

WORKFORCE DEVELOPMENT PANEL





AQUACULTURE WORKFORCE DEVELOPMENT

EMMA HAUSER

AQUACULTURE OUTREACH SPECIALIST

UNIVERSITY OF WISCONSIN STEVENS POINT NORTHERN
AQUACULTURE DEMONSTRATION FACILITY

WISCONSIN SEA GRANT

WHAT MAKES UWSP NADF UNIQUE

- ✓ **Aquaculture Experience** Expert staff and skilled experience available at the facility working with variety of species/systems
- ✓ **Commercial Scale & Industry Applied** Research and Demonstration (23,000 –44,000L RAS grow-out systems)
- ✓ **Over 15 Species of Freshwater Fish Researched** at various life stages including food fish, bait fish and conservation species
- ✓ **Various Production Systems** showcasing RAS, flow-through, outdoor pond, cold_water and cool_water incubation, and larval systems

= **TECHNICAL ASSISTANCE**

= **RESEARCH CAPACITY**

= **EDUCATIONAL OPPORTUNITIES**



1. SPARKING INITIAL INTEREST

- EDUCATIONAL TOURS (~200 K-12 ANNUALLY)
- HANDS ON ACTIVITIES AT EVENTS





2. INCORPORATION INTO THE CLASSROOM-
DONATIONS, TECHNICAL ASSISTANCE, RELATIONSHIP
BUILDING

The diagram on the left illustrates the aquaponics cycle. It shows a 'RESERVOIR' containing a 'WATER PUMP' and an 'AIR PUMP' connected to an 'AIR STONE'. A 'TIMER' is also shown. Water is pumped from the reservoir to a 'GROW TRAY' where plants are growing. The water then returns to the reservoir. The photograph on the right shows a large-scale hydroponic greenhouse with multiple levels of plants growing in a nutrient-rich water solution.

What is Aquaponics?

Grow Fish and Food
Fish poop fertilizes plants



3. OWNERSHIP, INCENTIVES, FUTURE
POSSIBILITIES- INDEPENDENT STUDY, INTERNSHIPS,
APPRENTICESHIPS





FUTURE INITIATIVES:

- **STREAMLINE EFFORTS & NATIONAL COLLABORATION** (USAS, NAA, AFS CERTIFICATION).
- **BUILD UPON EXISTING NETWORKS** (4-H/AGRICULTURE PROGRAMS)
- **CURRICULUM ENHANCEMENT** (WISCONSIN SEA GRANT PARTNER)
- **LEVERAGE GRANTS/FUNDING TO SUPPORT INITIATIVE**
- **DEVELOP PRACTICES FOR REACHING HIGHSCHOOL & UNDERGRADUATE STUDENTS**
- **DETERMINE IMPACTS**



Outreach Activity

Inspiring and Learning Opportunity

Dong-Fang Deng

Aquaculture Nutrition Lab

School of Freshwater Sciences, University of Wisconsin-Milwaukee



Education

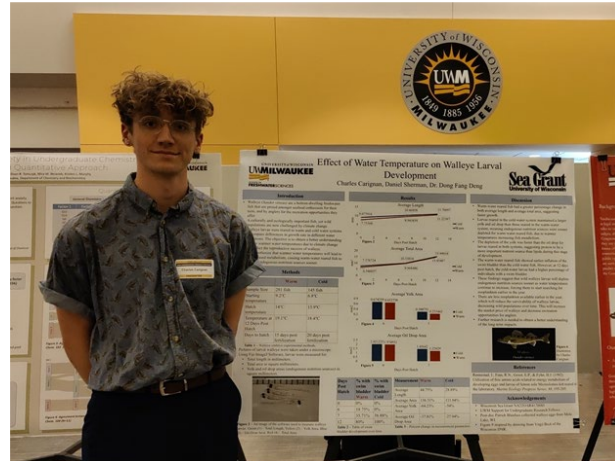
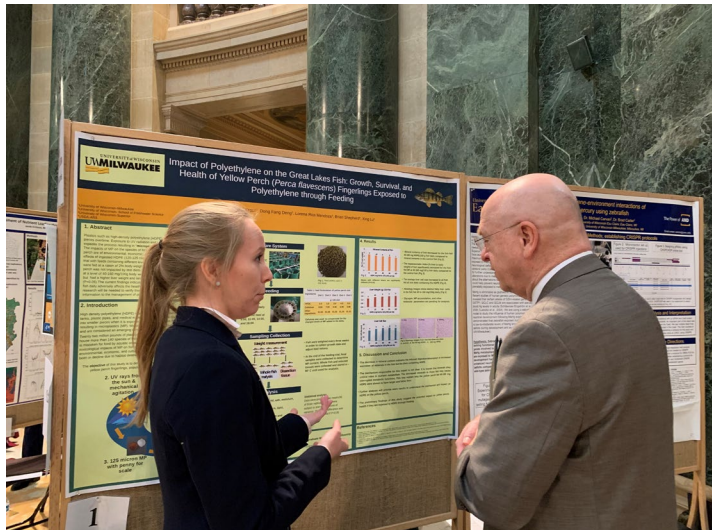
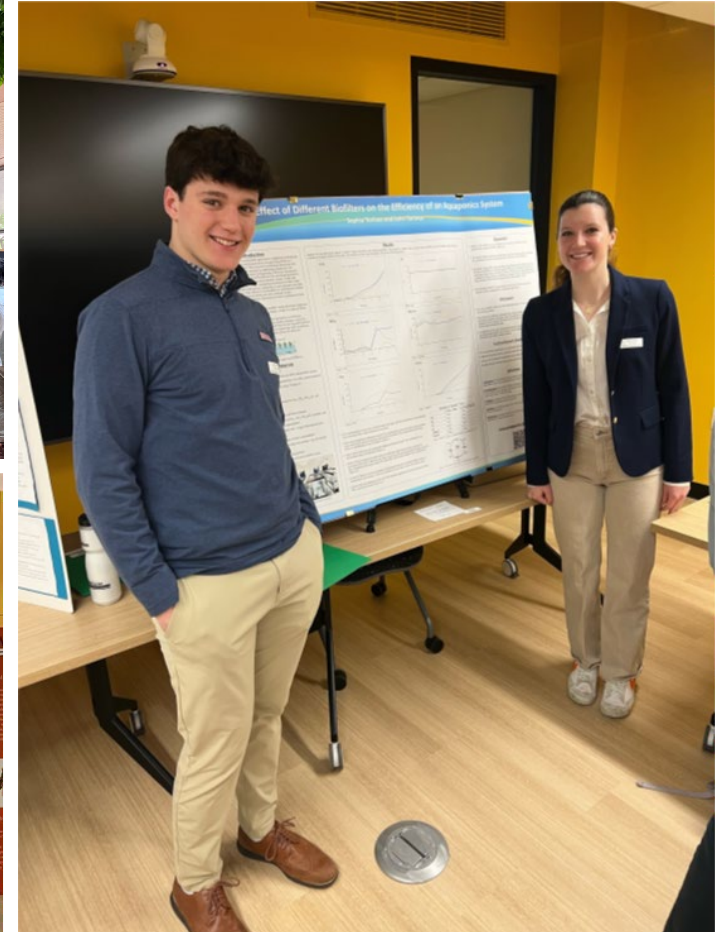
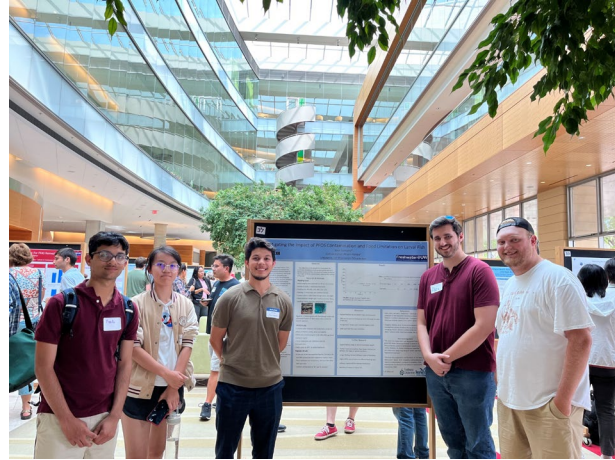
Research Tours and Demonstration



Hands-on Learning undergraduate and high school students



Communication





Aquaculture in Action

TOOLS FOR TEACHING SCIENCE

@ Maryland Sea Grant

J. Adam Frederick

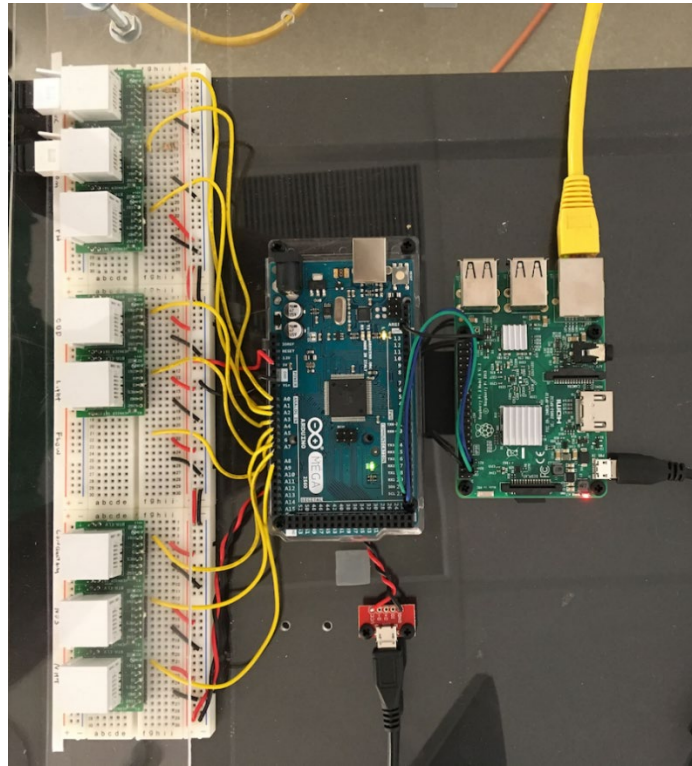
Assistant Director for Education

Maryland Sea Grant College

Institute of Marine and Environmental Technology



Aquaculture in Action- tools for teaching science



- Technology integration
- Hands-on science
- Long-term research and data collection
- Raise and release native species

Aquaculture in Action- tools for teaching science



VOLUMES

| | |
|-----------------------------|--------------------------|
| TANK SIDE A: | 61.36 CUBIC FEET |
| TANK SIDE B: | 61.36 CUBIC FEET |
| MAIN BIOFILTER: | 12.50 CUBIC FEET |
| SETTLEMENT TUB: | 25.45 CUBIC FEET |
| MAIN SUMP: | 8.48 CUBIC FEET |
| ANAMMOX TUBS: | 1.39 CUBIC FEET |
| EMPTY FILTER: | 3.14 CUBIC FEET |
| BIOBEAD FILTER: | 3.94 CUBIC FEET |
| TOTAL PIPING VOLUME: | 5.45 CUBIC FEET |
| TOTAL SYSTEM VOLUME: | 183.07 CUBIC FEET |

INDEX OF TANK DRAWINGS

| | |
|-----|-------------------------|
| T.1 | AERIAL VIEW |
| T.2 | VIEW FROM THE CLASSROOM |
| T.3 | VIEW FROM OUTSIDE |
| T.4 | TANK DETAILS |

FLOW RATE ANALYSIS

FLOW RATE TRIALS BELOW DISPLAY THE LITERS OF WATER BEING PUMPED OUT IN LITERS PER SECOND. TRIALS 1-5 WERE DONE BY PULLING WATER FROM TANK SIDE A, WHEREAS TRIALS 6-10 WERE DONE FROM TANK SIDE B.

| TRIAL | FLOW RATE |
|----------------------------|---------------------------|
| 1 : | 0.083 LITERS / SEC |
| 2 : | 0.080 LITERS / SEC |
| 3 : | 0.074 LITERS / SEC |
| 4 : | 0.074 LITERS / SEC |
| 5 : | 0.081 LITERS / SEC |
| 6 : | 0.103 LITERS / SEC |
| 7 : | 0.103 LITERS / SEC |
| 8 : | 0.105 LITERS / SEC |
| 9 : | 0.099 LITERS / SEC |
| 10 : | 0.104 LITERS / SEC |
| AVERAGE FLOW RATE: | 0.091 LITERS / SEC |
| STANDARD DEVIATION: | 0.013 LITERS / SEC |

OUTSIDE

AERIAL VIEW



Raspberry Pi. Photograph: Daniel Strain

| | | |
|--|-------------|---------------|
| COMPLETIONS: | MSL | CHRIS TOLLINI |
| DESIGNING: | MSL | 10/2008 |
| ANNAMOX TANK SYSTEM SCIENCE RESEARCH I SOUTH CARROLL HIGH SCHOOL | AERIAL VIEW | |
| LEANDSMAN ENGINEERING | T.1 | |



ELLIOT NELSON
MICHIGAN STATE UNIVERSITY
MICHIGAN SEA GRANT





The Michigan Aquaculture Workforce Pathway



Elliot Nelson
MI Sea Grant / MSU Extension

Dr. Barbara Evans
Lake Superior State University

Recruiting and Training Teachers

Recruiting and Training Teachers

- Recruiting through existing networks
 - Michigan Math and Science Centers
 - Center for Great Lakes Literacy
 - National Sea Grant aquaculture contacts



Training Teachers – Professional Development

- 3 day workshops in MI and WI (2018)
- 2 Day Workshops at LSSU (2022 and 2023)
- ½ Day Workshop at Wisconsin Aquaculture Association Meeting(2020 and 2023)
- Presentations at Michigan Science Teachers Association (2019, 2020, 2021)
- Presentations at aquaculture associations and Center for Great Lakes Literacy
- Over 200 teachers and educators trained in why aquaculture is important and how to use aquaculture in the classroom since 2019



Training Teachers – Compiling and Distributing Resources

Aquaculture ... > 22-24 Teacher ... > Resource Folder F...

Type ▾ People ▾ Modified ▾

Folders

- Presentations from Works...
- Pictures
- Lesson Plans and Unit Plans
- Additional Resources

Files

- Untitled document
- Teaching Aquaculture Res...

Equip - NCRW - A part of FSA, can find resources for hoop houses and greenhouses
Local conservation (LCC) - conservation based resources for land management, pond management, wetlands and other natural resource topics that may include training or technical assistance and other resources.

Teaching Aquaculture: A Resource Sheet
PDFs, Presentations and More Resources at: <http://bit.ly/SeaGrant>
Aquaculture Fun Facts:

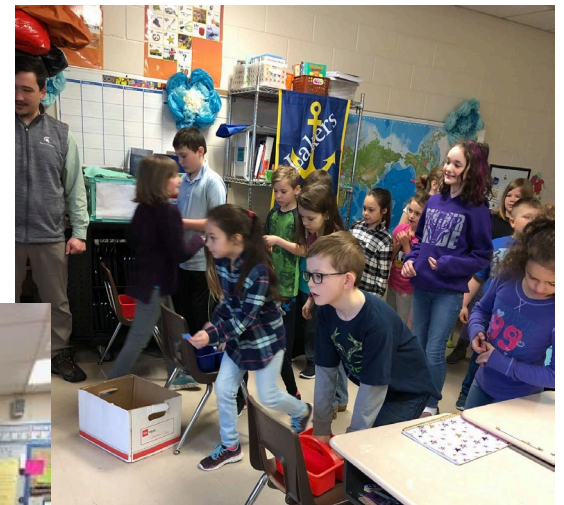


K-8 Programs and High School Aquaculture Challenge



K-8 Programs

- Boat 2 School (6th Grade)
- PreK – 5th Library Program
- 3rd and 5th grade in classroom programs
- 7th and 8th grade programs at LSSU-CFRE
- Since 2018, over 1000 PreK-8th Grade youth exposed to aquaculture as food production and important for food security!



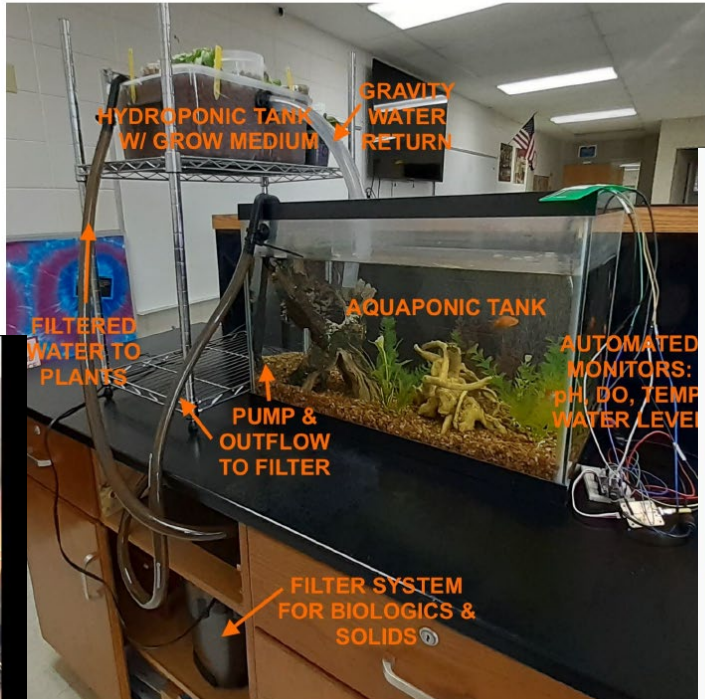
8th-12th Grade - Aquaculture Challenge

- High School Competition

- A 4 part Challenge

- Build
- Monitor
- Business Plan
- Seafood Outreach

SOARFF SYSTEM SUPPORTING



LABELED SYSTEM PIC



WOLF DEN AQUAPONICS

100 Wolf Run
Winneconne WI, 54986

| | |
|--------------------------|--------------------|
| Leaf Lettuce | 51 cents per pound |
| Tilapia Fillet | \$8.00 per fillet |
| Cucumber | 50 cents each |
| Avon Spinach | 51 cents per pound |
| Cherry Tomatoes | \$2 per pound |
| Zucchini | 50 cents each |
| Super Sweet Tomato | \$2 per pound |

Aquaculture Challenge

- One-on-One Support is key
- Teacher Training is key
- Virtual platform has made it very open and accessible
- Over 50% low income schools.
Diverse student populations
- Teacher and student post-evaluations
- Since 2018
 - Over 500 high school youth participants!
 - Over 50 Teacher coaches
 - Schools from MI, WI, OH, MN, NY, NE, IA, IL and IN



Post-secondary Training at LSSU

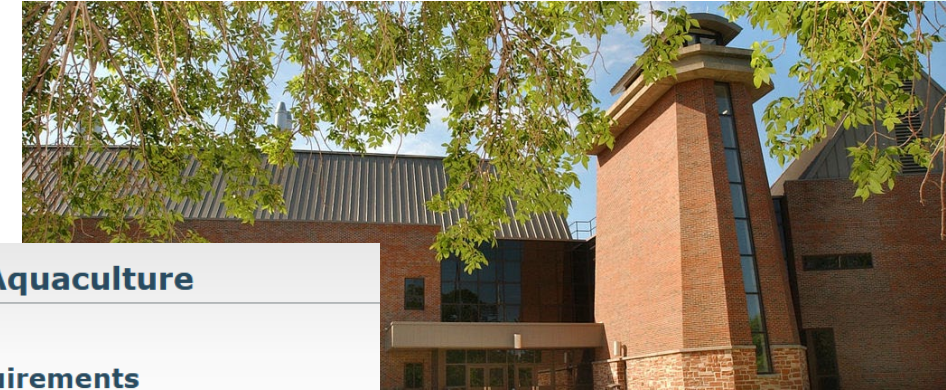
Post-secondary Curriculum Development: MI Sea Grant led effort

- Advisory group
- In depth workshop
- Model curriculum document
- Eventually utilized by LSSU to create programs



Lake Superior State University Aquaculture Programs

- Long Term programs that have channeled people into the industry
 - Fisheries and Wildlife Major
 - Biology Major
- Programs Created in 2018 and 2019
 - Aquaponics Entrepreneurship AAS (16 enrolled or graduated)
 - Aquaponic Production Minor (3 enrolled or graduated)
 - Aquaculture Minor (6 enrolled or graduated)
- These programs have led to more:
 - Aquaculture Classes
 - Aquaculture Internships



Minor: Aquaculture

Degree Requirements

Total Credits Required: 20

Required Courses:

- [MRKT281](#) Marketing Principles and Strategy 3
- [NRES310](#) Ichthyology 3
- [NRES345](#) Limnology 4
- [NRES372](#) Freshwater Fish Culture 3
- [NRES389](#) Internship in (Aquaculture) 3

Select one of following:

- [ACTG132](#) Principles of Accounting I 4
- [ECON202](#) Principles of Microeconomics 3

Select one of following:

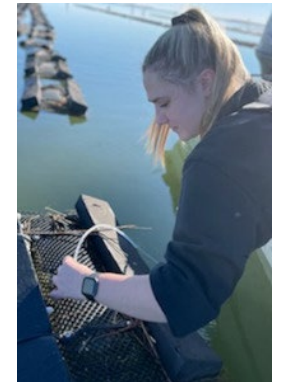
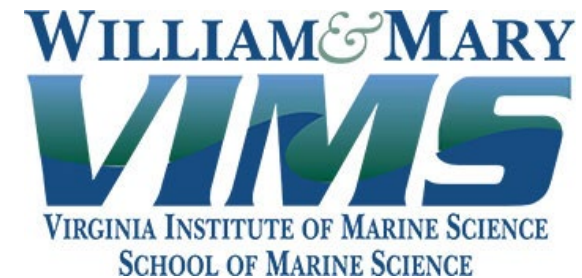
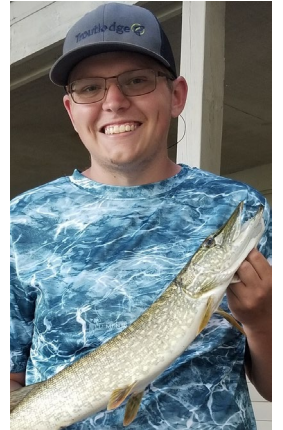
- [BIOL389](#) Internship in (Fish Health) 3
- [NRES450](#) Apprenticeship in (Fish Culture) 1



Recent LSSU Graduates Have moved on to...



ATLANTIC
SAPPHIRE®



Adult / Continuing Education

GLAC activities in 2019-2022

We hosted three Great Lakes Aquaculture Days in 2020-2022

1. Virtual conference with 11 talks and panel discussions ending in a cooking competition
2. Virtual farm tours with Q and A with farmer
3. Hybrid fish health workshop



Events website: greatlakesseagrant.com/aquaculture/events/featured/

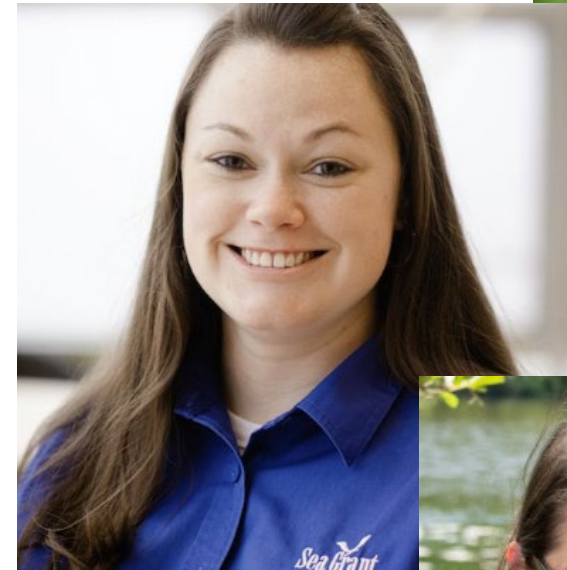
MI Sea Grant New Farmer Resources

**SITE SELECTION PLANS
FOR NEW AND EXPANDING
AQUACULTURE FACILITIES
IN MICHIGAN**



**COMMERCIAL
AQUACULTURE**
in Michigan

SITING GUIDEBOOK





Thank you!

michiganseagrants.org

elliottne@msu.edu - Elliot Nelson - 906-322-0353



SANDRA NAAS
ASHLAND HIGH SCHOOL
AGRICULTURE/NATURAL EDUCATION











OLIVIA DACHEL
COOPERATIVE EDUCATIONAL SERVICE AGENCY



Aquaculture Labor Data

This table shows a list of occupations with job duties that are similar to those of farmers, ranchers, and other agricultural managers.

| | OCCUPATION ▲ | JOB DUTIES | ENTRY-LEVEL EDUCATION ⓘ ⚙ | 2022 MEDIAN PAY ⓘ ⚙ |
|---|--|---|--|---------------------|
|  | <u>Agricultural and Food Science Technicians</u> | Agricultural and food science technicians assist agricultural and food scientists. | Associate's degree | \$46,140 |
|  | <u>Agricultural and Food Scientists</u> | Agricultural and food scientists research ways to improve the efficiency and safety of agricultural establishments and products. | Bachelor's degree | \$74,940 |
|  | <u>Agricultural Engineers</u> | Agricultural engineers solve problems concerning power supplies, machine efficiency, the use of structures and facilities, pollution and environmental issues, and the storage and processing of agricultural products. | Bachelor's degree | \$83,260 |
|  | <u>Agricultural Workers</u> | Agricultural workers maintain crops and tend livestock. | <u>See How to Become One</u> | \$33,290 |
|  | <u>Animal Care and Service Workers</u> | Animal care and service workers attend to or train animals. | High school diploma or equivalent | \$29,790 |
|  | <u>Construction Equipment Operators</u> | Construction equipment operators drive, maneuver, or control the heavy machinery used to construct roads, buildings, and other structures. | High school diploma or equivalent | \$51,050 |

What are Top 5 Best Paying Related Aquaculture Jobs in Wisconsin

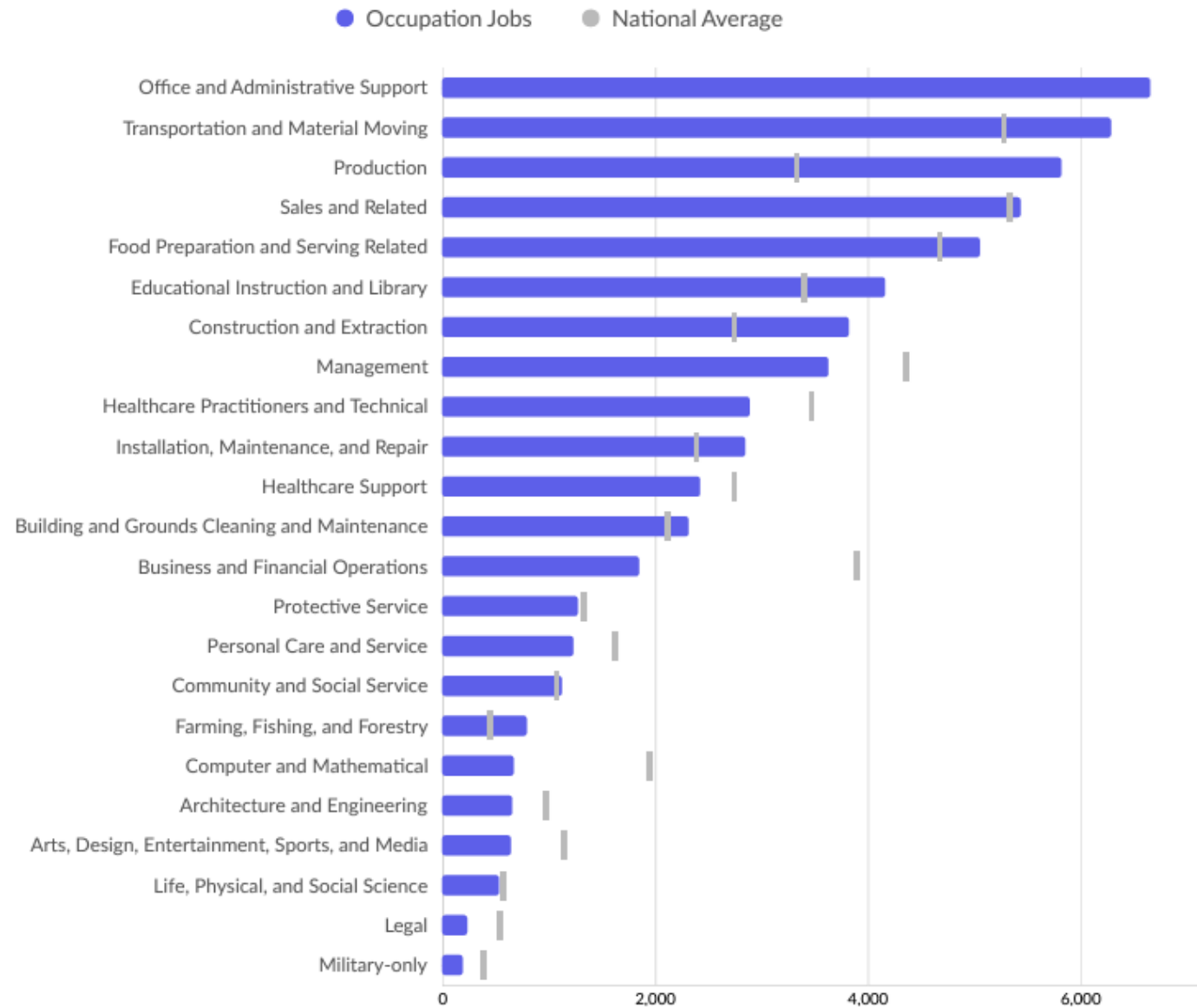
We found a few jobs that pay more than jobs in the Aquaculture category in Wisconsin.

For example Aquaculture Engineering jobs pay as much as \$91,152 (200.8%) more than the average Aquaculture salary of \$45,398.

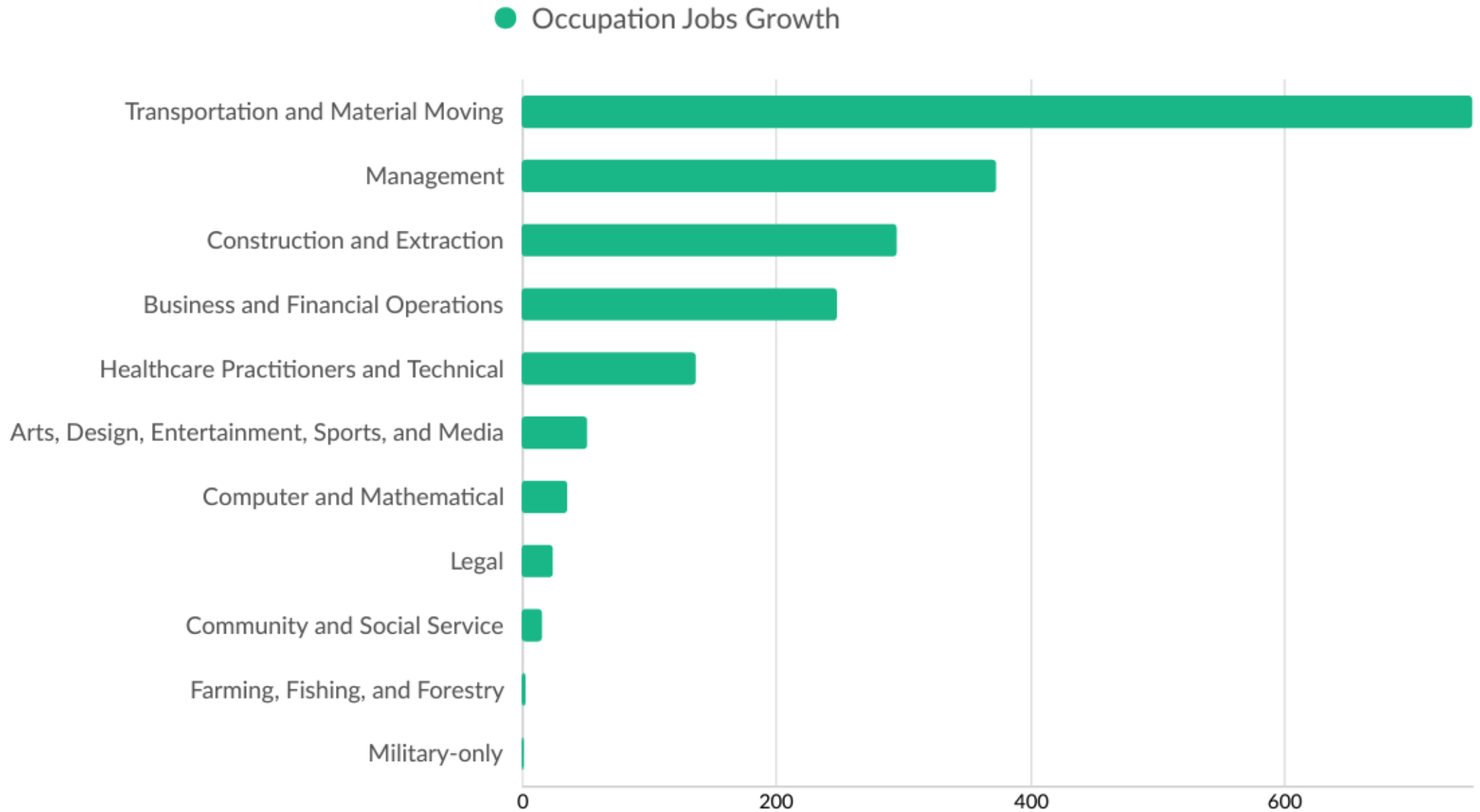
| Job Title | Annual Salary | Monthly Pay | Weekly Pay | Hourly Wage |
|---------------------------------------|---------------|-------------|------------|-------------|
| Aquaculture Engineering | \$136,550 | \$11,379 | \$2,625 | \$65.65 |
| Work From Home Aquaculture Technician | \$52,299 | \$4,358 | \$1,005 | \$25.14 |
| Aquaculture Specialist | \$45,372 | \$3,781 | \$872 | \$21.81 |
| Aquaculture Technician | \$37,302 | \$3,108 | \$717 | \$17.93 |
| Fish Farm Technician | \$32,924 | \$2,743 | \$633 | \$15.83 |

Workforce Characteristics

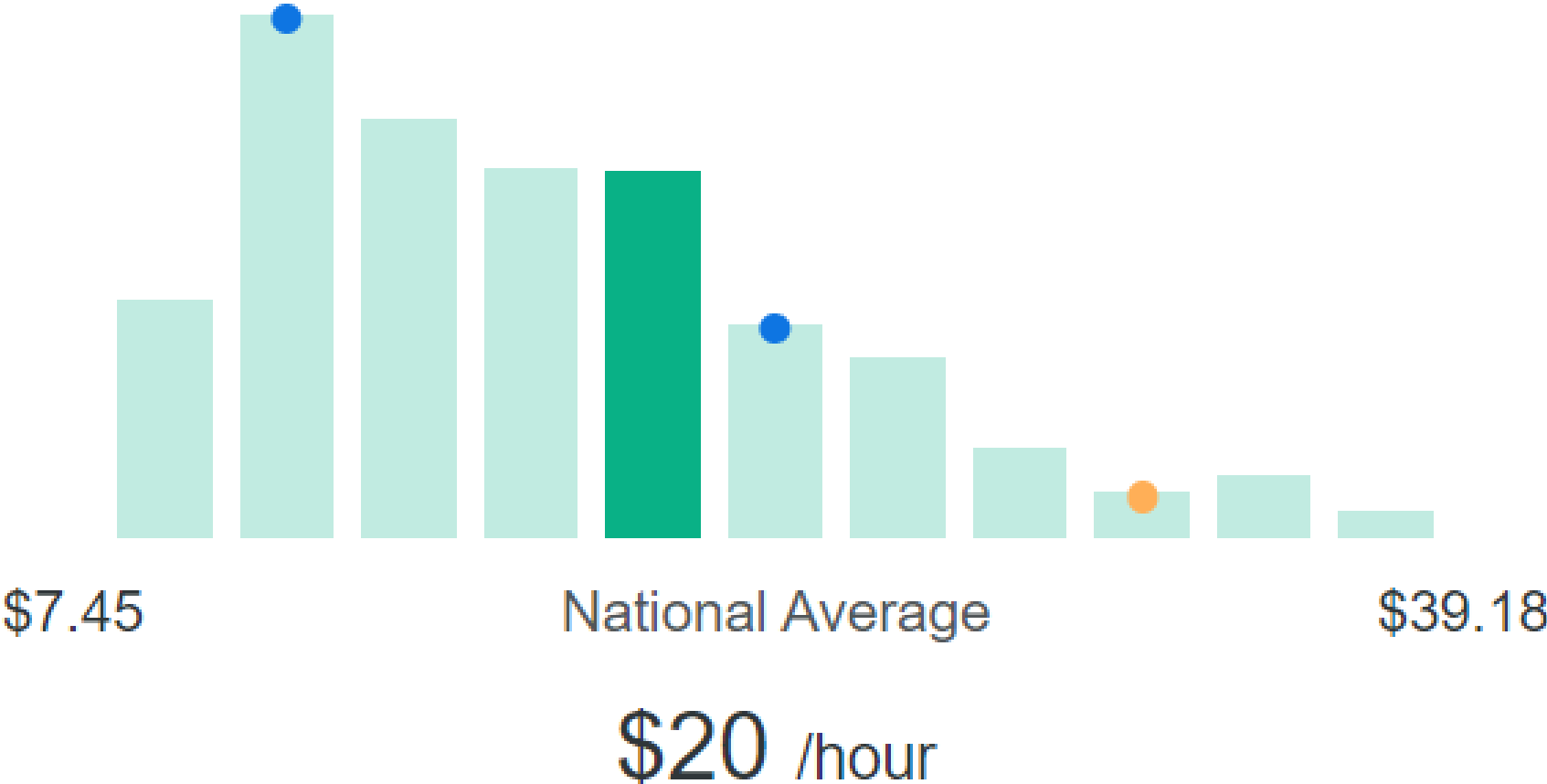
Largest Occupations



Top Growing Occupations



How much do high school students jobs pay per hour?





Youth Apprenticeship Programs

Youth Apprenticeship (YA) is a 1- or 2-year program that gives juniors and seniors in high school the chance to explore a career area of interest. Students spend part of their school day earning credit and wages while they gain valuable industry experience under the guidance of a local business mentor.

YOUTH APPRENTICESHIP PROGRAMS INCLUDE:

- Agriculture, Food & Natural Resources
 - Architecture & Construction
 - Arts, A/V Technology & Communications
 - Finance
 - Health Science
 - Hospitality, Tourism & Lodging
 - Information Technology
 - Manufacturing
 - Marketing
 - Science, Technology, Engineering & Math (STEM)
 - Transportation, Distribution & Logistics
-

Grow Your Pipeline of Talent

A robust recruitment strategy is pivotal for expanding your company's talent pool. A significant portion of students completing a Youth Apprenticeship program often transition to full-time or part-time roles with the YA employer while pursuing further education beyond high school. By engaging in the Youth Apprenticeship initiative, you not only invest in the future of a qualified apprentice who aligns with your company's requirements but also stand to reduce employee turnover and retention costs by seamlessly hiring graduates from the youth apprenticeship program into full-time positions.



Recruitment

Develop a recruitment pipeline and train future employees.



Diversity

Increase workforce diversity.



Opportunities

Provide supervisory opportunities for staff.



Motivation

Work with highly motivated students and create positive relationships with local school districts.



Skills

Students gain technical skills in the classroom that help them perform at a high level on the worksite.



Curriculum

Provide influence on curriculum offerings and student preparation.



Turnover

Reduce employee turnover and increase retention by hiring youth apprentice graduates.





Employer Responsibilities



- Interview and hire YA student(s)
- Participate in mentor training sessions
- Provide on-the-job training to YA student(s)
- Pay YA student(s) at least a minimum wage
- Participate in regular Progress Reviews with apprentice(s) at least 3 times per year
- Ensure 450 hours per year of worksite training/work hours
- Comply with employment of minor labor laws in Wisconsin

[View Program Employer Overview](#)

[View Employer Timeline](#)

Foster Community Engagement and Empower Local Students

In the Youth Apprenticeship program, you get to work with highly motivated students and create positive relationships with local school districts. Apprenticeships also allow companies to shape apprentices' skills to meet specific business needs, ensuring a well-trained workforce. As a partner in this program, you not only serve as an employer but also as a mentor to support high school students.

**Agriculture
Food & Natural
Resources**
[On the Job
Learning Guides](#)

| Agriculture, Food and Natural Resources (AFNR) (Click to Select Another Pathway) | | |
|--|---------------------------------|----------------------------------|
| | Overview (PDF) | Related Instruction Guide (DOCX) |
| Agriculture Mechanic Technician | OJL Guide (PDF) | OJL Guide (DOCX) |
| Animal Fundamentals | OJL Guide (PDF) | OJL Guide (DOCX) |
| Animal/Herd | OJL Guide (PDF) | OJL Guide (DOCX) |
| Arborist | OJL Guide (PDF) | OJL Guide (DOCX) |
| Crops | OJL Guide (PDF) | OJL Guide (DOCX) |
| Dairy Grazier | OJL Guide (PDF) | OJL Guide (DOCX) |
| Environmental Systems: Basic and Adv. Water Resources | OJL Guide (PDF) | OJL Guide (DOCX) |
| Floral/Greenhouse | OJL Guide (PDF) | OJL Guide (DOCX) |
| Landscaping | OJL Guide (PDF) | OJL Guide (DOCX) |
| Plant Fundamentals | OJL Guide (PDF) | OJL Guide (DOCX) |
| Small Animal/Vet Tech | OJL Guide (PDF) | OJL Guide (DOCX) |

How to get started

- Call the nearest high school.
- School's guidance counselor or Local YA Coordinator.
- Reach out to your local Future Farmer of America program
- Reach out to your nearest CESA
- Department of WD YA Site:
<https://dwd.wisconsin.gov/apprenticeship/ya/>
- Or <https://www.apprenticeship.gov/employers/explore-apprenticeship>





QUESTIONS & DISCUSSIONS

