DEPARTMENT OF
PRIMARY INDUSTRIES

Development of Best Practice Environmental Management Guidelines for the Salmonid Aquaculture Industry

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Victoria
The Place To Be

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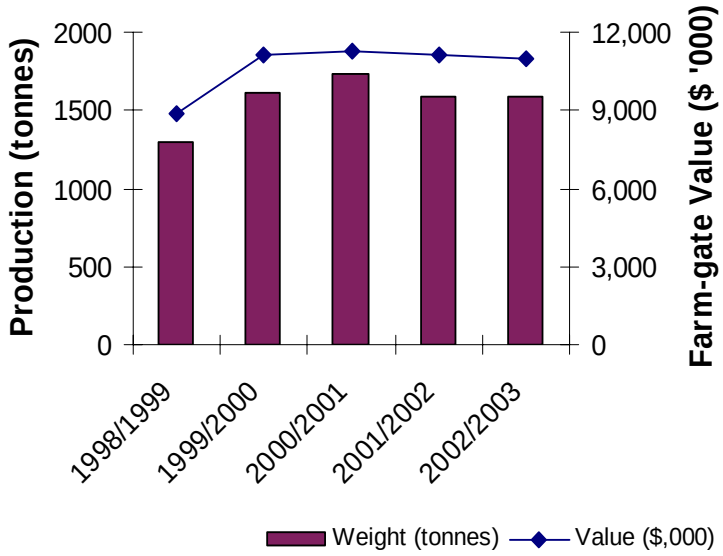
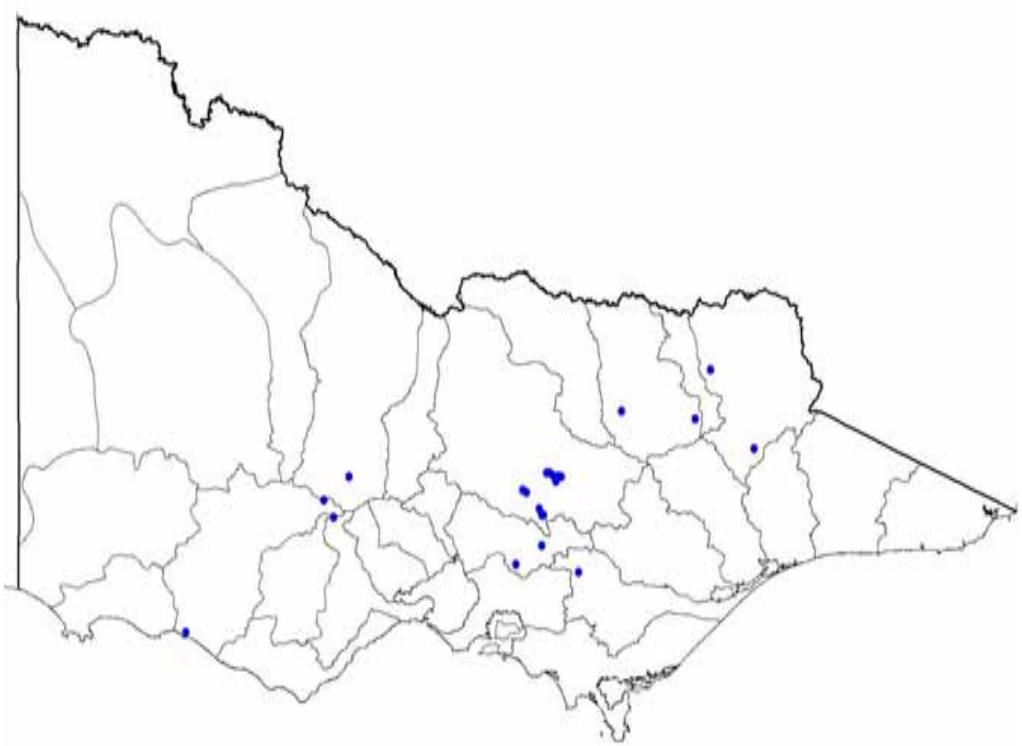
Freshwater salmonid industry in Victoria

- Commercial salmonid aquaculture industry developed during 1970's and 1980's.
- Annual production is between 1,500-2,000 tonnes of table sized fish (value $11m).
- 200-500,000 juveniles for restocking.
- Species include:
  - Rainbow trout (95% of production)
  - Brown trout
  - Chinook salmon
  - Brook trout and
  - Atlantic salmon.



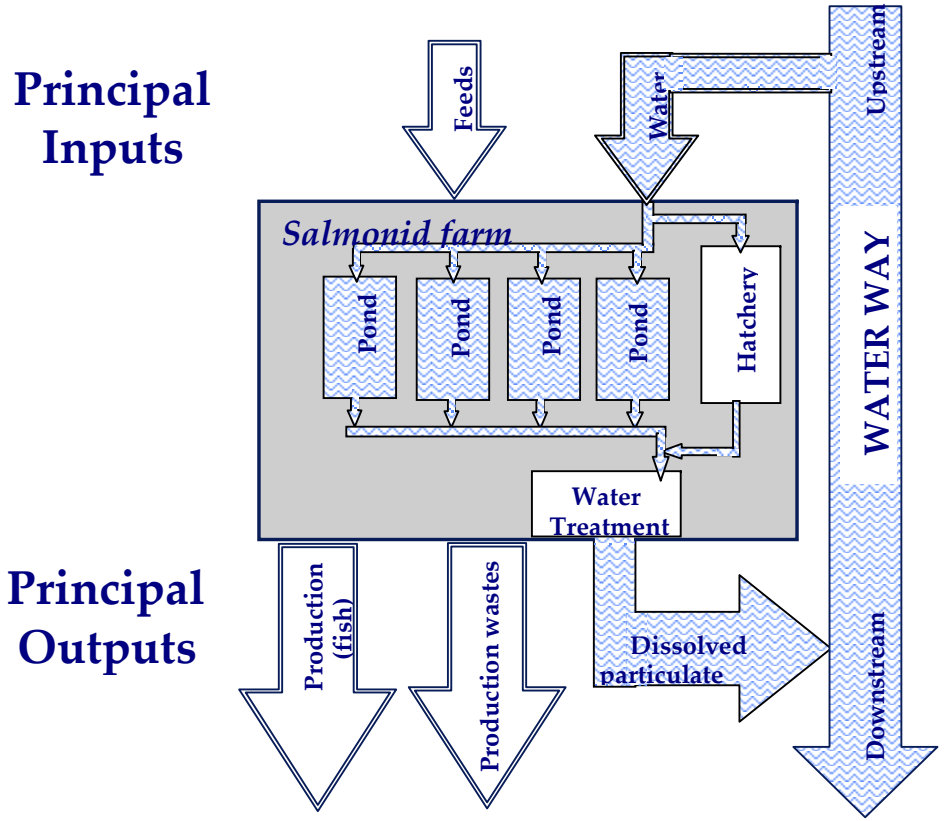
Location of farms

- In 2002/2003 there were 22 operating farms.
- 12 were located in the upper Goulburn river catchment some on regulated reaches others on unregulated tributaries.
- Upper Goulburn catchment - represents 85% of total production in tonnes.

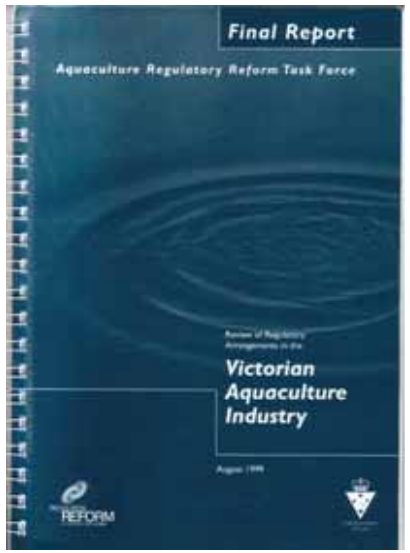


Farming Systems

- Principal inputs
  - Fish;
  - Water;
  - Feeds;
  - Chemicals and therapeutants.
- Principal outputs
  - Fish;
  - Effluent water;
  - Wastes.



Development of BPEM Guidelines for the salmonid aquaculture industry



Key drivers

- Fisheries Victoria- outcomes of ORR review
- Industry - desire to secure tenure and improve environmental sustainability
- DSE River Health Strategy
- EPA implementation of new SEPP (Waters of Victoria)
- CMA Water Quality Strategies.

Development process

1998

- Healthy Waterways Program contracted EPA to develop BPEM guidelines.
- Sub-contracted Aquaculture Program, MAFRI to implement project.
- Draft BPEMG completed for EPA but industry and EPA failed to reach a consensus on the scope and content of the guidelines and they were not formally adopted.

2003

- Fisheries Victoria funded Aquaculture Section, PIRVic to review and update guidelines.
- First draft released for comment April 2004.
- Final draft released July 2004.
- Signed off by EPA, FV and Industry October 2004.

Key elements of BPEMG for salmonid aquaculture industry

- Overview of freshwater salmonid industry in Victoria.
  - Conducted industry survey to benchmark current industry practices;
  - Identified principal inputs and waste streams.
    - Organic matter in effluents (including nutrients)
    - Solid wastes from settlement ponds;
    - Chemicals and therapeutants
    - Fish mortalities and processing wastes;
    - Escaped fish;
    - Greenhouse gas emissions.

- Overview of applicable regulations and legislation.
  - Licences required from Fisheries Victoria, EPA, Water Authorities and CMAs.

Key elements of BPEMG for salmonid aquaculture industry

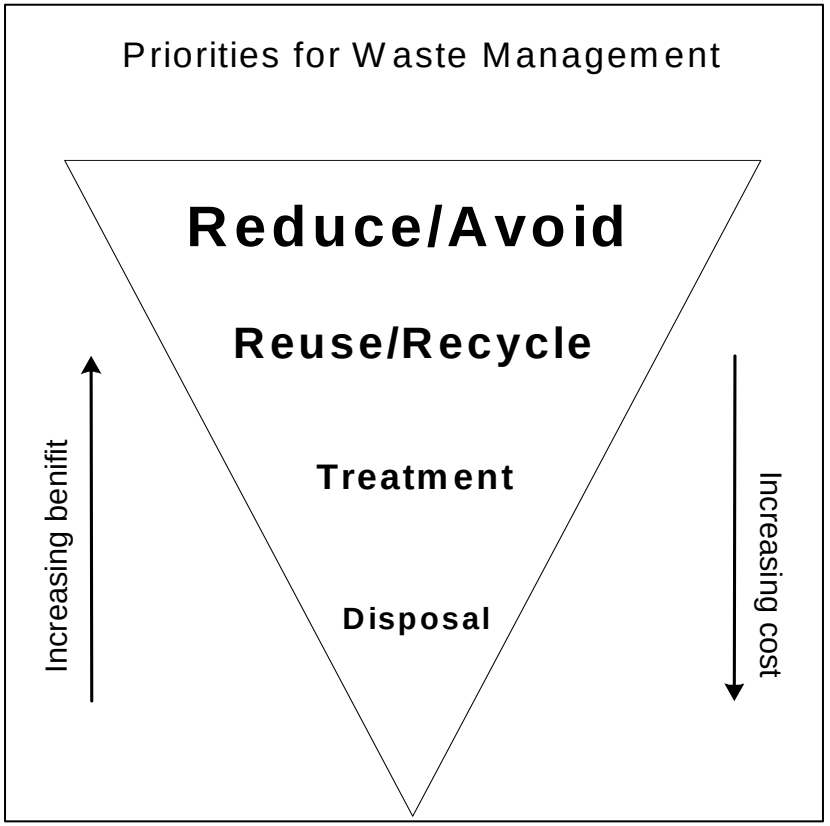
- Identification of environmental issues.
  - Potential impacts of the waste streams and other issues on the environment, including:
    - aquatic ecosystems (including SEPP beneficial uses)
    - indigenous flora and fauna.
    - humans in terms of nuisance or health risks;
    - wider global environment.
- Best practice environmental management for salmonid farms
  - Documented best practice measures for waste streams and other environmental issues.
  - Data required to accurately monitor and report performance.
- Environmental management systems.

Best Practice Environmental Management for Salmonid Farms

- Cornerstone of BPEM is compliance with all relevant regulatory responsibilities.
- Definition of BPEM:

"Minimising the waste stream by maximising production efficiency per unit production."

- Applied the "Waste management heirarchy" to develop best practice guidelines for the issues identified.



Waste Management Heirarchy applied to salmonid aquaculture waste streams

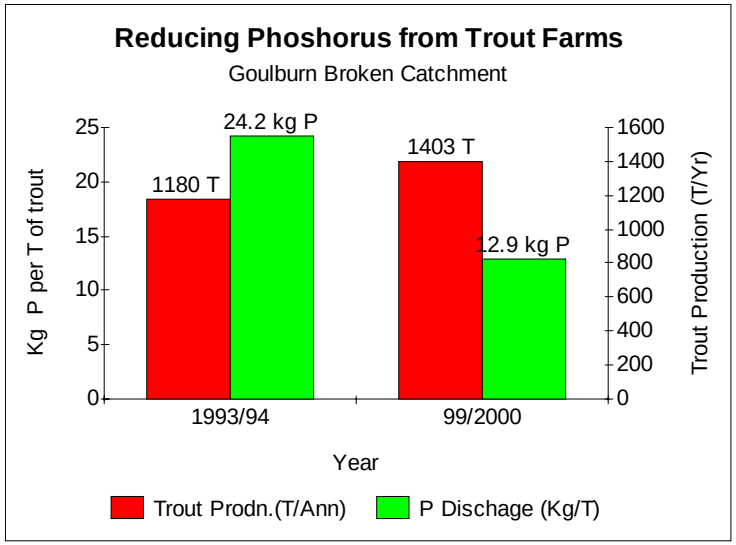
Waste stream	Avoidance/ reduction	Re-use/recycle	Treatment	Disposal
Organic matter & nutrients in effluents;	√		√	√
Sludge from settlement ponds;	√	√	√	√
Chemicals and therapeutants;	√			√
Fish mortalities and processing wastes; and	√	√		√
Fish escapes.	√			
Greenhouse gas emissions	√			

Other issues that were addressed

- Reducing impacts of water abstraction
- Minimising impacts on habitats during construction and operation.
- Minimising impacts on birds and other predators.
- Minimising visual impacts
- Minimising noise
- Minimising odours
- Compliance, monitoring and reporting.

Case study: BPEM-reducing nutrient loads in effluents

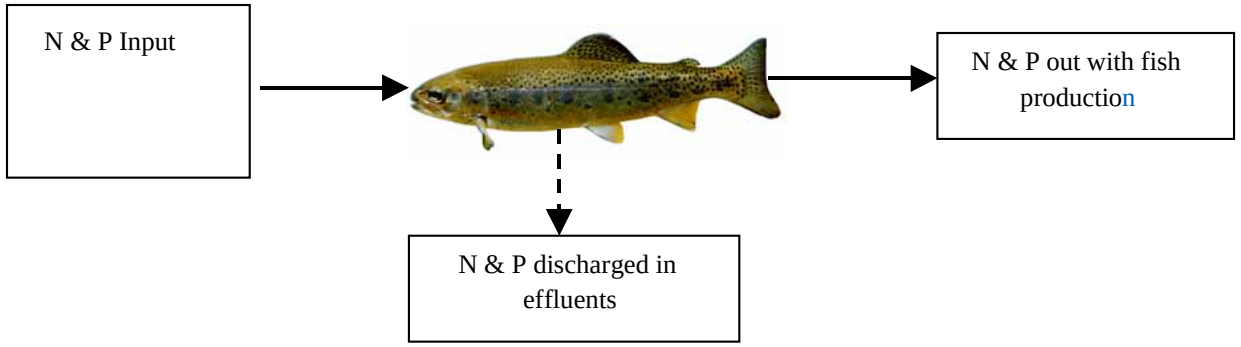
- Recognised as key issue for the industry to address due to potential local and catchment-scale impacts.
- Industry had already achieved a significant reduction in nutrient output in the last decade due to improved management.
- Two ways to reduce nutrient loads in effluents:
  - REDUCE INPUTS - increase efficiency of feeding.
  - TREAT EFFLUENT - using appropriate technologies.



Case study: BPEM-reducing nutrient loads in effluents

1. **REDUCE INPUTS - increase efficiency of feeding (low FCR).**

- Feed management
  - diet quality, feeding rates, diet size and delivery;
  - Use mass balance models to gauge performance.
- Water (oxygen) management
  - Monitor oxygen levels in water flow to assess optimal feeding rates.
- Use mass-balance models as management tool.



Case study: BPEM-reducing nutrient loads in effluents

2. EFFLUENT TREATMENT

- Settlement ponds or filtration systems can remove solid wastes (including P) if properly designed and maintained.
- Settlement cones can be installed in each pond.
- Biological filters required to reduce nitrogenous wastes.

Case study: BPEM-reducing nutrient loads in effluents

BPEM Targets

- Minimise FCRs through efficient feed management:
  - Target: maintain FCRs below 1.2:1 (annual average)
- Use mass-balance models to calculate nutrient budgets
  - Target: Ensure P loads less than 12kgP/tonne fish produced.
- Adopt water (oxygen) management systems
  - Target: Oxygen levels should remain above desired levels for ambient temperature.
- Production should not exceed carrying capacity of farm
  - Target: Annual production to daily inflow should be around 3:1 unless appropriate technology installed.
- Install appropriate waste treatment technologies.

Future work

- BPEM process highlighted that there was very little data on actual impact of the salmonid aquaculture on the environment.

- Comprehensive study required to investigate and quantify actual impacts of salmonid farming on the environment.
  - Intensive monitoring program of background, downstream and effluent waters required.
  - Results used to develop site-specific key performance/sustainability indicators for trout farms on the Goulburn river and key tributaries (ie link impacts to size of farm compared to river, management practices etc).