Overview of Aquaculture

Opportunities for adding value to farms in Missouri

Definition

"Aquaculture is the farming of aquatic organisms"

Farming implies some form of intervention in the rearing process to enhance production, such as regular stocking, feeding, protection from disease, harvesting etc.

According to the US Department of Commerce

- "Aquaculture is the fastest growing form of food production. It provides a significant source of protein. Globally, nearly half the fish consumed by humans is produced by fish farms. This trend is expected to continue. At the same time, demand for safe, healthy seafood is also expected to grow"

Why Aquaculture?

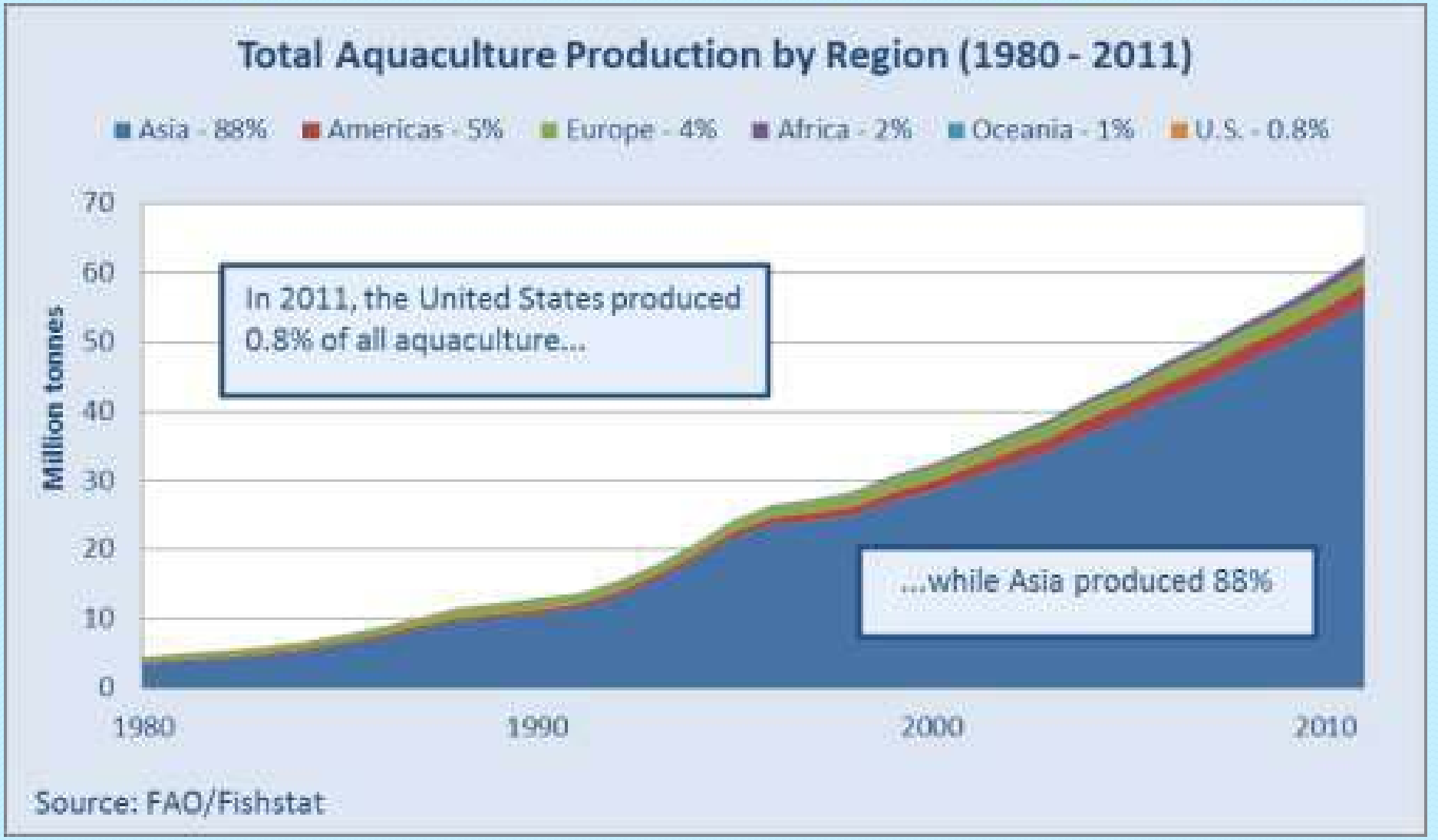
- Global collapse of major commercial fisheries
- While wild-catch supplies will decrease seafood consumption continues to increase as an important source of protein
- Only aquaculture can bridge the gap

What are the global trends?

- World aquaculture production continued to grow in 2013, reaching 97.2 million tonnes (live weight) with an estimated value of USD 157 billion.
- The production of farmed food fish (finfish, crustaceans, molluscs and other aquatic animals) was 70.2 million tonnes, a 5% increase from 2012.
- The contribution of aquaculture to the world total fish production reached 43.1 percent. It was only 30.6 percent in 2003.
- Globally, inland finfish aquaculture has been the most important driver for total increase in annual output. This subsector contributed 64.9 percent to the 2003–2013 increase in world farmed food fish production.

http://www.fao.org/3/a-i4899e.pdf

Total Aquaculture Production



U.S. Seafood Imports & Exports
(1976 - 2011)

Source: FAO/FishStat


Doubling current U.S. aquaculture could result in 50,000 jobs and over $1 billion farm-gate value.

Advantages of Aquaculture

- Can manipulate both the fish and the production method to achieve objectives
- Proven methods have been developed: Pond, cage culture, raceways, recirculating systems
- The bulk of aquaculture production is composed of a small number of species
  - In 2010, about 30 species accounted for 78 percent of global production

However there are limitations …

- Liability – requires a relatively large investment
- Risks – environmental impact (effluent discharge, disposal of waste)
- Requires knowledge of fish biology, production methods, water chemistry (a lot of training)
- Requires marketing skills and development

Legal Requirements…..

- Fish must originate from a commercial facility (broodstock, fingerlings etc….)
- Approved aquatic species list (MDC)
- Effluent discharge is regulated by Missouri DNR

Processing Requirements

- Must meet county health requirements (food handling)
- Processing of aquatic species is under the authority of the Food and Drug Administration (FDA)
- HAACP (Hazard Analysis and Critical Point) Plan is required – more training is required

Requirements for Success…..

- Adequate water supplies
- Capital
- Must acquire knowledge and technical skills
- Markets must be developed
- Produce a marketable species
  - Acceptable product form (fillets, whole, live)
  - Competitively priced

Aquaculture: the reality

- Land - facilities
- Water
- Money
- Training

Species Selection

- Producer's expertise
- Marketability
- Climate
- Water temperatures
- Production economics
- Species biology
- Production methods

Species Production

Types of Aquaculture in Missouri

- Food Fish (warm- and cold-water)
- Baitfish
- Ornamentals
- Sport Fish for Pond Stocking
- Fee Fishing
- New species such as freshwater prawn, shrimp etc.....
- http://agriculture.mo.gov/abd/aqua/

Food Markets

Catfish

Largemouth Bass

Freshwater prawns

Food Fish Culture-Sunfishes

Bluegill

Hybrid sunfish

Live Fish Market

Grass carp

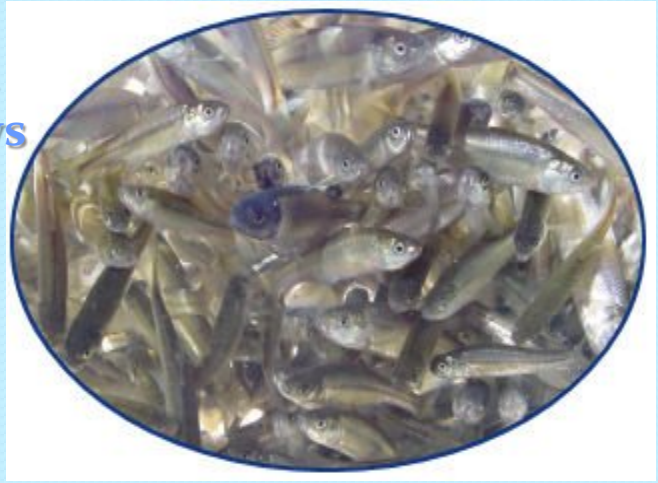
Largemouth bass

Pond Stocking

- Channel catfish
- Largemouth bass
- Bluegill
- Redear sunfish
- Rainbow Trout
- Forage fish
- Grass carp

Bait and Forage Fish Culture

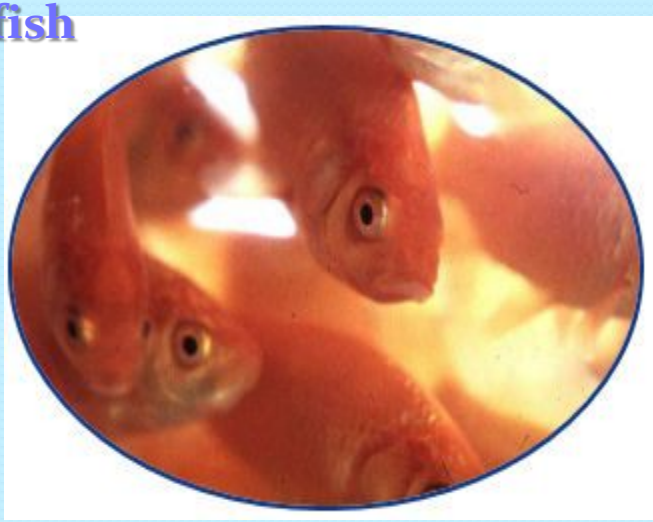
Fathead Minnows



Shiners

Rosey Reds

Goldfish



Pond Reared Ornamental Fish

Fancy Koi

Bubble eye

Orandas

Common Goldfish

Black moors

Paddlefish "Ranching" Program

- Under a simple contract agreement paddlefish fingerlings are stocked in ponds or lakes at no cost to the pond owner; a leasing arrangement;

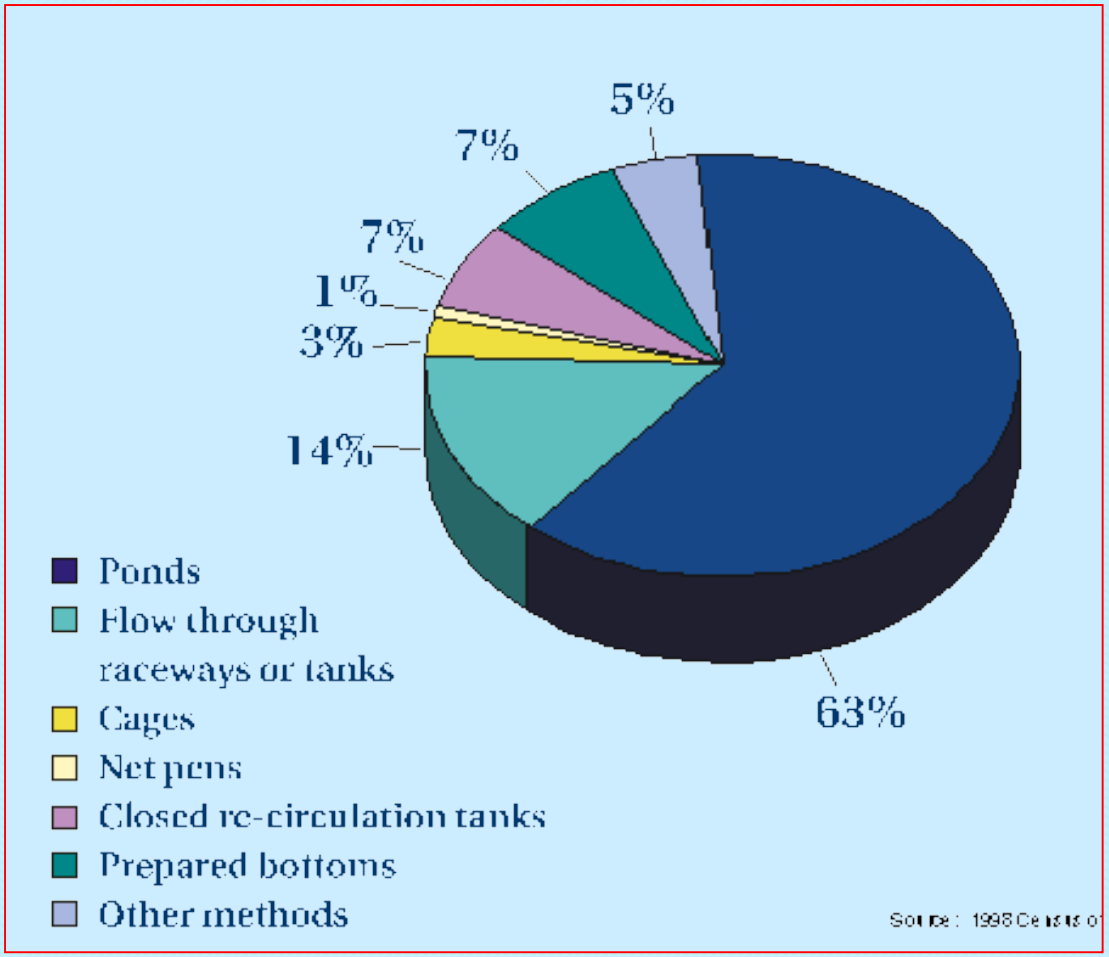
  Allows for other uses of the pond

- Ponds are stocked during the fall and winter

  Stocking rate: 4 to 6 fish per surface acre
  Dependent on fertility of pond water

Production Methods

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



Ponds

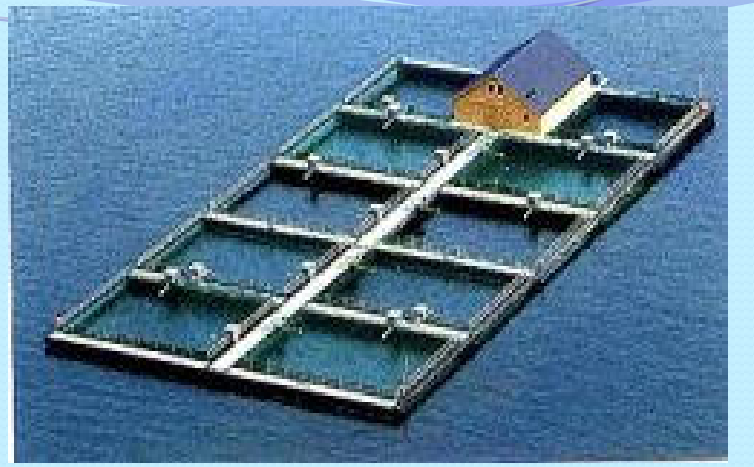
- Produce Broodstock
- Produce Fingerlings
- Produce Fish for growing out market size

Pond Culture – Levee Ponds

- Large Production Ponds- Catfish, Hybrid Striped Bass, Largemouth Bass
- Bait Culture-fathead minnows, golden shiners, green sunfish, gold fish.

Over 300,000 Watershed Ponds in Missouri

Cage Culture



Sunfish cage culture

Catfish cage culture with a 3 ft X 3ft X 3ft cage and feeding ring or with other designs

Hybrid bass cage culture

Advantages and Disadvantages

- A method to raise fish in large – deep ponds or lakes and use pond for other objectives
- Relatively low startup costs
- Good way to learn aquaculture at a small scale

However….

- Water quality may be difficult to manage
- Higher potential for disease outbreak
- Vandalism

Raceway Culture

Commercial trout hatchery

Crystal Lake Fisheries near Ava, MO

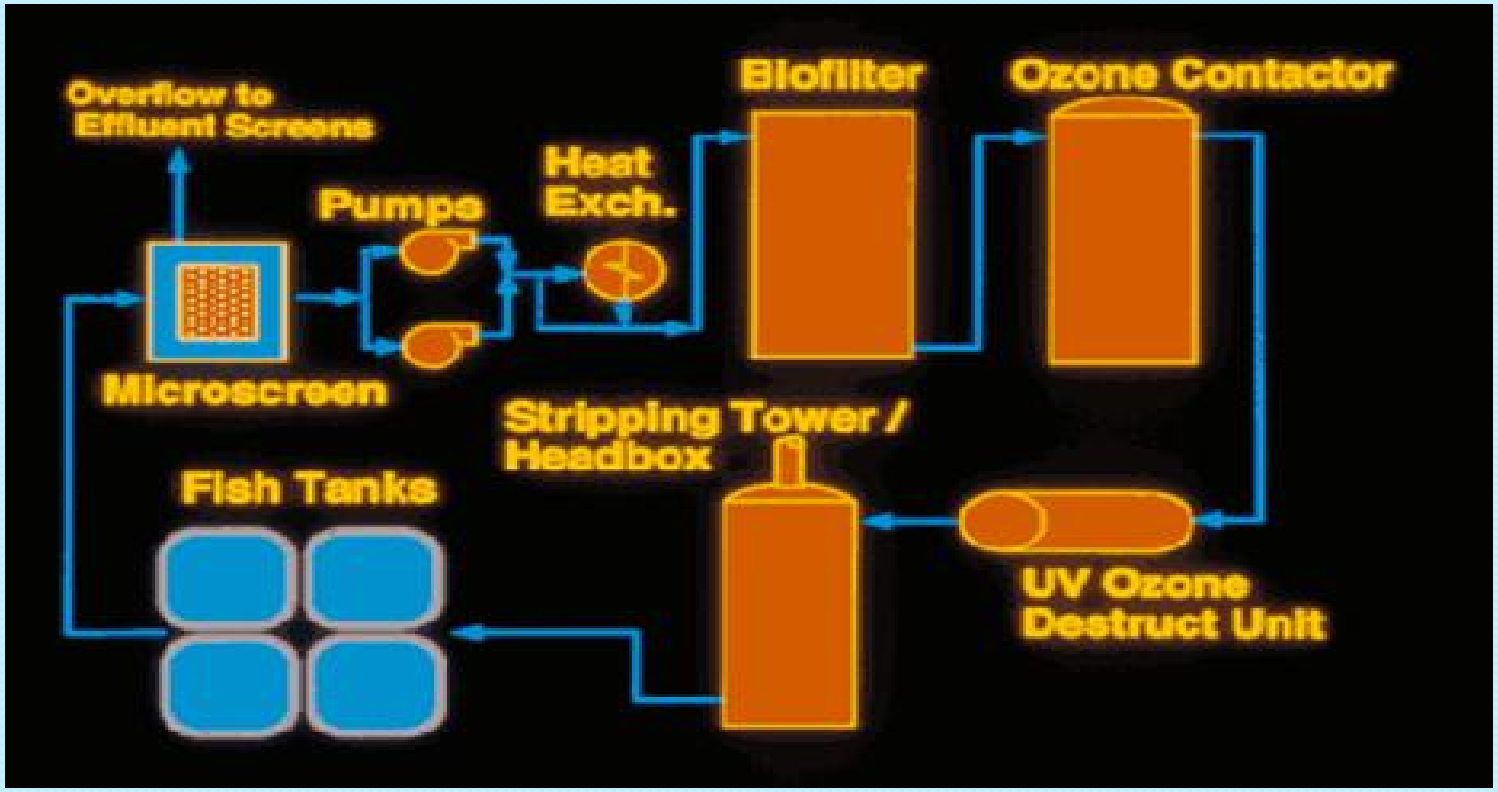
Shepherd of the Hills Trout Hatchery

Spring water source

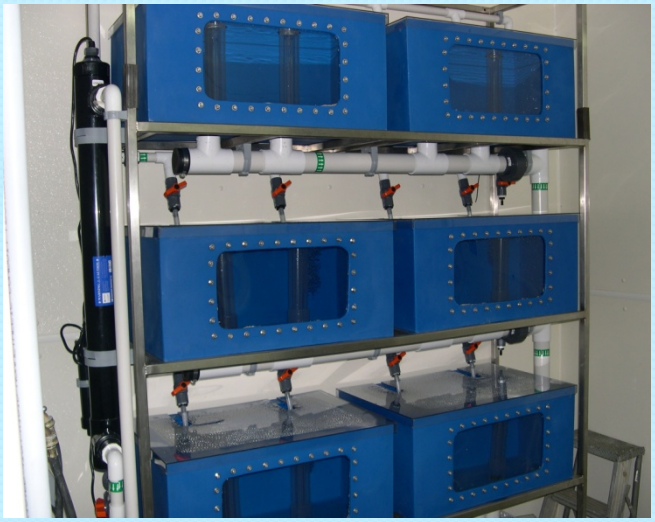
In-Pond-Raceways

Indoor Recirculating Systems

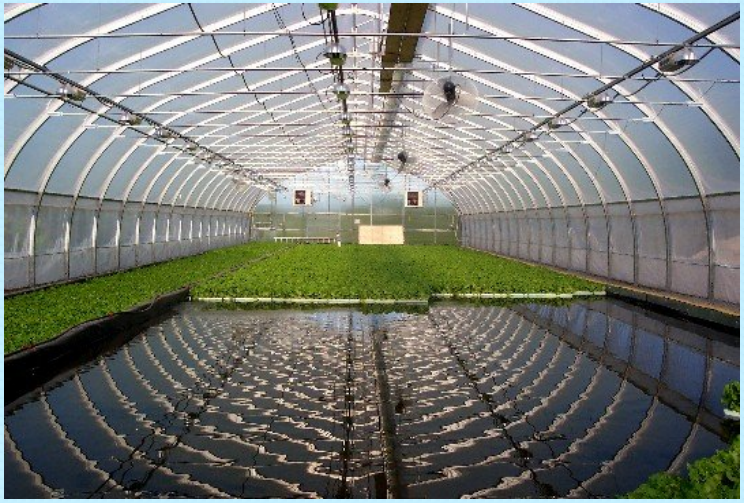
Basic Design



Many Examples



Aquaponics



- The Association is committed to improving the quantity, quality, and efficiency of aquaculture production in an environmentally responsible manner with maximum opportunity for profitability in all sectors of the industry.
- The Missouri Aquaculture Association is open to all individuals and firms with an interest in aquaculture.
- http://moaquaculture.org/index.html

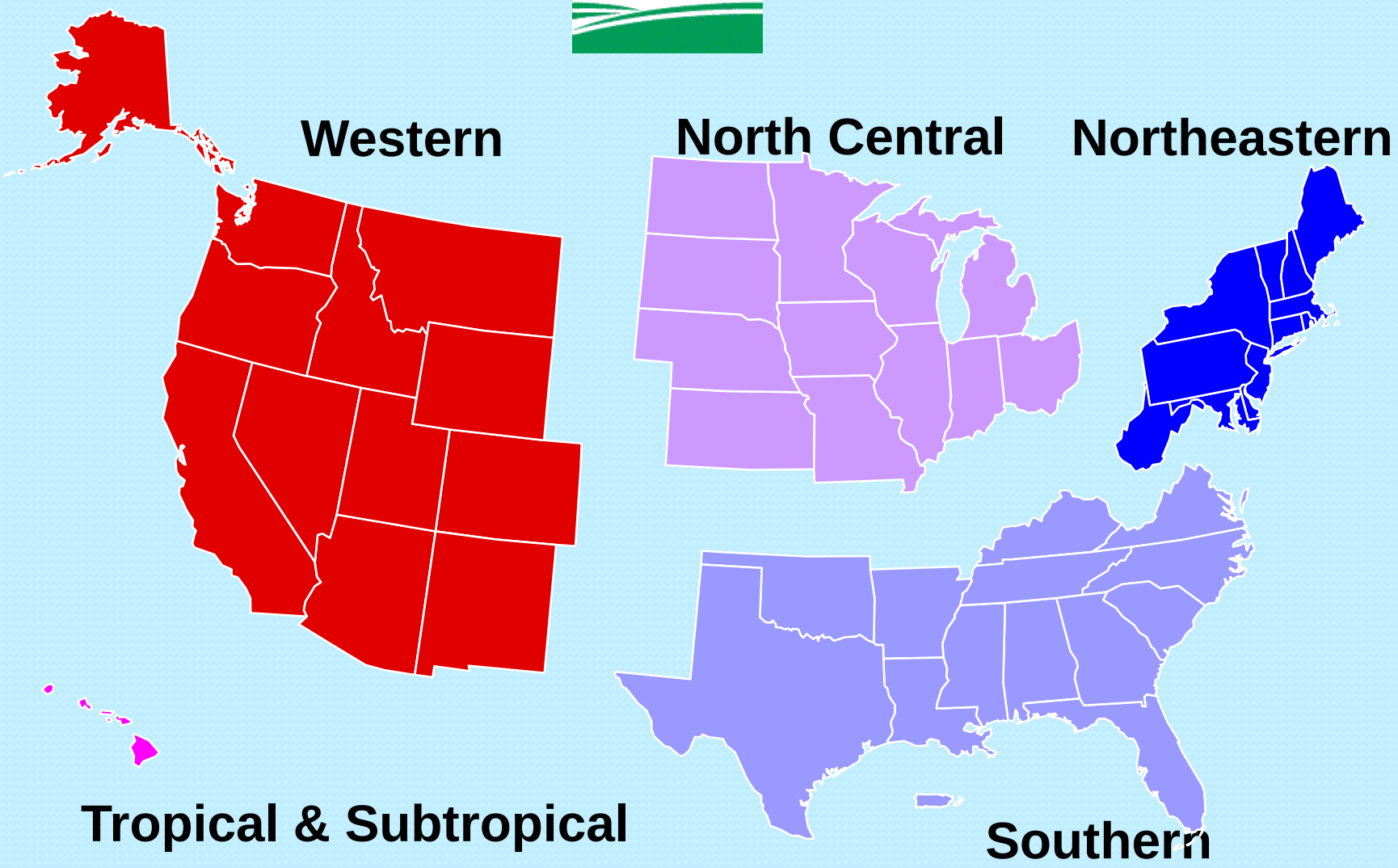
Missouri Aquaculture Council

- The MAC was established in 1989 by statute to administer the "**Aquaculture Marketing Development Fund**" -

Goals:

- promote the consumption of fish and fish products
- increase the efficiency of aquaculture production through marketing
- provide for research and education programs that benefit Missouri producers
- implement the provisions of the enabling legislation as they relate to the production and marketing of fish and fish products
- http://moaquaculture.org/mac.html

Regional Aquaculture Centers



Selected Resources

- Missouri Aquaculture Association: http://moaquaculture.org/pdf/2016MoAADirectory-online.pdf
- Overview of Missouri Aquaculture regulations: http://moaquaculture.org/regs.html
- MU Extension Fisheries and Aquaculture publications: http://extension.missouri.edu/main/DisplayCategory.aspx?C=555
- Missouri Department of Conservation pond management and fisheries information: http://mdc.mo.gov
- USDA North Central Regional Aquaculture Center: https://www.ncrac.org/
- USDA NCRAC publications and educational resources: http://www.ncrac.org/publications
- USDA Southern Regional Aquaculture Center: http://srac.msstate.edu/
- USDA SRAC publications and educational resources: https://srac.tamu.edu/
- Lincoln University Aquaculture Research Program: https://www.lincolnu.edu/web/cooperative-research/aquaculture