Aquaculture as a Post-Mining Activity for Surface and Deep Mines

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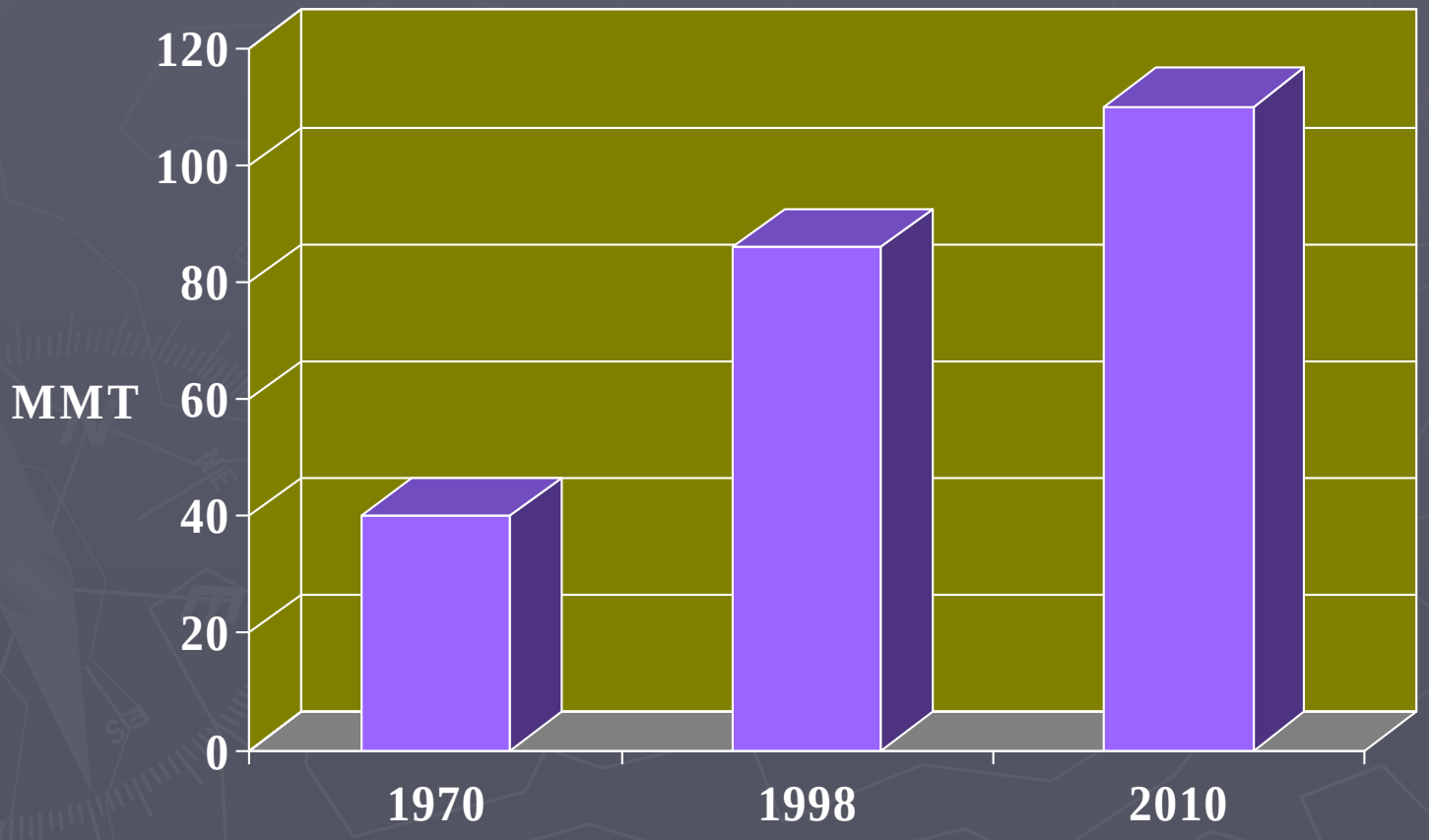
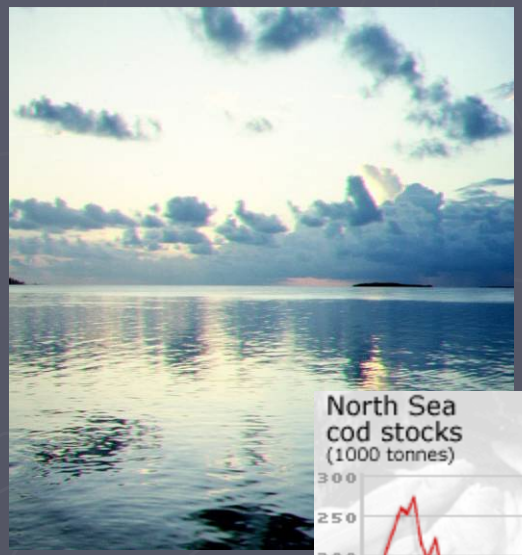
The Demand for Fish Increases Every Year

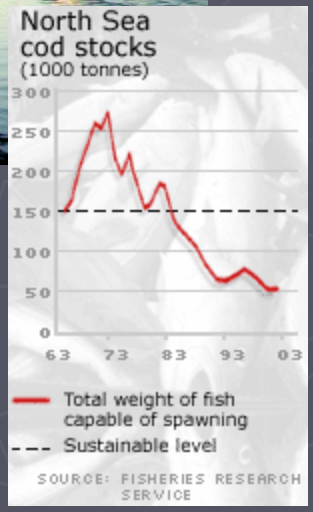


But where does our fish come from?

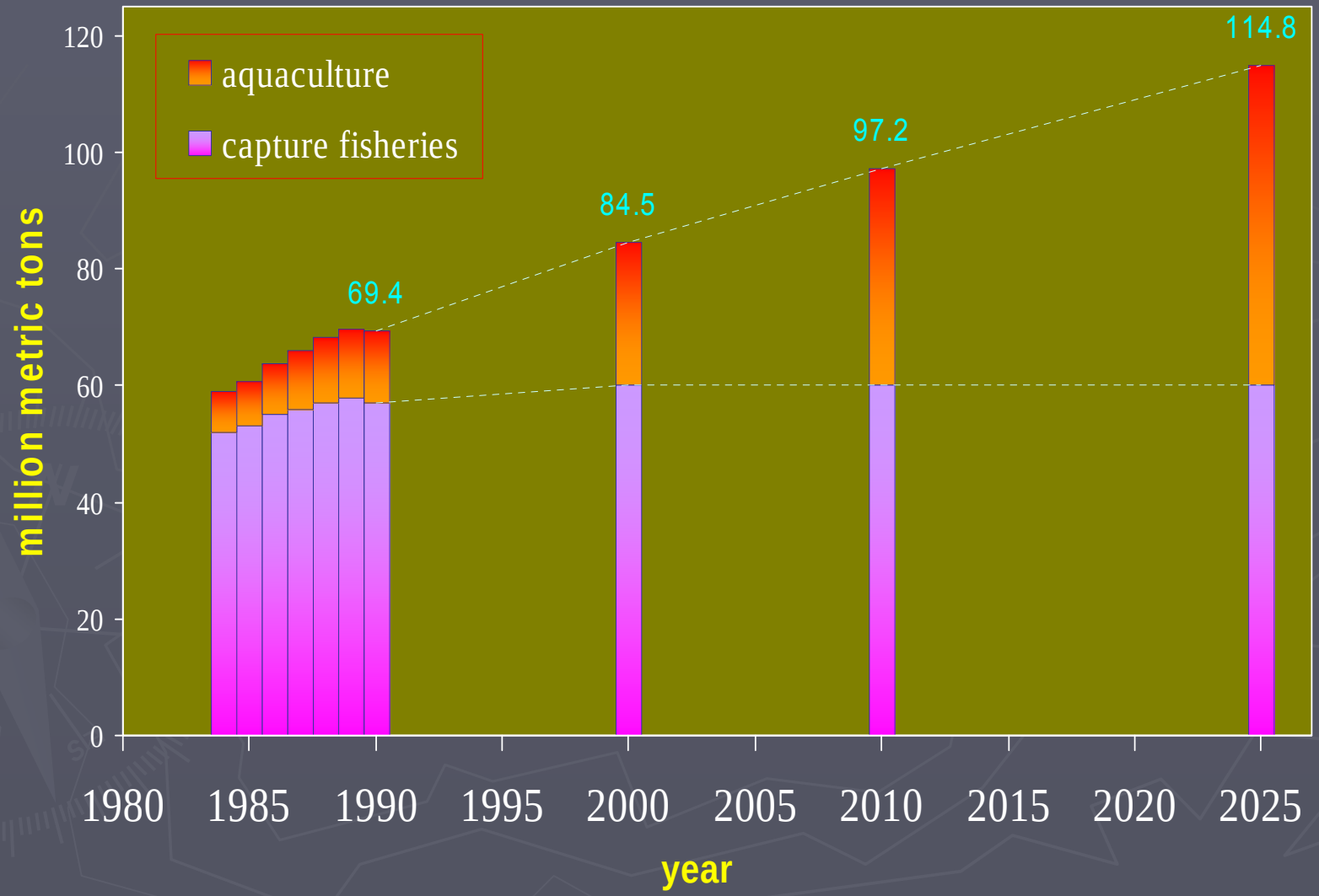
Only Two Sources- Capture or Culture

- Historically – Most captured from the oceans
- We have always thought the ocean was limitless. Wrong!
- Most wild fisheries are at maximum sustainable yields or declining.

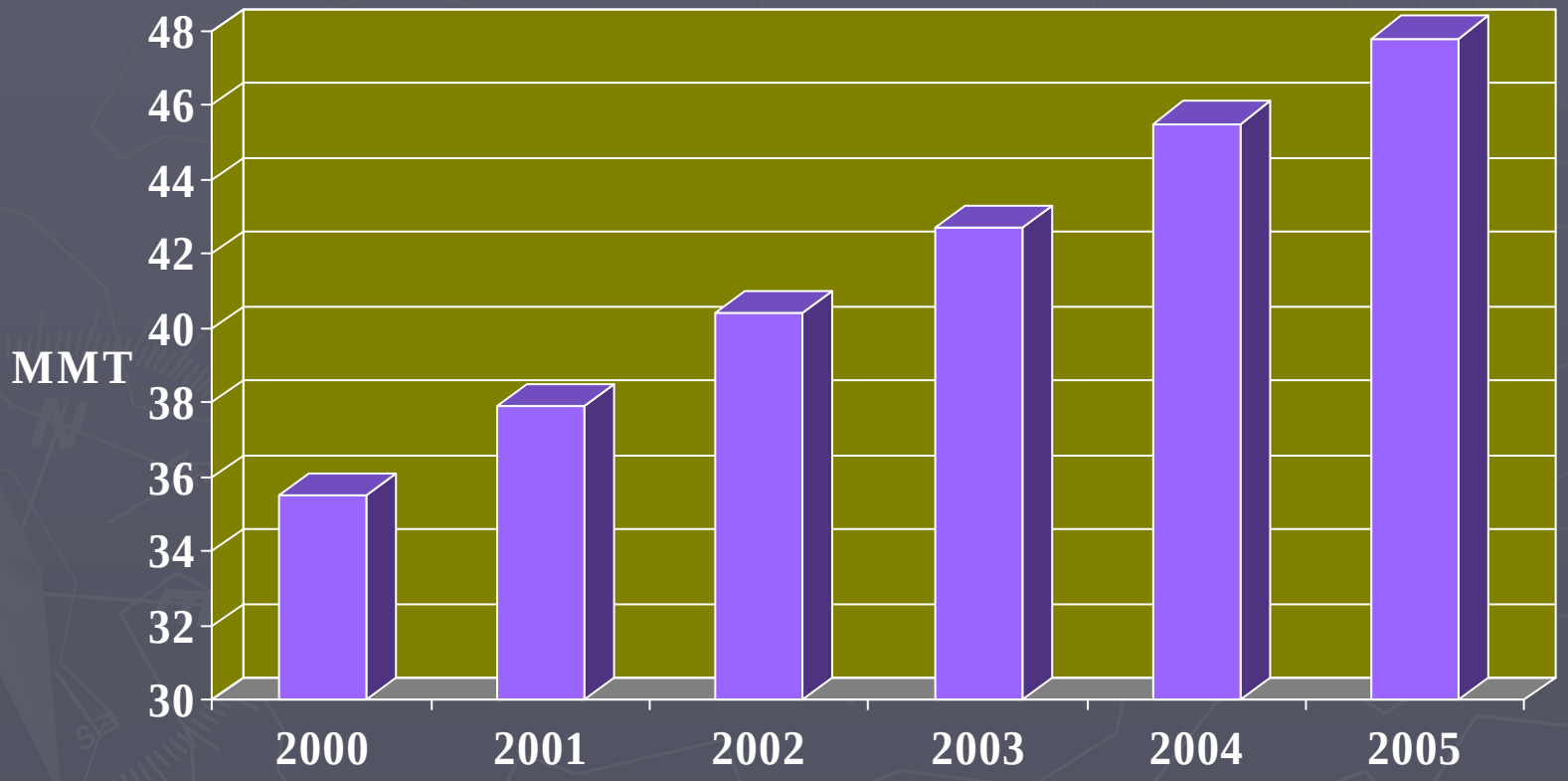




All future increases in food fish supplies will come from aquaculture



Aquaculture is world's fastest growing source of human food.



U.S. Seafood Exports and Imports

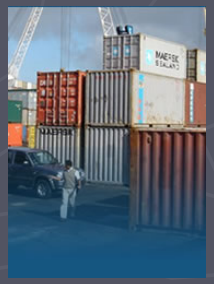
U.S. Trade Deficit in Seafood Exceeds

> $ 9Billion/Year

Over **70%** of the US seafood supply is imported.

90% for shrimp and others

Food Security a Real Issue.



Kentucky State University

5 PhD researchers, 3 Extension specialists and only research facility in the state.

Aquaculture and Coal Mining in KY

Since 1970's Clay Co. KY

Raising catfish for pay lakes and food fish since the 1970's.

1980’s

Eastern KY

Addington Resources

Geese + paddlefish

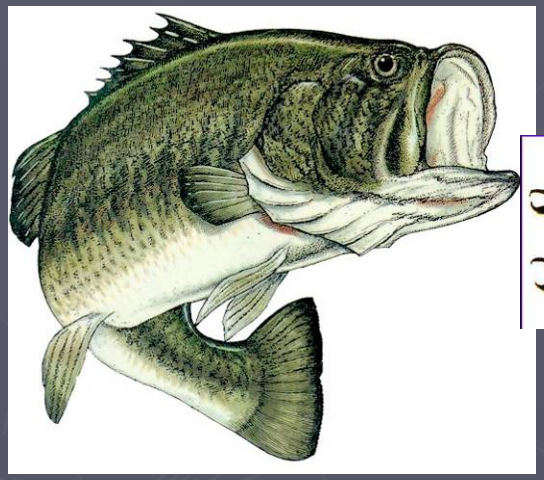
1995

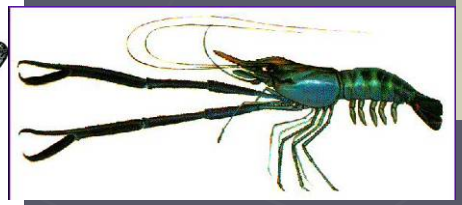
Peabody's Ken Mine in West KY

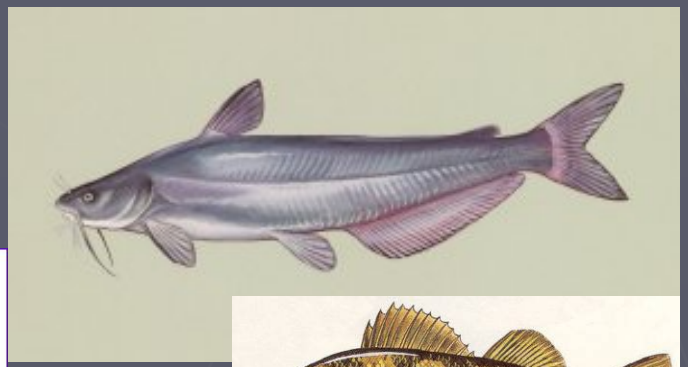
KSU Field Trial produced about 800 lbs of freshwater shrimp from 4 reclamation ponds with > 60% survival.

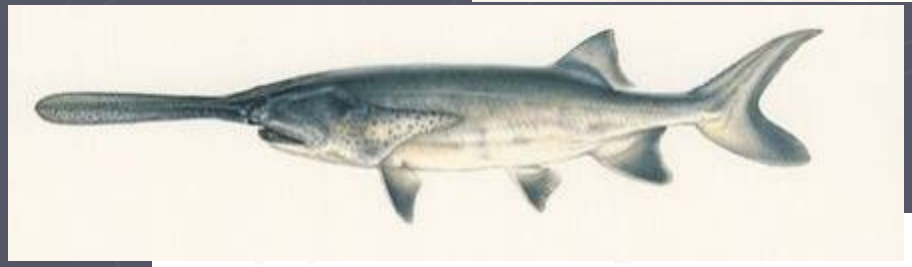
Great help from Brent Gray, Reclamation Manager and cooperator Jeff McGuire

Kentucky State University
Experience with a variety of species



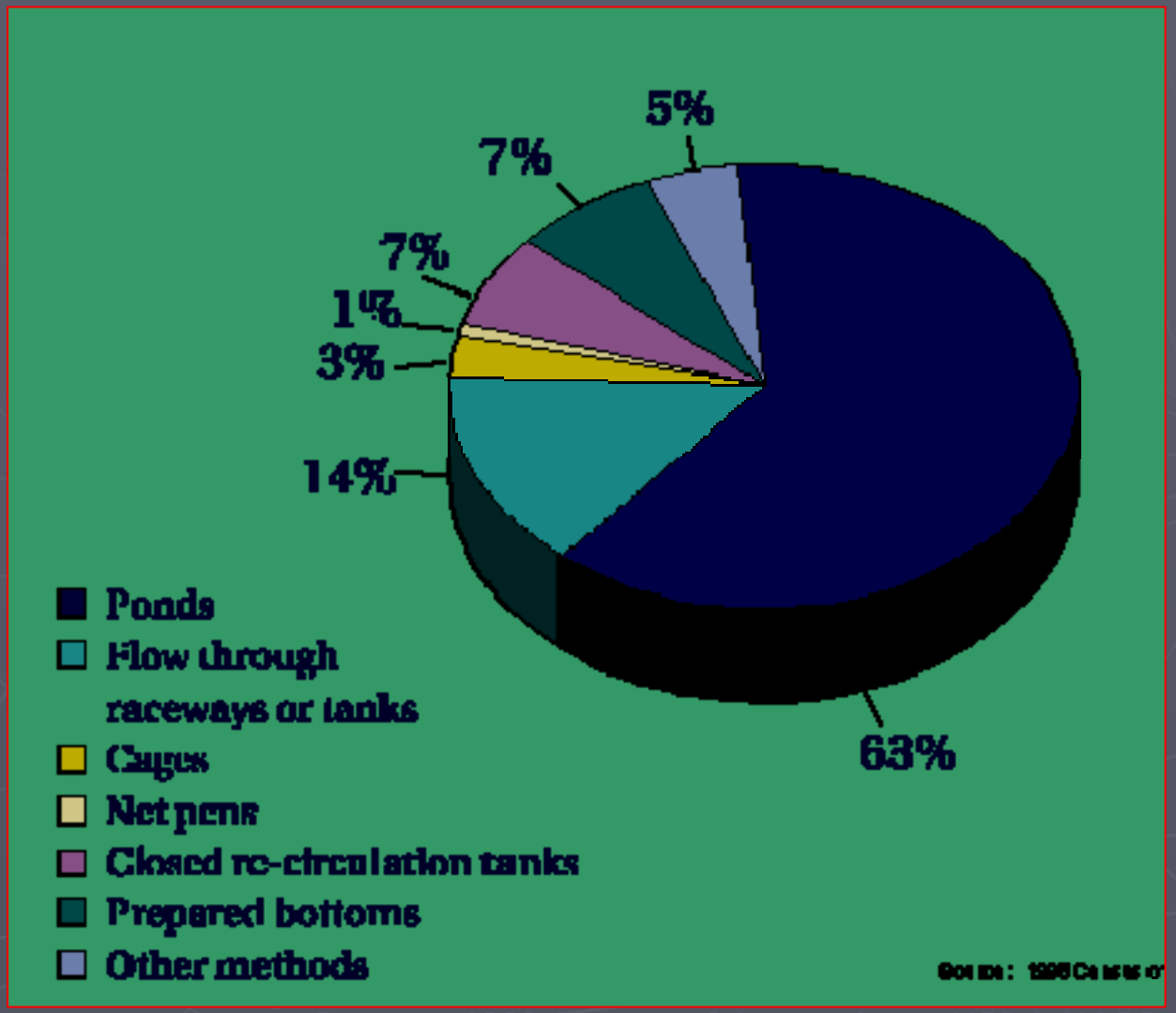






Production Methods

- Ponds
- Cages and pens
- Raceways
- Closed re-use systems



Source: 1998 Census of Aquaculture, USDA-NASS

In MS, catfish are grown in 10- 20 acre levee ponds with flat bottoms.

In AL, large watershed ponds are the norm

Reclamation of coal mines, returning the habitat to its natural state

Construction of Purpose Built Ponds

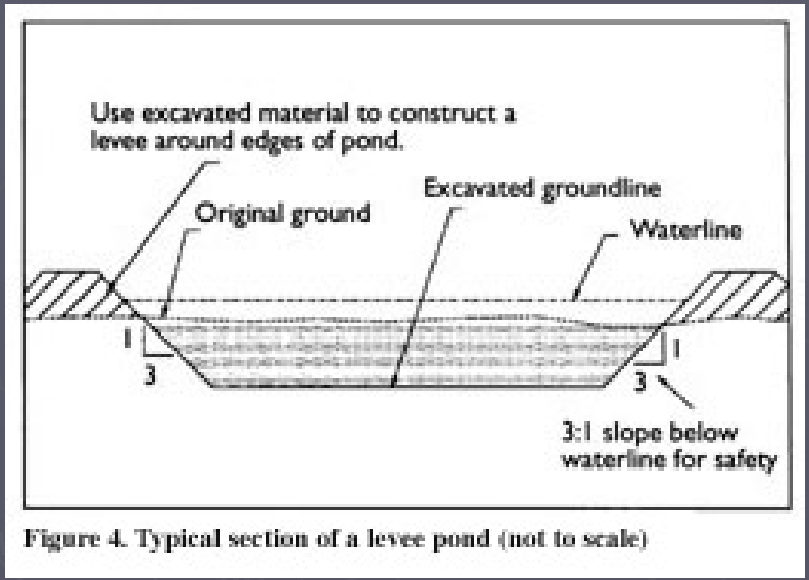


Figure 4. Typical section of a levee pond (not to scale)

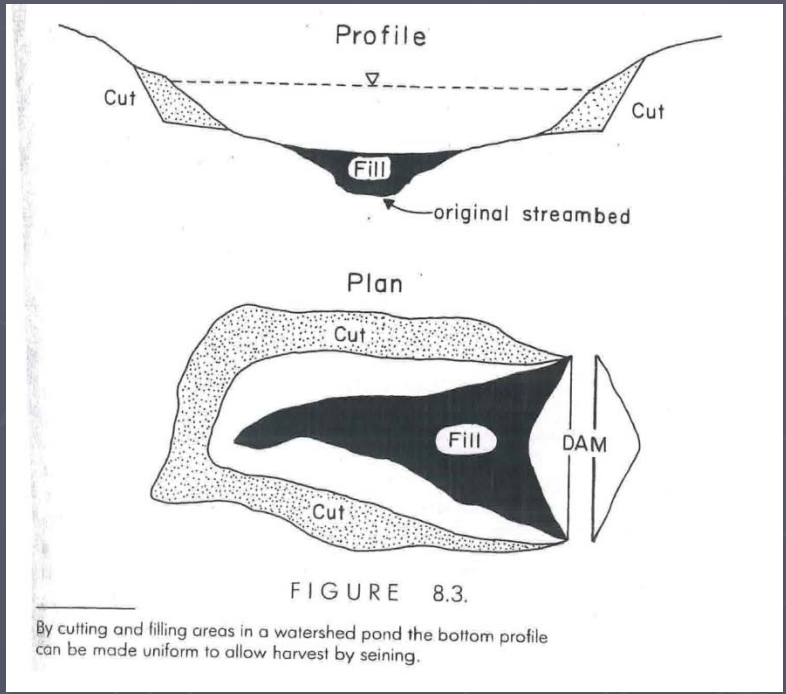


FIGURE 8.3.

By cutting and filling areas in a watershed pond the bottom profile can be made uniform to allow harvest by seining.

Purpose Built – Needs a Drain

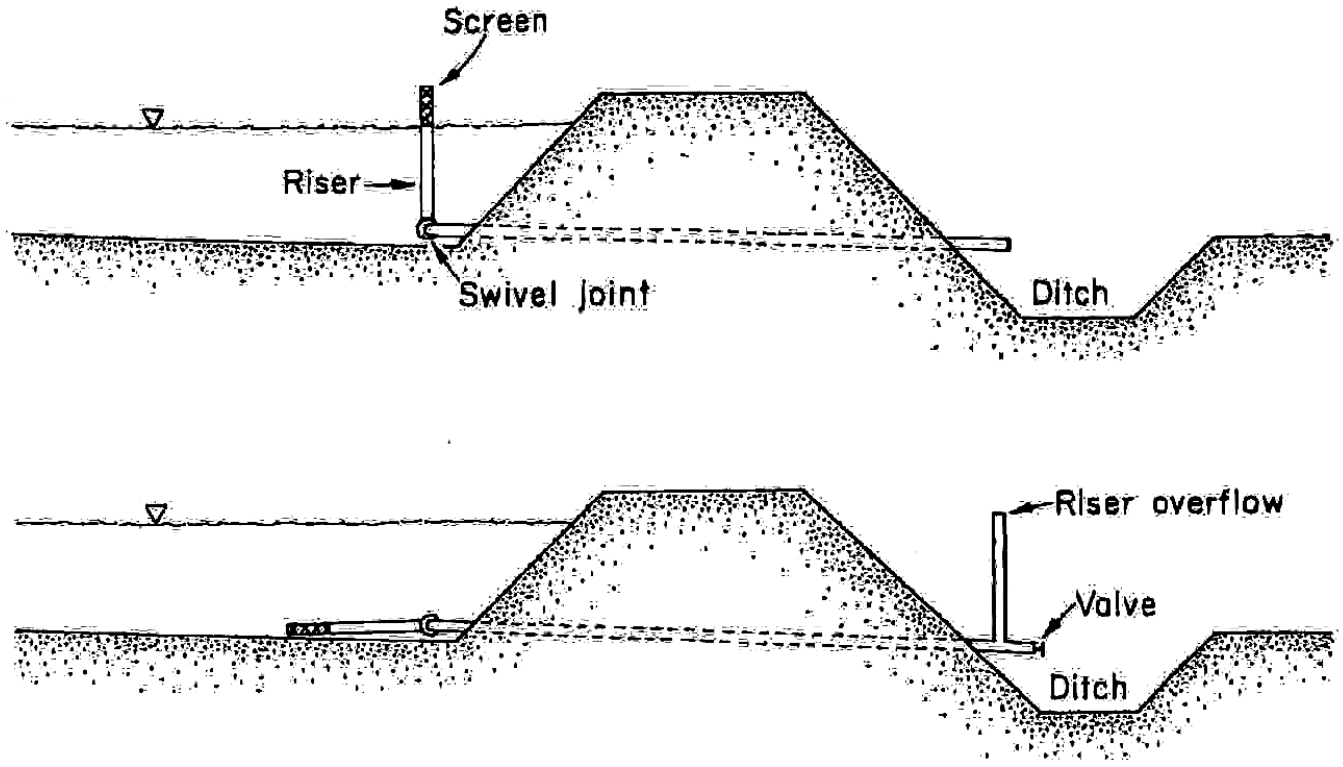


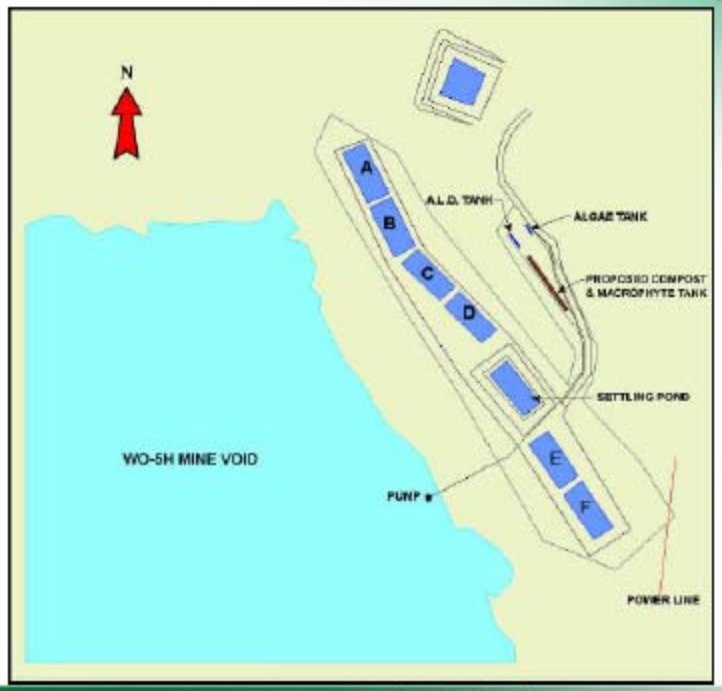
FIGURE 8.2.

Two types of drains used in levee ponds: inside swivel drain (top) and outside drain with valve (bottom).

Project in Australia

Raising Marron on Premier Coal Site

Aquaculture options



- Industry
- Recreation
- Ecotourism
- pH buffering

Intensification of Ponds

Most of the oxygen in a pond is supplied by photosynthesis.

Limits production to about 1,500 lbs/acre.

Above this, need to monitor and be able to aerate

Using Existing Ponds

Reservoir Ranching Production System…

Cages in Existing Ponds

Potential Polyculture

Potential of early bond release if shown to be in a productive capacity


Raceway Production System
Need flow of > 400 gpm, hard to find

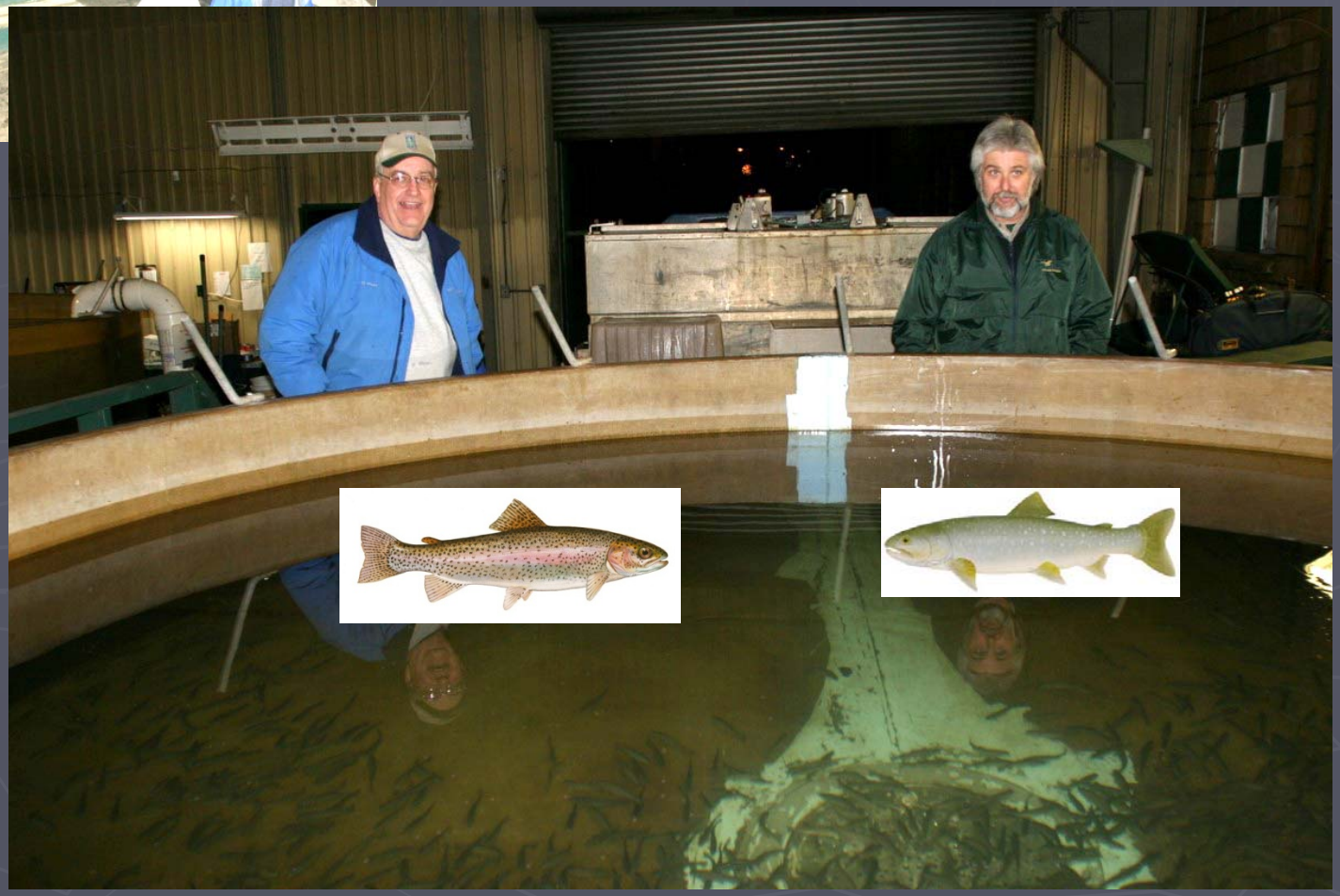
Eastern KY
Deep Mines

Portal 30

> 2,000 gpm

Potential Species

Rainbow trout
Arctic char

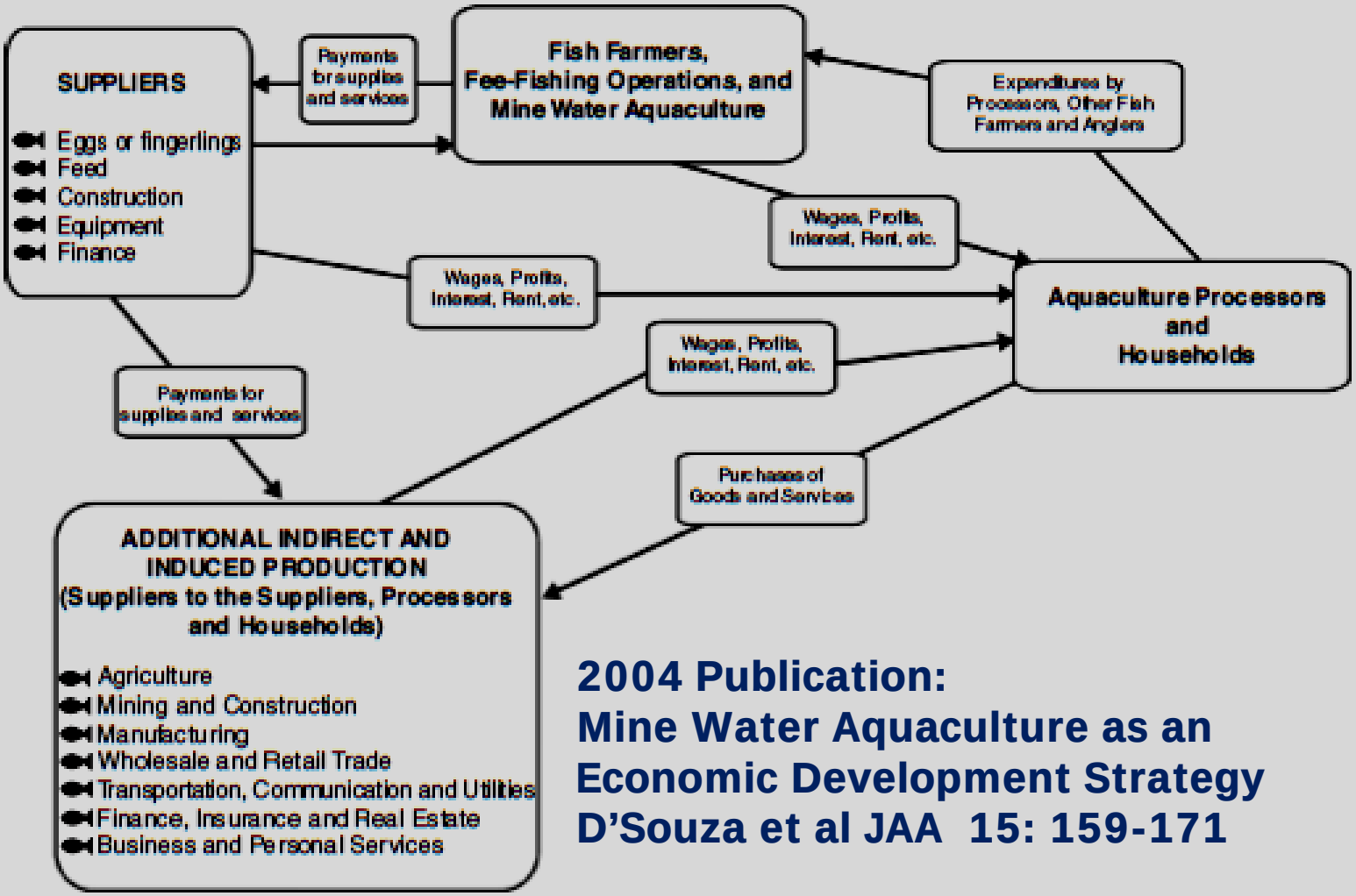


Economics of 100,000 lbs /year appear viable

Portal 31

Tourists sales

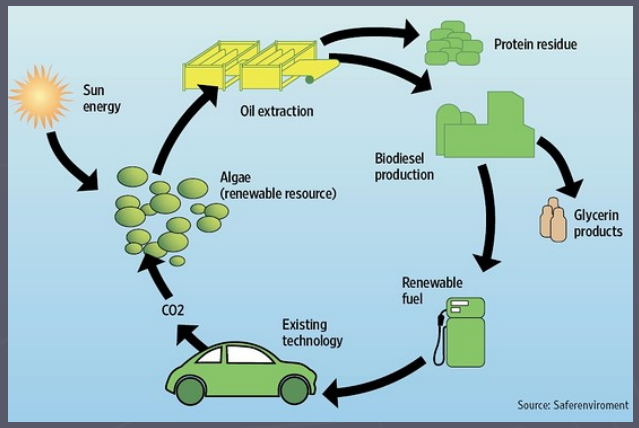
FIGURE 6. How aquaculture or fish farming creates jobs and income (adapted from Shifflet 2000).



2004 Publication:
Mine Water Aquaculture as an Economic Development Strategy
D'Souza et al JAA 15: 159-171

Can aquaculture assist in long-term use of coal?

Potential of both removing CO_2 and producing biofuels.

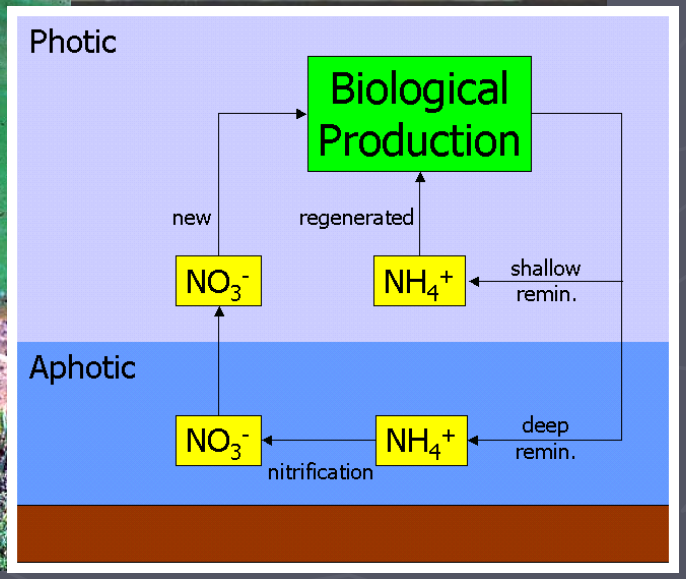


90 acres. Green ponds culturing Spirulina and red ponds with Haematococcus

Aquaculture is largely algae management

Shrimp Hatchery

Oyster hatchery



Kent SeaTech Corporation
Now Kent BioEnergy Corporation
Renewable Energy from Microalgae

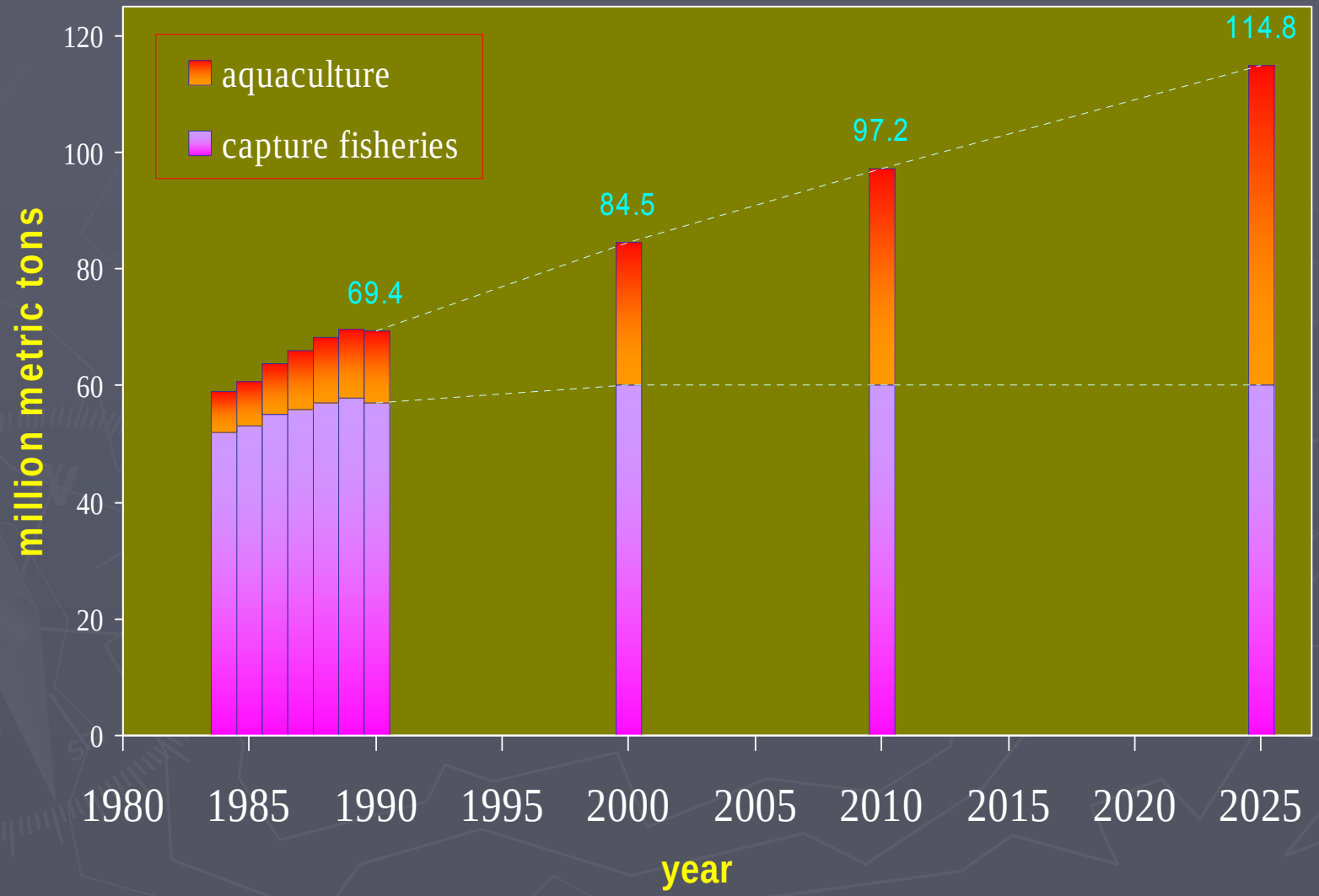
Kent BioEnergy Corporation
Renewable Energy from Microalgae

The Glamour of the Algae Harvest at Kent BioEnergy

Kent Bio Energy's Development Facility in Southern California

2-Ac Freshwater System for Aquaculture @ Clemson

All future increases in food fish supplies will come from aquaculture



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More information is available on our website at: www.ksuaquaculture.org