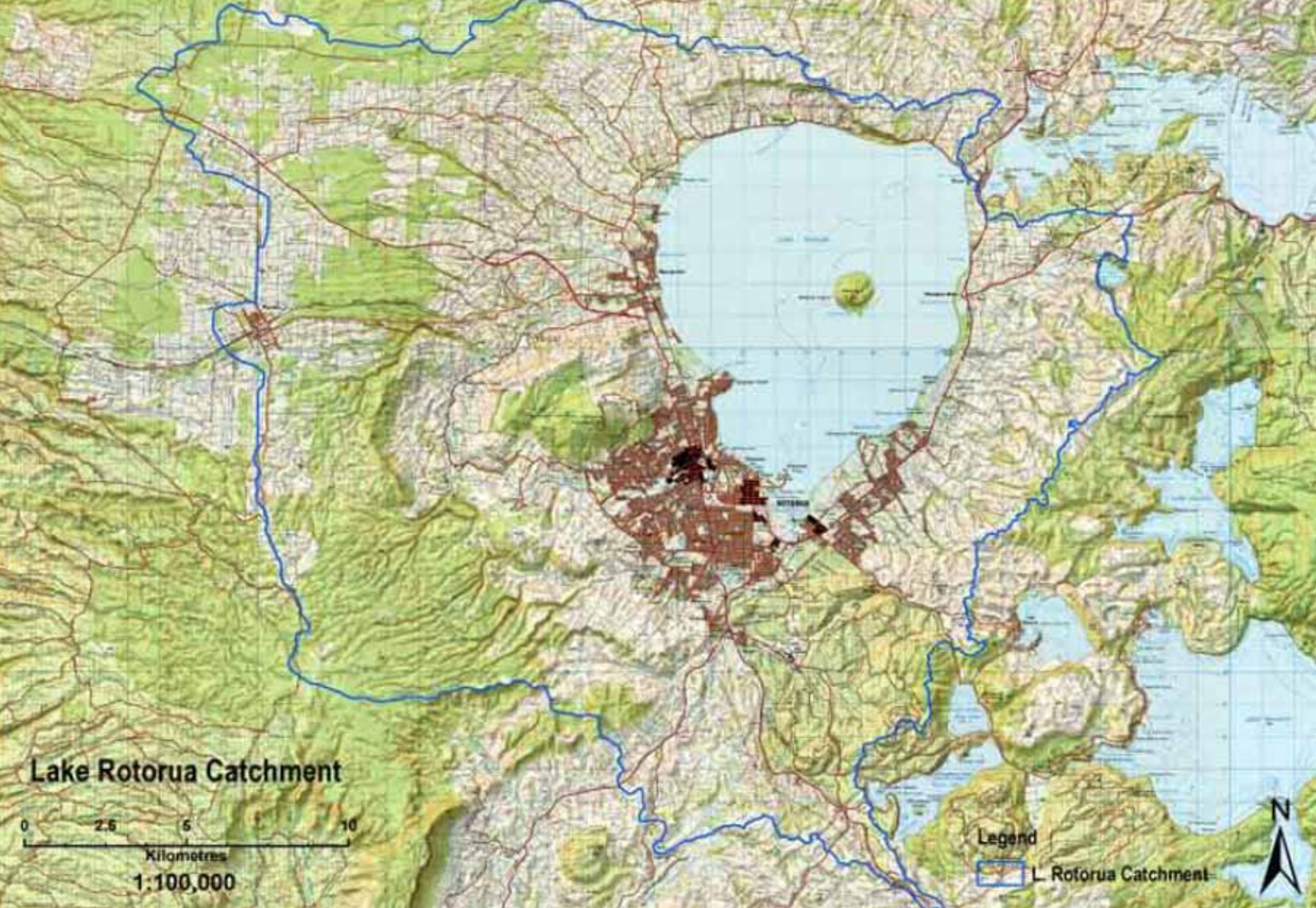
NIWA

GNS-Science

CommonGround

Chapman Tripp





# Lake Rotorua Catchment





# What is nutrient trading?

- Set total 'allowances' equal to environmental target
- All nutrient sources report their nutrient losses and surrender allowances to match them each year
  - *Nutrient losses are modelled using a model such as OVERSEER*
- Sources with insufficient allowances must buy more on the market
- Sources with excess allowances – possibly because of mitigation actions – can sell
- Can control N and P



Nutrient trading allows those with high reduction costs to pay those who can reduce nutrients more easily – the environmental goal can be achieved at lower cost.



# Limits to nutrient trading

- Will achieve the environmental goal that society defines – no more.
- Requires supportive policies that allow flexible responses
- Complements other reduction policies: e.g. technology and education, by aligning financial rewards with these programmes
- Nutrient trading is appropriate only in catchments with large numbers of heterogeneous actors and a challenging target



# Prototype developed with stakeholder group input





# Defining the environmental goal

- Target the environmental goal as directly as possible
- Set a goal for inputs of nutrient to the lake not exports from the land
- The long-term stated target is 436 for Nitrogen
- The short-term targets need to balance environmental, economic and social concerns

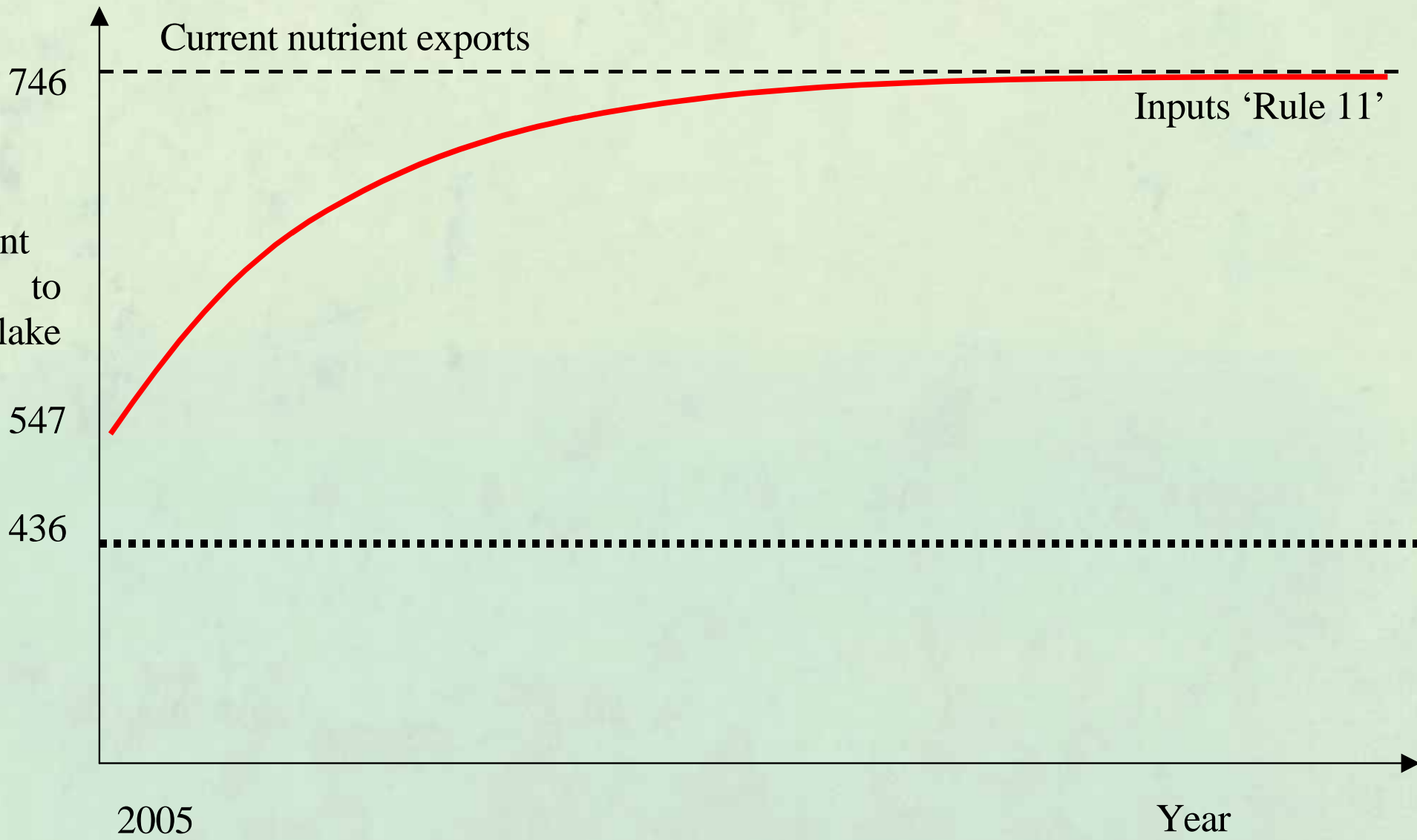


# Translate target into trading cap

- Some nutrient inflows are unmanageable
  - *Rainfall*
  - *3kg minimum from plantation forest*
  - *Groundwater flows – historical emissions coming to lake over 200 years*

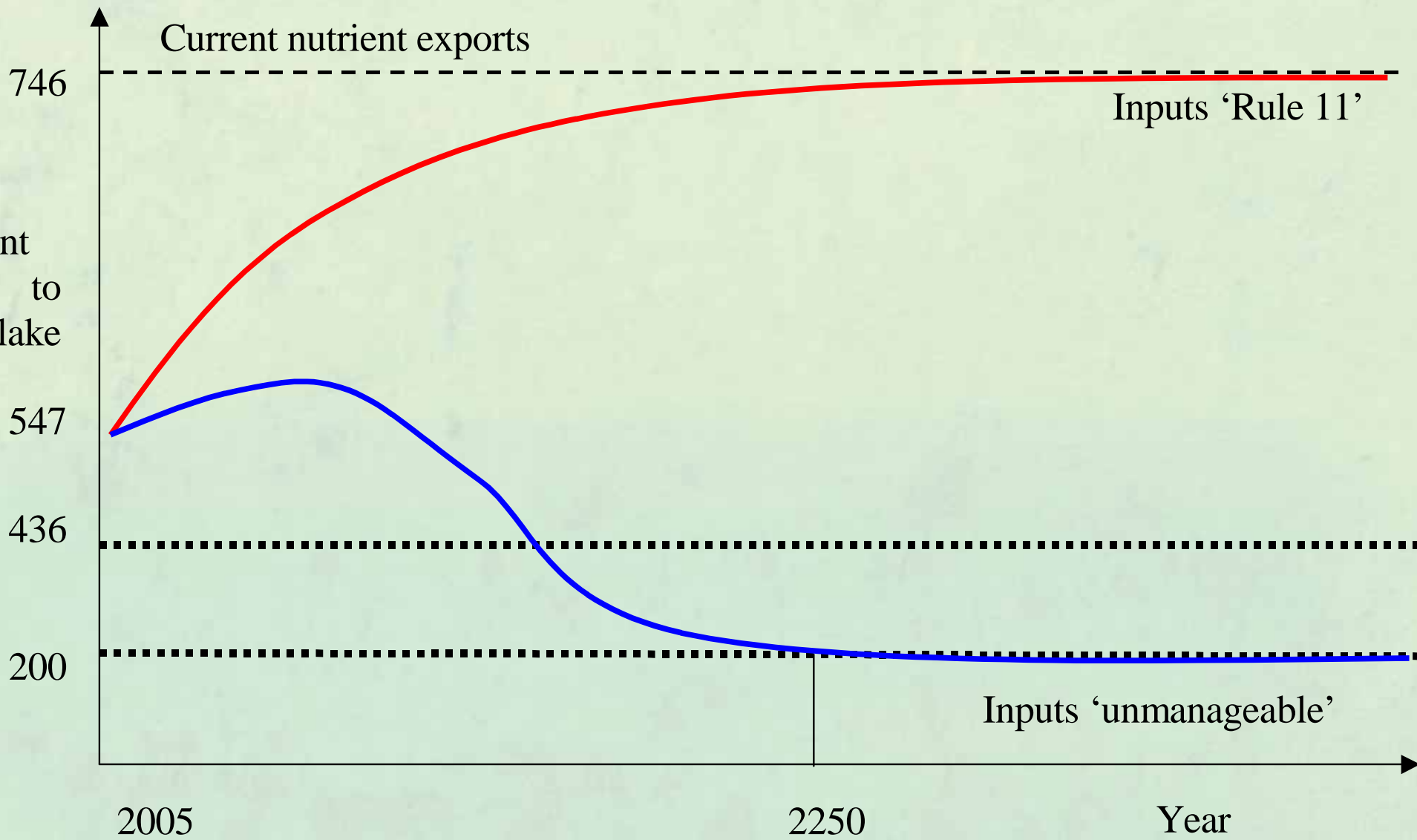


Nutrient  
inputs to  
the lake  
tN/y

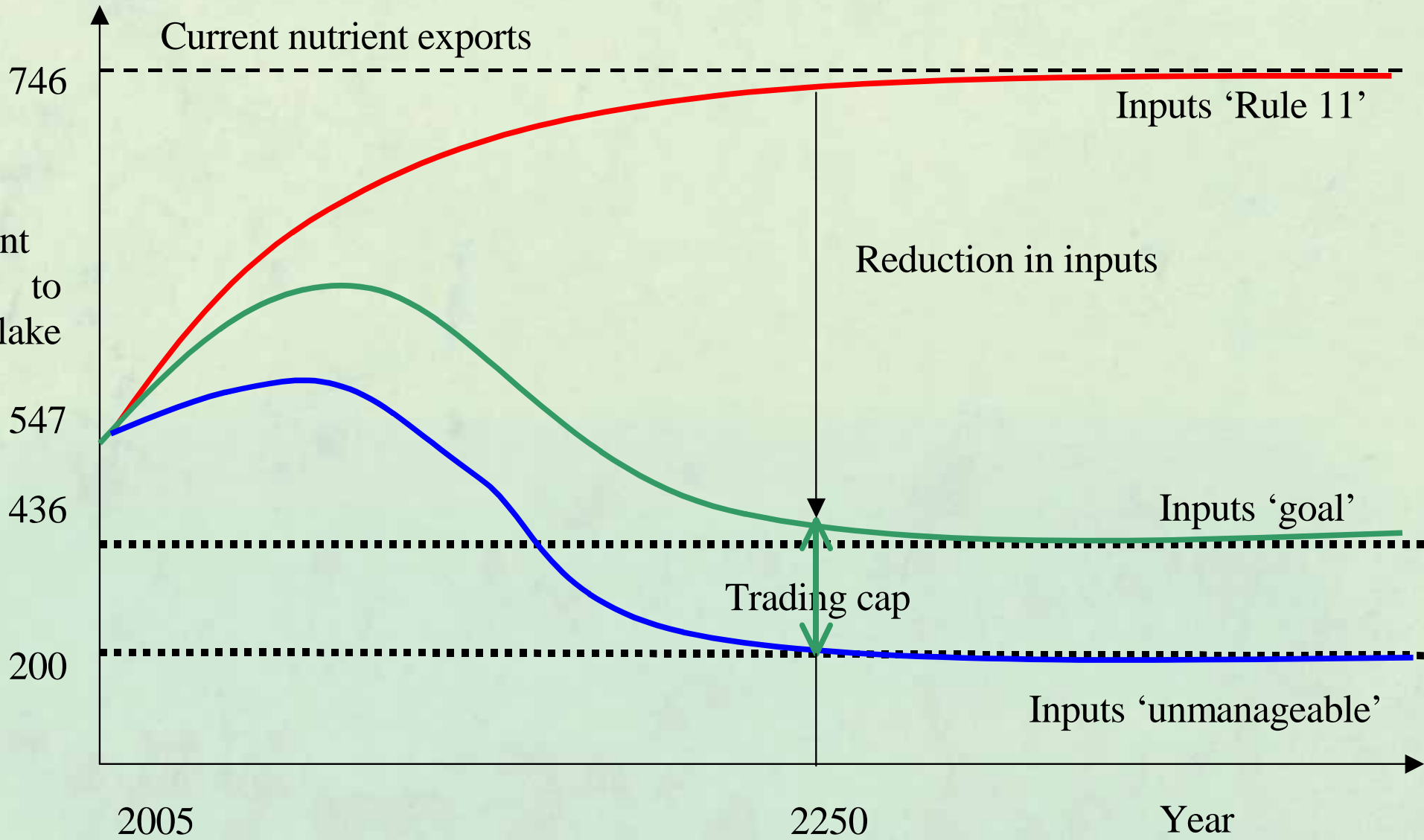




Nutrient inputs to the lake tN/y



Nutrient inputs to the lake tN/y



# Vintage Allowances

- **Where** nutrient are lost matters because it determines **when** they reach the lake: 0 – 200 years
- We propose
  - *Create a series of markets*
  - *Each allowance would have a ‘vintage’ and could be used to cover nutrient loss that reaches the lake in that period only.*
  - *Each nutrient source would have one groundwater lag zone associated with it.*





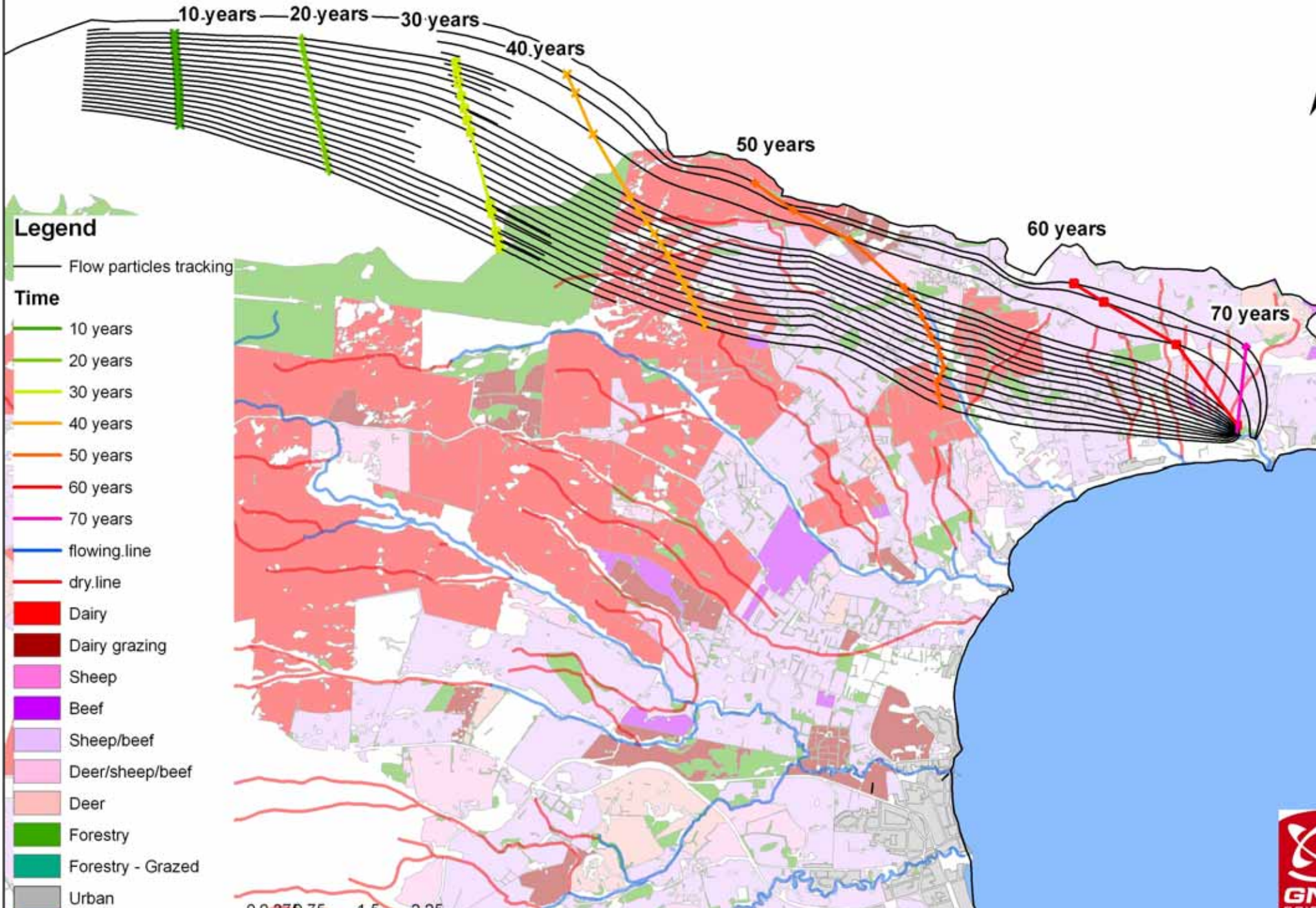
# To avoid having 200 zones...

- The zones will be grouped across several years
- The size of groups will depend on a combination of scientific uncertainty and an assessment of market liquidity



# Groundwater Boundaries







A nutrient source with a 1-5 year lag between export and input to the lake...

- Will surrender 2010-2014 allowances to match 2009 nutrient loss

A nutrient source with a 50-60 year lag...

- Will surrender 2059-2069 year allowances to match 2009 nutrient loss



# Who can they trade with?

- Those in their own lag zone who want to use the allowances at the same time
- Those in other zones who will use them at different times
- Trading alters the timing of 'exports' but not of inputs – i.e. it does not affect lake quality



# What sources are in the system

- We propose to:
  - *include all sources*
  - *define the form of participation based on property size supplemented by some land use information*
- *Why?*
  - *maximise flexibility in nutrient reductions to minimise cost*
  - *control compliance costs*
  - *minimise changes in regulation as land use changes*





# Our system would require:

- *detailed reporting from 'large' sources*
  - *More than 10ha of dairy + cropping/hort in parcel*
  - *More than 25ha of dairy + crop/hort + pastoral*
- *simple reporting from medium sized sources*
  - *More than 10ha in total but not a 'large' source*
  - *Can opt for detailed reporting*
- *EBOP or RDC responsibility for small parcels and sources*
  - *(depending on urban/non-urban definition)*
- *DOC etc responsible for their own land*
- *May want to align with the emissions trading system*



# Who receives allowances?

- Initially allocate to current sources to minimise economic dislocation
  - Each source will receive allowances of the vintages they will need in the next few years
- After a few years, transition to allocation on the basis on potential nutrient loss – modelled with same calibration of OVERSEER

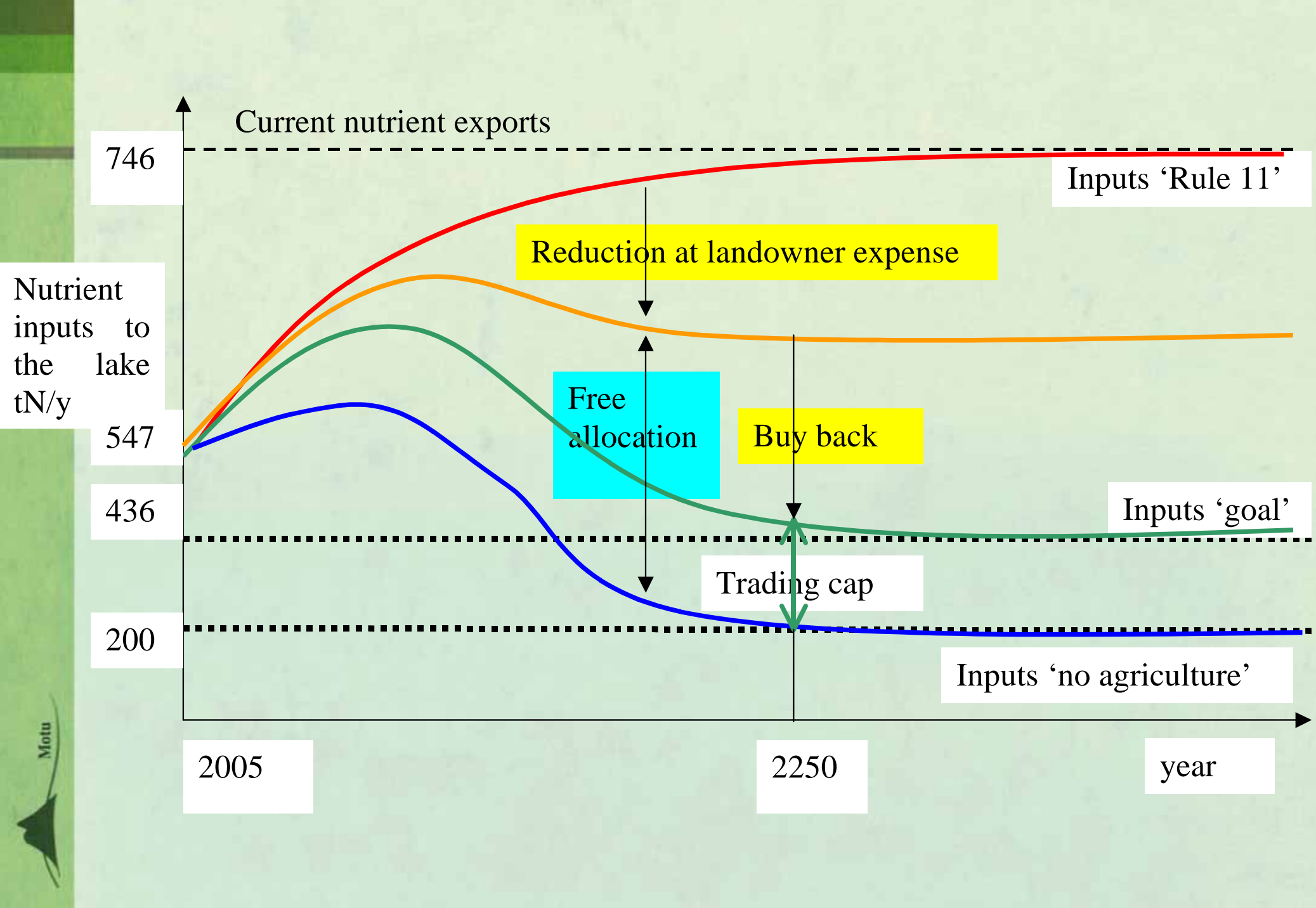
But if we allocate enough to cover current exports, this will not achieve the environmental goals



# Who bears costs of reductions?

- National taxpayers and local ratepayers bear some – historical beneficiaries of pollution and beneficiaries of clean lake
  - Central, regional and local government ‘buy-back’ some allowances from nutrient sources
- Nutrient sources bear some – polluter pays
  - Reduce allowances proportionately relative to initial allocation
  - Nutrient sources would profit if they were fully allocated at their existing export levels







# Cost sharing

- X % District council buy-back
- Y % Regional council buy-back
- Z % National government buy-back
- Remainder – proportional cut across all allowance holders



# Protecting the vulnerable

- Don't allocate all allowances immediately
  - This reduces the potential for irreversible errors
- Educate nutrient sources about how markets work
- Limit the proportion of each vintage of allowances that can be held by one participant
- Limit allowance ownership to those who own property in the catchment?



# Mechanics: reporting, compliance and trading

- Monitoring model fixed at beginning of compliance year
- Sources can trade any vintage of allowance at any time without pre-trade approval
- Sources report nutrient losses and surrender allowances of correct vintages to match at end of year
- Regulatory agency rapidly either confirms compliance or decides to audit
- Properties that are found to be out of compliance are fined and also have to 'make good' the environmental damage by buying allowances



# Trading within the Resource Management Act

- Our legal advice suggests that this simple form of trading is possible within the existing RMA
  - *Regional consents would be required for activities that involve nutrient loss*
  - *A condition on these consents would require surrender of allowances according to a process defined in the system rules*
  - *This is a novel and legally untested approach*



# Changes over time

- New scientific information
- Changes in social priorities
- Unanticipated issues

The system needs to be able to evolve to account for these without its basic structure being threatened

For efficient nutrient loss, we need to provide as much investment certainty as possible





# Who decides?

We suggest

- Two groups: one advisory and one with authority

## 1 Advisory group

- Represents wide range of perspectives
- Good technical/ scientific advice
- Provides recommendations with conflicting opinions

## 2 Small political body

- Makes decisions
- Uses majority voting
- Must publicly justify decisions



# Both groups need strong guiding principles

- Open, generous discussion
- Use best available science
- Encourage innovation
- Avoid benefits to special interests
- Protect property rights and key elements of system



# Changing trading caps

Rules for changes should be announced in advance

- *How much warning of change?*

*Who pays for reductions / benefits from expansions?*

We suggest

- *Use same principles for cost bearing when changes are made as when initial allocation was done; i.e. X% district council, Y% regional council, Z% central government, remainder by proportional change in all existing allowances*



# Changing nutrient loss model or zones

## Why change?

- *New information on levels of nutrient loss*
- *New options for nutrient reduction that are not in model*

## Who bears costs of change?

- *Landowners should not need to purchase more (or benefit) from continuing same practices. No retrospective penalties / rewards*
- *If total modelled emissions in the catchment rise, use rules for adjusting cap*

## Why?

- *Impacts could be focused on small numbers of players who cannot avoid the risk*
- *We want to encourage innovation and reduce resistance to new science*



We believe a nutrient trading system is feasible

A clear path of goals needs to be set before it could be implemented

Many details require refinement

We hope this prototype provides clear guidance





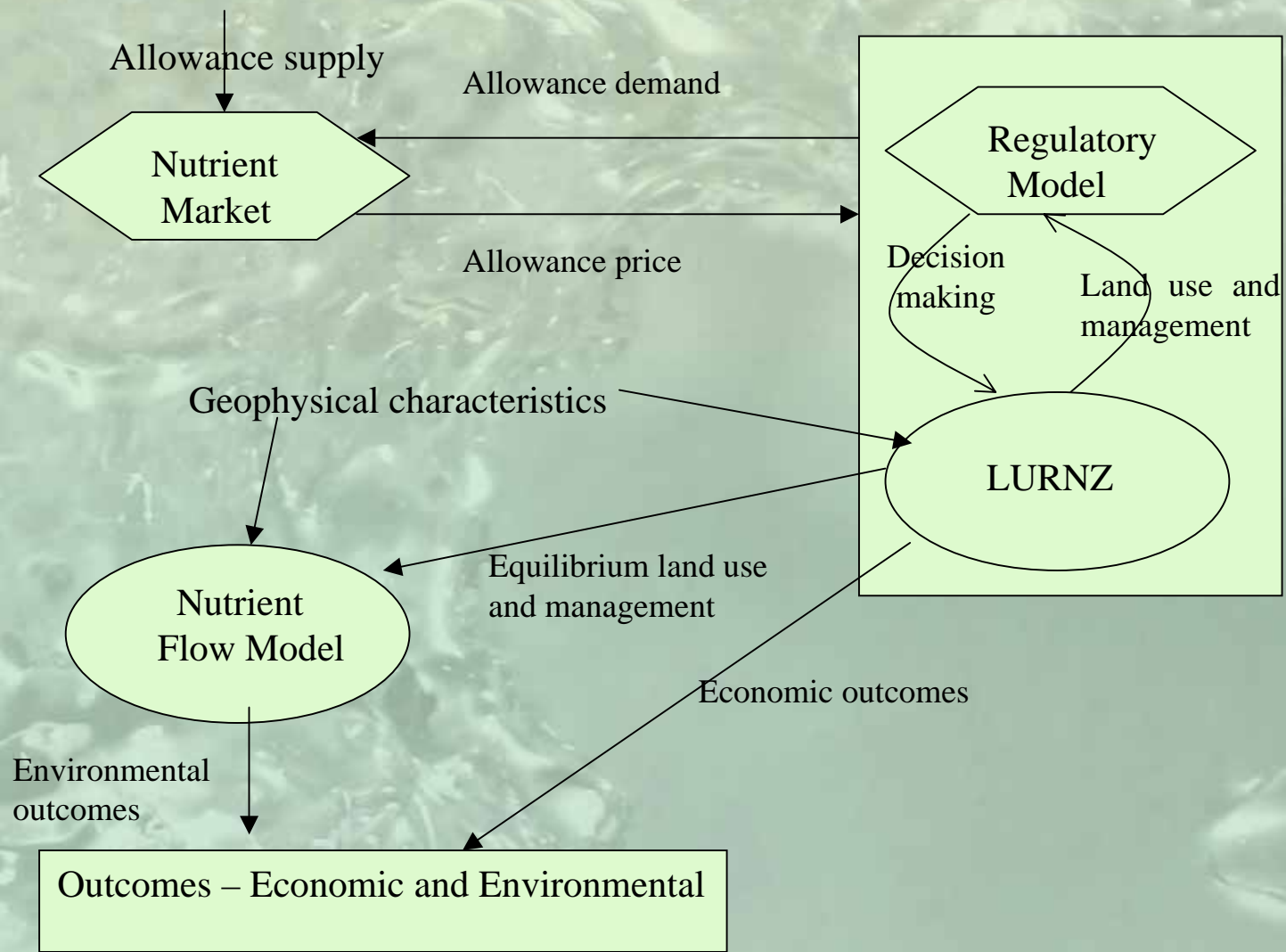
# Ongoing Work

Working with NIWA and GNS to build a simulation model for the catchment.

Explore issues such as:

- How would a change in the trading cap affect economic costs and environmental outcomes?
- How many zones?
- How important are transaction costs?
- Does adverse selection matter in choosing level of detail in modelling?

# N-TRADER



[www.motu.org.nz/nutrient\\_trading](http://www.motu.org.nz/nutrient_trading)

