

# AQUACULTURE SUMMIT



**University of Idaho**

Aquaculture Research Institute



**WE'VE  
GOT  
THE  
FISH.**

**NOW  
WHAT?**

# WHY ARE WE HERE TODAY?



- We will describe ARI
  - Facilities & Resources
  - Research programs and projects
  - Our 'Industry Affiliate Program'
  - ARI's aspirations
- We will hear from prominent experts
- We will hear from you
  - What are industry and agency priorities?
  - Is ARI positioned to address these priorities?
  - What is the best way to deploy ARI resources?



# ***FUTURE SUMMITS***



- ***Focus will be on specific topics***
  - Fish culture technologies
    - RAS or hybrid RAS systems, aquaponics, etc.
    - Utilizing underground water resources (geothermal, saline)
    - Selective breeding of marine fish
    - Sterilization technologies or sex-reversal
  - Feed ingredient opportunities
  - Consumer trends, product development, fish welfare issues, etc.
  - Geopolitical and trade issues that affect aquaculture
- ***Summits will bring together diverse segments of the aquaculture and fisheries resource worlds***
  - Scientists already talk to scientists
  - We see value in summits with diverse participation
    - Consumer science, social science, business and finance, etc.
    - Producers, suppliers, distribution and marketing
    - Regulators, funding agencies

# EVOLUTION AND OPPORTUNITIES FOR THE AQUACULTURE RESEARCH INSTITUTE



**University of Idaho**

Aquaculture Research Institute



Hagerman Station



New Moscow Facility

**RONALD W. HARDY, DIRECTOR EMERITUS**

# BRIEF ARI OVERVIEW

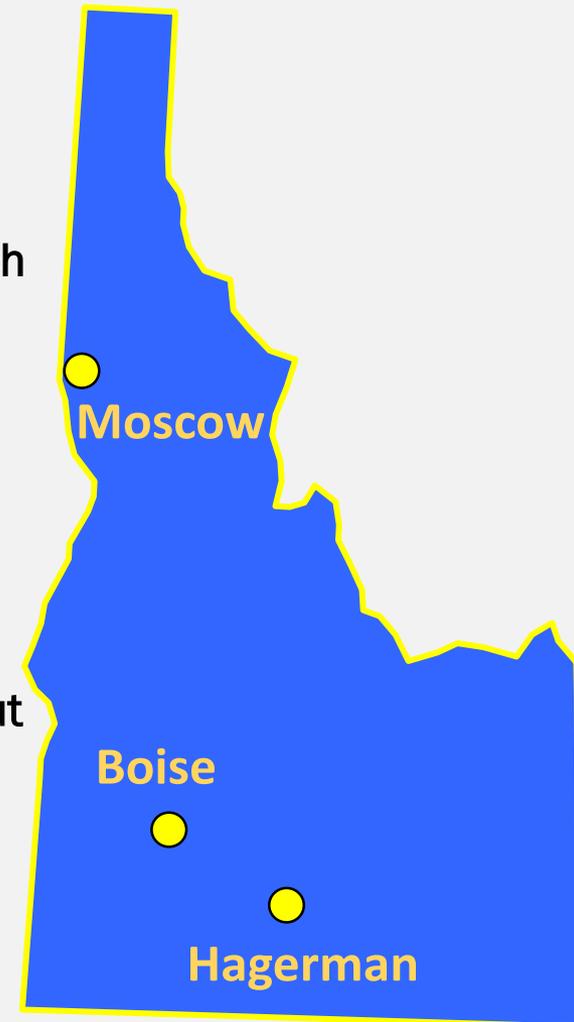


## What is ARI?

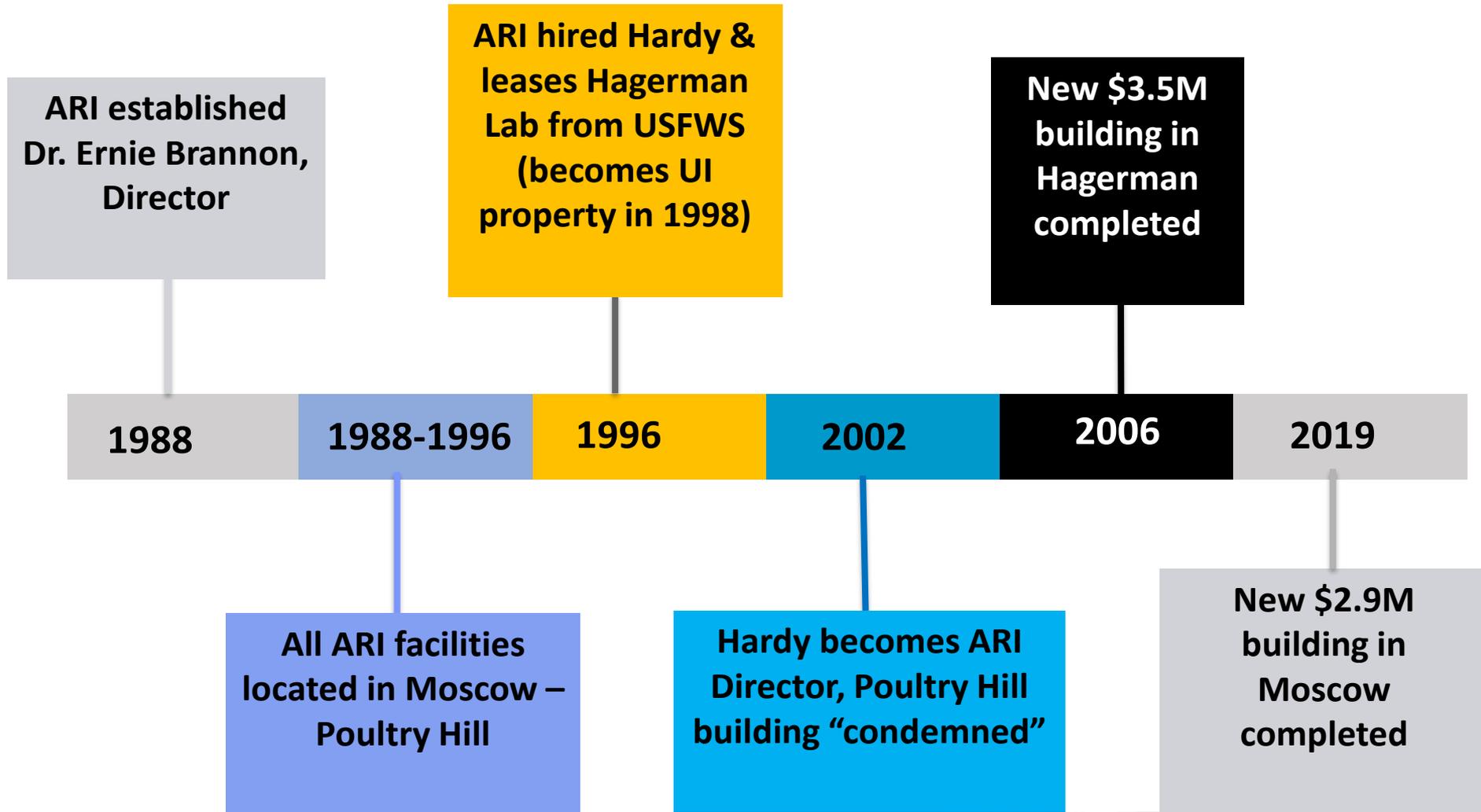
- One of four UI Institutes created to conduct and facilitate inter-disciplinary research across UI colleges and departments
- Institutes report to the Vice President for Research and Economic Development
- Primary activity is research
  - ARI does not grant degrees; Colleges grant degrees

## Where does ARI operate?

- Began at UI Moscow campus in 1988
- Expanded in 1996 by obtaining the Hagerman Station from the USFWS in heart of the Idaho trout industry
- In 2019, new facilities completed in Moscow to undertake research with salmon and marine fish research



# AQUACULTURE RESEARCH INSTITUTE TIMELINE

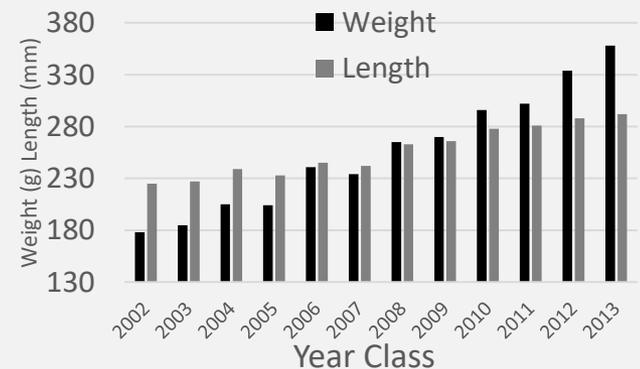


# BRIEF ARI OVERVIEW



## ■ *What does ARI do?*

- ARI's charter is to contribute to the UI's research and teaching missions and conduct specific research projects with agencies and industry
  - ARI focuses on issues facing state, federal and tribal fisheries agencies, and the aquaculture industry
  - ARI uses advanced research technologies to solve practical problems
- ARI works on today's problems but also looks ahead
  - What are emerging challenges?
  - Good example is selective breeding of trout for high performance on plant protein feeds
    - We developed this project in 1998 and got initial funding in 1999
    - At the time, the trout strain wasn't needed
    - Only 15+ years later did industry need the fish
    - We anticipated the need, saw the value and obtained the resources to do it



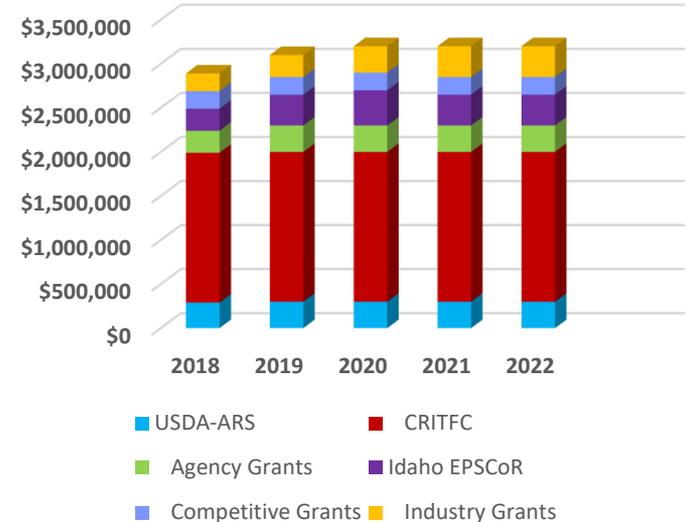
# BRIEF ARI OVERVIEW



## ■ *How is ARI funded?*

- State funding supports building M & O, plus a few faculty/staff positions
- External funds support research and pay research staff
  - Competitive grants from USDA, NSF, other agencies
  - Research contracts with private companies
- Formal cooperative agreements
  - USDA-ARS in selective breeding of trout (since 1999)
  - Columbia River Inter-Tribal Fisheries Commission (since 2005)
    - Population genetics of Idaho's anadromous fish (Pacific salmon & steelhead trout)

Estimated Direct Income for ARI



# ARI'S AREAS OF EXCELLENCE



- **Fish nutrition and nutritional physiology**
  - Low phosphorus feeds, low-pollution feeds
  - Alternative protein and lipid sources for sustainable feeds
  - Functional feeds
- **Molecular genetics**
  - Application of genomics to nutrition, physiology and fish immune function
- **Genetics and selective breeding**
  - 19-year effort funded by Congress via USDA
- **Fish health**
  - Vaccine development
  - Functional feeds that boost immune function

# ARI RESEARCH FOCUS HAS EVOLVED



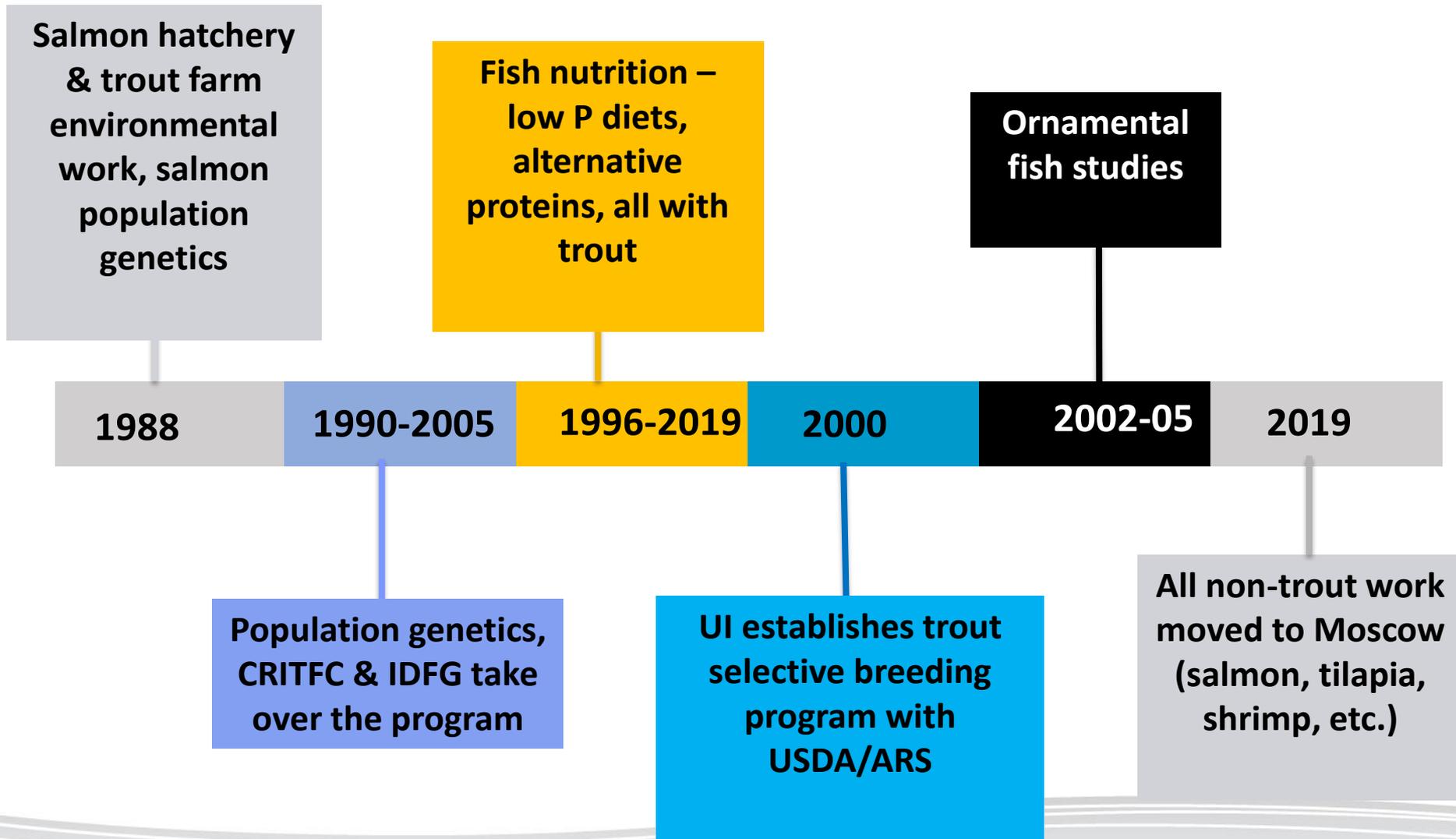
- Industry and agency priorities change
- Tools used in research also change
- ARI has remained focused on its goal:

**“BECOME THE TOP UNIVERSITY RESEARCH PROGRAM  
IN AQUACULTURE IN THE USA”**

- This requires facilities, equipment, faculty, staff, students, and agility



# AQUACULTURE RESEARCH INSTITUTE PROGRAMS



# AQUACULTURE IS ANIMAL SCIENCE



- Animal science and all livestock/poultry rearing is based on four distinct but inter-related disciplines
  - Nutrition and feeding
  - Genetics and selective breeding
  - Physiology, including reproductive and metabolic physiology
  - Health management
  - Animal scientists refer to this as the four-legged stool
- However, fish are aquatic organisms, so we need a fifth discipline -
  - Water quality management



# IDAHO AND GLOBAL AQUACULTURE



- **Freshwater resources are fully utilized**
  - Irrigation, industry, food processing, manufacturing, transportation, hydroelectric energy, recreation, etc.
- **Climate change, population growth and economic development add to this challenge**
- **Aquaculture can only expand in the marine environment or by employing water-reuse systems**
- **ARI is positioned to address these challenges with its new Moscow research facility**
  - Idaho's industry and agencies provide a real-world laboratory to address global challenges

# SHRIMP REARING IN MOSCOW - RAS



# ARI HAS VALUABLE PARTNERSHIPS



- **USDA's Agricultural Research Service**
  - Trout selection program now in its 19<sup>th</sup> year and 9<sup>th</sup> generation
  - Resulted in a trout strain that thrives on all-plant protein, high-soy feeds
  - Selected trout strain is being used by industry
- **Columbia River Inter-Tribal Fisheries Commission**
  - Genetic sequencing of salmon/steelhead returning to the Columbia River to identify stocks
  - This information is used for fisheries management and in restoration efforts



# ARI SUPPORTS INDUSTRY NEEDS



- **Feed ingredients**
  - Product development
  - Digestibility, palatability, nutritional value
  - Feeding trials
  - Data for FDA approval
- **Development of genetic tests and tools**
  - Molecular diagnostics
  - Breeding programs
- **Novel species for aquaculture**
  - Ornamentals
  - High-value food fish



# ARI COMPLEMENTS AGENCY RESEARCH



- Agencies and industry have research capacity and do excellent work
- ARI can complement this by exploring mechanistic aspects of nutrition, selection, physiology to improve hatchery fish quality
- ARI is involved in landscape genomics
  - Fish distribution and agent-based modeling



# ARI IS EXPANDING IN NEW AREAS



- Lead regional research projects
  - Example – Idaho EPSCoR GEM3  **GEM3**  
Genes by Environment  
Modeling · Mechanisms · Mapping
    - “Linking Genome to Phenome to Predict Adaptive Responses of Organisms to Changing Landscapes”
    - \$24M, 5-year project involving all Idaho universities
- Expand research beyond trout (salmon, shrimp, marine species)
  - Additional opportunities for industry supported projects
  - This will attract more PhD students
    - Formalize partnerships with foreign universities in Chile, Korea, India, Greece, Mexico and others

# ARI'S ASPIRATIONS



- Use ARI's expertise and resources to increase value for US aquaculture industries
- Remain forward-thinking and creative to address challenges as well as opportunities
- Integrate the four (or five) legs of the stool in novel, interdisciplinary ways
- Seek new partnerships and collaborative opportunities with industry

**“BECOME THE TOP UNIVERSITY RESEARCH PROGRAM IN AQUACULTURE IN THE USA”**

