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ABSTRACT

Materials, including curriculum units, are provided for the natural resources and aquaculture components of the vocational agriculture curriculum. Aquaculture is a new component, added because of increased recognition of the opportunities offered by Connecticut's rich shoreline resources. A brochure and flyer on the aquaculture program follow a promotion packet containing the basic materials needed to "pitch" the program to the news media. Sample letters and media presentations are included. The curriculum for both components consists of these units: 3 exploratory and 18 specialized natural resources units and 16 exploratory and 13 specialized aquaculture units. Exploratory units are generally appropriate for grades 9 and 10; specialized units are designed for grades 11 and 12. Each unit has these components: unit title, length (time), when taught (grade and semester), student objectives, related job titles and relevant competencies, content outline, teacher and student activities, evaluation recommendations, a listing of resources, bibliography, and media list. Representative natural resources topics include conservation; forestry; wildlife management; outdoor safety; Christmas tree production; fish culture; forest fires; forest harvesting, measurement, products, protection, soils, surveying and land measurement; game bird propagation; recreation; and timber management. Representative aquaculture topics are boat handling, first aid, pipe fitting, rope splicing, knot tying, cranberry culture, fish culture, metals and welding, tides and currents, aquaculture business management, boat repair and maintenance, boat building, saltwater fishing, and lobstering. (YLB)

REVISING AND UPDATING THE NATURAL RESOURCES AND AQUACULTURE COMPONENTS OF THE CONNECTICUT VOCATIONAL AGRICULTURE CURRICULUM

Prepared by

AGRICULTURAL EDUCATION PROGRAM
DEPARTMENT OF EDUCATIONAL LEADERSHIP
SCHOOL OF EDUCATION
UNIVERSITY OF CONNECTICUT
STORRS, CONNECTICUT

Prepared for

CONNECTICUT STATE DEPARTMENT OF EDUCATION
DIVISION OF VOCATIONAL, TECHNICAL AND ADULT EDUCATION
BUREAU OF VOCATIONAL SERVICES
HARTFORD, CONNECTICUT

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All opinions expressed reflect the views of the authors and are not necessarily those of The State Department of Education.

June, 1986

PREFACE

This printing of the Natural Resources and Aquaculture components of the suggested Connecticut Vocational Agriculture Curriculum has been designed for use in the Connecticut Regional Vocational Agriculture Centers. These centers are multi-staffed with three or more teachers of Vocational Agriculture who have each developed an expertise in one or more of the major areas of agriculture. The curriculum is based on the major areas of agriculture as being Animal Science, Plant Science, Agriculture Mechanics and Natural Resources.

This printing includes a new major area of emphasis, namely, aquaculture. The aquaculture component has been added because of the increased recognition of the many and varied employment and entrepreneurship opportunities offered by the rich shoreline resource of Connecticut. As printed the aquaculture units could be taught as one of the major areas of specialization in a regional vocational agriculture center or as a specialty curriculum designed specifically to focus on vocational agriculture and marine science related occupations.

A full program of Vocational Agriculture is based on four years of enrollment. The student would, in the first two years, be enrolled in exploratory units of study covering all four major areas of study. Development of fundamental skills would be stressed during the exploratory units.

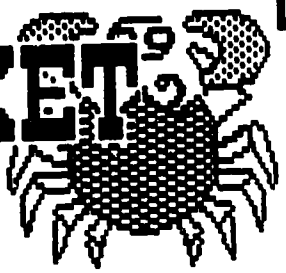
The third and fourth year of enrollment would be made up of an election of units designed to best prepare the individual student to meet his or her vocational objective in agriculture.

Students enrolled in the program will be involved in areas of study common to all of agriculture. These areas include career awareness, agricultural business management, leadership development through involvement in the Future Farmers of America chapter and the practical application of units studied through involvement with the supervised occupational experience program.

The Natural Resources and Aquaculture Components of the Connecticut Vocational Agriculture Curriculum are the first to be revised since the curriculum was first printed in the early 1980's. Plans have been made to revise and update other major areas of the Connecticut Vocational Agriculture Curriculum in subsequent years.

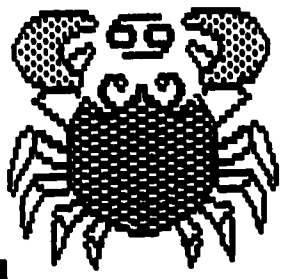
This revision includes the integration of a new section in each unit of instruction entitled, "Related Job Titles and Relevant Competencies" for both Natural Resources and Aquaculture. The section is designed to highlight for teachers and students the potential employment or entrepreneurship job titles and relevant competencies needed for employment or self-employment success. The job titles and relevant competencies were identified and validated in the National Agriculture Occupations Competency Study and are included as an integral part of the curriculum.

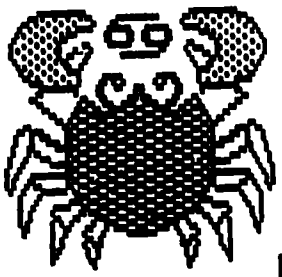
PROMOTION PACKET



NATURAL RESOURCES AND AQUACULTURE

CONNECTICUT VOCATIONAL AGRICULTURE CURRICULUM





PROMOTION PACKET

NATURAL RESOURCES AND AQUACULTURE

CONNECTICUT
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CURRICULUM

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Revising and Updating the Natural Resources and Aquaculture Components of the Connecticut Vocational Agriculture Curriculum

June, 1986

Developed as part of a study supported by the Connecticut State Department of Education, Bureau of Vocational Education, Carl D. Perkins Vocational Education Act Funds, Public Law 98-524.

TABLE OF CONTENTS

PUBLIC RELATIONS PLAN FOR AQUACULTURE

In this packet you have the basic materials necessary to 'pitch' the story of your AQUACULTURE program to the news media. The more, and better, the materials you provide the media, the greater likelihood you have that they will be used.

The news release and brochure act as your basic overview tools. They provide a good understanding of what the program is about. The flyer is useful as a handout.

The materials were designed as if the program was ongoing. If your purpose in promotion is to elicit community response to such a program were it to be offered, then you must adapt the materials accordingly.

Attached is a listing of media available statewide. You will obviously target the information to the media in your particular area.

Don't think of the newspaper as the only source for disseminating information. Today there are more local opportunities than ever, with the proliferation of radio stations and cable systems. Let's look at the approaches to the various media.

NEWSPAPERS

Weeklies and dailies. Make sure you know the various papers serving your region. Send them all notices regarding meetings you're having to explore the curriculum with the public; encourage the city desk or the education writer to do a story about what could be offered if the citizens of the area supported it; and, perhaps, encourage parents to submit letters to the editor indicating their hope that such a program is implemented locally. There is no reason, particularly in shoreline communities, not to provide the editorial page editor with all the material about the program and as editor of the paper, to editorialize the benefits to the community.

If you have portions of the curriculum in place, invite the newspaper to visit your school(s) and take photos of students engaged in AQUACULTURE-related activities. Make sure you submit a copy of the AQUACULTURE logo with all of your materials. Newspapers like to dress up their pages with visually appealing materials.

RADIO STATIONS

AM's and FM's. Get to know the formats of the local stations. In that way, the material you send them can be more appropriate. Most FM's concentrate on music. Therefore, they often want short public service announcements. Examples are included in this packet. Provide them neatly-done material. Many AM's have talk-oriented formats, which encourage live or taped interviews. Contact the station and try to arrange for such interviews for appropriate persons on your staff. Work as closely with the local radio stations as you do the local newspapers. You can often find radio public service or news directors to be more amenable to your information than the local newspaper editor.

CABLE SYSTEMS

Many cable franchises do programming for the community on their local origination channel. Seek out the program director of that channel to work out such an arrangement. All systems have a responsibility to maintain a public access channel which will air materials produced by community organizations. Have your media department work with you on a thirty-minute program about AQUACULTURE which you can present to the cable system for public access. Then get information to parents letting them know when it will be on. Have the cable system air it several times, so parents can tune in at a time convenient to them. Cable stations also run PSA messages.

TV STATIONS

While, in Connecticut, most stations are serving the Hartford market, many are licensed to local areas. WTXX-Channel 20 is licensed to Waterbury. It does much community service for that area. A new station, Channel 26, is starting soon in New London. WTNH-Channel 8 serves the New Haven and shoreline communities. Your packet has enough material to approach the stations seeking a public service spot or announcement to encourage support for the development of a local AQUACULTURE curriculum.

CAUTION

The mass media such as TV, radio, cable or newspapers may not be the best means for getting your message across. Targeting of information to enlist the support of parents, school board members and other opinion leaders is often more effective than an article in the newspaper. The combination of targeted information and media attention to the same issue is a powerful one. Coordinate your release of information for the most impact possible in your community.

LETTER TO MEDIA

Dear (Newspaper Editor) (Public Service Director-Radio/TV):

Enclosed please find materials regarding the new AQUACULTURE program available to public high school students at the _____ regional vocational agriculture center.

The course--which begins in the 9th grade and continues through 12th grade and may include out-of-school youth and adults--teaches students what they need to know to make a living from the sea. It was designed specifically by Connecticut educators for Connecticut students, in recognition of our rich shoreline and coastal waters.

We hope that our materials reach 7th and 8th graders and their parents as they contemplate and plan their high school careers. AQUACULTURE, as part of the vocational agriculture program, is studied one or two periods a day. The remainder of the day students take regular high school offerings.

We feel that this program is unique and deserving of public attention. If I can answer any of your questions about it, please call me at _____.

Sincerely,

FOR RELEASE

AQUACULTURE COURSE DESIGNED FOR CONNECTICUT'S HIGH SCHOOL STUDENTS, OUT OF SCHOOL YOUTH AND ADULTS

High school students across the state will have the opportunity to study aquaculture, a new curriculum of the vocational agriculture program which explores all of the varied skills and industries associated with making a living from the sea.

From freshman to senior year students take a variety of courses such as boat handling, rope splicing and knots, tides and currents, shellfish, fish management, fresh and tidal water surveys, lobstering and boat building. Special programs are also available to out of school youth and adults.

The curriculum, developed in 1985, is being offered at the vocational agriculture center. Public high school students served by those centers can take AQUACULTURE for one or two periods a day. The remainder of their studies consists of traditional high school courses.

The program was developed for Connecticut students by Connecticut educators and industry leaders.

Roger Lawrence, vocational agriculture consultant for the Connecticut State Department of Education, said that "there are many opportunities for meaningful employment for students who want to work in areas associated with our state's rich shoreline and coastal waters."

Lawrence said that some of the careers awaiting graduates of this program would be commerical fishing, boat building, marina management, piloting of a ship and seafood wholesaling.

The AQUACULTURE curriculum incorporates various aspects of natural resources and agricultural mechanics, also part of the vocational agriculture program. Other courses in this field include plant science and animal science.

Classroom work in AQUACULTURE is enhanced by a supervised occupational experience program. The student is required to have a work experience beyond the school day and/or usual school year. The work experience program must be in a field related to vocational agriculture studies.

"We feel this is an exciting field of study which will really capture the imagination of the students," Lawrence said.

The regional vocational agriculture centers offering the program include:

_____

_____

For further information, call _____.

LETTER DESCRIBING THE PROGRAM

Dear (Parent) (Principal):

AQUACULTURE.

That term applies to all of the varied skills and industries associated with making a living from the sea. Now, AQUACULTURE studies are available to high school students through their vocational agriculture program.

Young people will learn about specialties ranging from boat handling, repair and building to lobstering, shellfish and cranberry culture. The entire curriculum--from freshman to senior year, and including out of school youth and adults--is designed to build a deep understanding and interest in the many facets of marine and oceanic studies and to help students to become employable in the industry.

All of this is accomplished while students remain enrolled in the total high school program. Their AQUACULTURE studies constitute one or two periods a day.

The program is brand new. It was developed for Connecticut by Connecticut educators and industry experts. It recognizes the many opportunities for meaningful and rewarding employment for adventurous young people who want to work in areas associated with Connecticut's rich shoreline and coastal waters.

The vocational agriculture program has been most successful at imparting a wide range of knowledge and skills to students at eighteen regional centers throughout the state. AQUACULTURE, its newest offering, incorporates important aspects of the natural resources and agriculture mechanics studies, to make students aware of all they need to know in this fascinating field.

AQUACULTURE offers unique hands-on experience for students interested in exploring a whole new world.

To find out more, contact the vocational agriculture department in your local school district or write to the Connecticut State Department of Education, Bureau of Vocational Services, P.O. Box 2219, Hartford, CT 06145.

Sincerely,

LETTER EXPLAINING PROGRAM TO SCHOOL ADMINISTRATORS AND MEMBERS OF BOARDS OF EDUCATION

Dear Superintendent/Board Member:

I am pleased to inform you of a new program, the AQUACULTURE curriculum, offered by vocational agriculture centers. As the name implies, courses relate to the varied skills and industries associated with making a living from the sea.

The program was developed for Connecticut students by Connecticut educators and industry leaders. It recognizes the many opportunities for meaningful and rewarding employment or entrepreneurship opportunities for adventurous students who want to work in areas associated with our state's rich shoreline and coastal waters.

Young people will learn about specialties ranging from boat handling, repair and building to lobstering, shellfish and cranberry culture. The entire curriculum--from freshman to senior year--is designed to build a deep understanding and interest in the many facets of marine and oceanic studies and to help make students employable in the industry.

As with other vocational agriculture studies, all of this is accomplished while students remain enrolled in the total high school program. Their AQUACULTURE studies constitute of one or two periods a day. Out of school youth and adults may also participate in the program.

We believe that our current vocational agriculture programs have added a new dimension to students from school districts participating in the program. AQUACULTURE, our newest offering, incorporates important aspects of the natural resources and agriculture mechanics studies, to make students aware of all they need know about this fascinating field.

Enclosed please find materials describing the program in more detail. We do look forward to your participation and support. AQUACULTURE offers unique hands-on experience for students interested in exploring a whole new world.

Please feel free to call me or write if you have any questions regarding the program.

Sincerely,

LETTER DESCRIBING THE PROGRAM

Dear Employer in Aquaculture-Related Industry:

-------- ---------- School District (System) is pleased to inform you that we are preparing to offer high school students and out of school youth and adults an exciting new learning opportunity in the field of AQUACULTURE. The curriculum, which is part of our vocational agriculture program, applies to the varied skills and industries associated with making a living from the sea.

Our young people will learn about specialties ranging from boat handling, repair and building to finfish, lobstering and shellfish culture. The entire curriculum is designed to build a deep understanding and interest in the many facets of marine and oceanic studies and to help students to become employable in the industry.

When they complete their studies our students will be able to pursue careers ranging from commercial fishermen to boat builders.

The program was developed for Connecticut students by Connecticut educators and industry leaders. It recognizes the many opportunities for meaningful and rewarding employment for adventurous young people who want to work in areas associated with Connecticut's rich shoreline and coastal waters.

The enclosed brochure describes the various aspects of the program. We will seek your support in providing our AQUACULTURE students with the appropriate occupational experience in the 'hands-on' phase of the program. You may also help by becoming a member of our consulting committee or by identifying potential students. After all, our goal is to sustain and expand the AQUACULTURE industry in Connecticut by insuring you of qualified workers in the future.

We will need the support of local businesses concerned about this field to make this program work over the long term. Your expertise will be invaluable to us.

Sincerely,

RADIO PUBLIC SERVICE ANNOUNCEMENTS

:10 SECONDS

HOW WOULD YOU LIKE AN OFFSHORE CAREER? STUDY AQUACULTURE AT _____ _____ REGIONAL VOCATIONAL AGRICULTURE CENTER. IT'S FOR STUDENTS WHO WANT TO EXPLORE A WHOLE NEW WORLD!

:15

EVER CONSIDER BECOMING A BOAT BUILDER? OR RUNNING A MARINA? GET A HEAD START IN HIGH SCHOOL BY STUDYING AQUACULTURE. IT'S AVAILABLE AT _____ _____ REGIONAL VOCATIONAL AGRICULTURE CENTER. AQUACULTURE...FOR STUDENTS WHO WANT TO EXPLORE A WHOLE NEW WORLD!

:30

EVER CONSIDER BECOMING A BOAT BUILDER? RUNNING A MARINA? OR BECOMING A COMMERCIAL FISHERMAN? GET A HEAD START IN HIGH SCHOOL BY STUDYING AQUACULTURE. IT'S AVAILABLE AT _____ REGIONAL VOCATIONAL AGRICULTURE CENTER. YOU'LL ATTEND AQUACULTURE COURSES ONE OR TWO PERIODS EACH DAY AND SPEND THE REMAINDER OF THE DAY TAKING REGULAR HIGH SCHOOL COURSES. AQUACULTURE...FOR STUDENTS WHO WANT TO EXPLORE A WHOLE NEW WORLD! ASK YOU GUIDANCE COUNSELOR ABOUT IT.

RADIO PUBLIC SERVICE ANNOUNCEMENTS

:60

EVER CONSIDER BECOMING A BOAT BUILDER? RUNNING A MARINA? OR BECOMING A COMMERCIAL FISHERMAN? GET A HEAD START IN HIGH SCHOOL BY STUDYING AQUACULTURE. IT'S AVAILABLE AT _____ REGIONAL VOCATIONAL AQUACULTURE CENTER. YOU'LL ATTEND AQUACULTURE COURSES ONE OR TWO PERIODS EACH DAY AND SPEND THE REMAINDER OF THE DAY TAKING REGULAR HIGH SCHOOL COURSES. THE PROGRAM IS DESIGNED FOR ADVENTUROUS YOUNG PEOPLE WHO WANT TO WORK IN CAREERS ASSOCIATED WITH CONNECTICUT'S RICH SHORELINE AND COASTAL WATERS. YOU'LL NEVER BE IN OVER YOU HEAD IF YOU STUDY AQUACULTURE AT _____ REGIONAL CENTER. IT'S FOR STUDENTS WHO WANT TO EXPLORE A WHOLE NEW WORLD. ASK YOU GUIDANCE COUNSELOR ABOUT IT.

TV SPOT SCRIPT - :30 SECONDS

EVER CONSIDER BECOMING A BOAT BUILDER?

RUNNING A MARINA?

OR FISHING COMMERCIALLY FOR A LIVING?

GET A HEAD START ON THESE EXCITING

CAREERS...AND MORE...BY STUDYING

AQUACULTURE THROUGH CONNECTICUT'S

REGIONAL VOCATIONAL AGRICULTURE

CENTERS.

THE PROGRAM IS OPEN TO HIGH SCHOOL

STUDENTS THROUGHOUT THE STATE.

TAKE THESE SPECIAL COURSES WHILE

GAINING YOUR TRADITIONAL HIGH

SCHOOL DIPLOMA.

AQUACULTURE...FOR STUDENTS WHO WANT

TO EXPLORE A WHOLE NEW WORLD!

ASK YOUR GUIDANCE COUNSELOR ABOUT IT.

AQUACULTURE SLIDE PRESENTATION

SCRIPT

VOCATIONAL AGRICULTURE PROGRAMS
IN CONNECTICUT HAVE BEEN
SUCCESSFUL IN PROVIDING
STUDENTS WITH THE OPPORTUNITY
TO EXPLORE ALL PHASES OF AGRICULTURE
IN THEIR FIRST TWO YEARS OF
HIGH SCHOOL.

IN THEIR THIRD AND FOURTH YEARS,
STUDENTS HAVE THE OPPORTUNITY TO
MAJOR IN MORE SPECIALIZED AREAS
OF STUDY.
THE FOCUS HAS BEEN ON:

*ANIMAL SCIENCE

*PLANT SCIENCE

*NATURAL RESOURCES, AND

*AGRICULTURE MECHANICS.

NOW STUDENTS HAVE ANOTHER OPTION...
TO EXPLORE THE WORLD OF
AQUACULTURE.

IT'S AN EXCITING NEW COURSE OF STUDY
PREPARING HIGH SCHOOL STUDENTS FOR
CAREERS IN THE INDUSTRIES ASSOCIATED
WITH CONNECTICUT'S RICH SHORELINE
AND COASTAL WATERS.

THE COURSE CONSISTS OF FIVE UNITS.

CULTURE FOCUSES ON SHELLFISH: CRANBERRY: FRESH AND TIDAL WATER SURVEYS AND FISH MANAGEMENT.

WHEN LEARNING ABOUT THE NECESSARY GEAR, STUDENTS LEARN ABOUT ROPE SPLICING AND KNOTS; AS WELL AS THE ASSORTMENT OF FISHING GEAR.

THE MARINE LIFE COMPONENT IMPARTS VITAL INFORMATION ON LOBSTERING; SALTWATER FISHING; AND THE FLOUNDER, BLUEFISH AND MACKEREL.

STUDENTS PREPARE FOR CAREERS IN MANAGEMENT THROUGH COURSE STUDY, AS WELL AS AN INDEPENDENT PROJECT.

AND INCORPORATING VARIOUS ASPECTS OF AGRICULTURE MECHANICS INTO THE AQUACULTURE PROGRAM, COUPLED WITH CAREER AWARENESS AND A HANDS-ON OCCUPATIONAL EXPERIENCE PROGRAM, HELP STUDENTS PUT THEIR FUTURE CAREER INTO PERSPECTIVE.

STUDENTS ATTEND AQUACULTURE CLASSES ONE OR

TWO PERIODS EACH DAY AND SPEND THE REMAINDER
OF THE DAY TAKING REGULAR HIGH SCHOOL COURSES.

THE AQUACULTURE PROGRAM WAS DESIGNED BY
CONNECTICUT EDUCATORS...FOR CONNECTICUT STUDENTS.
THE PROGRAM RECOGNIZES THE OPPORTUNITIES FOR
PRODUCTIVE AND MEANINGFUL EMPLOYMENT OFF OF THE
STATE'S SHORES.

STUDENTS ARE EXPOSED TO COURSES
RANGING FROM BOAT HANDLING IN FRESHMAN
YEAR TO BOAT BUILDING IN THE SENIOR
YEAR.

THE OPPORTUNITIES FOR THESE STUDENTS
UPON COMPLETION OF THE COURSE ARE
MANY. THEY CAN CHOSE TO BECOME:

COMMERCIAL FISHERMEN

BOAT BUILDERS

WATER QUALITY INSPECTORS

PILOTS OF SHIPS

MANAGERS OF MARINAS OR
COASTAL WATERS

OR SEAFOOD WHOLESALERS,

IF THEY'D LIKE.

OUR WATERWAYS REPRESENT ONE OF
THIS STATE'S MOST PRECIOUS RESOURCES.
WE'RE INSTITUTING THIS PROGRAM TO INSURE
THAT TRAINED AND DEDICATED YOUNG PEOPLE

CARRY ON THE IMPORTANT WORK OF UNDERSTANDING MORE ABOUT AQUACIJLTURE.

VOCATIONAL AGRICULTURE PROGRAMS ARE LOCATED AT EIGHTEEN REGIONAL CENTERS THROUGHOUT THE STATE. WE HOPE TO HAVE THE AQUACULTURE SPECIALTY AVAILABLE AT AS MANY SITES AS POSSIBLE IN THE COMING YEARS.

COMMITMENTS ARE ALREADY IN PLACE FROM THE FOLLOWING SCHOOL DISTRICTS:
AQUACULTURE ISN'T OVER THE HEADS OF MOST STUDENTS. HOWEVER, THE PROGRAM IS DESIGNED FOR HIGH SCHOOL STUDENTS WHO WANT TO EXPLORE A WHOLE NEW WORLD.

CONNECTICUT CABLE TELEVISION ASSOCIATION

Michael Petruzzi
AMRAC NORTHWEST CABLEVISION, INC.
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CABLEVISION OF CONNECTICUT
28 Cross Street
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CABLEVISION OF SOUTHERN CONNECTICUT
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New Milford, CT 06766
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Michael Suhanovsky
LAUREL CABLEVISION, INC.
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New Milford, CT 06766
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SAMMONS COMMUNICATIONS OF CT
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Waterbury, CT 06708
755-1178/757-2400

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Al Wiersema
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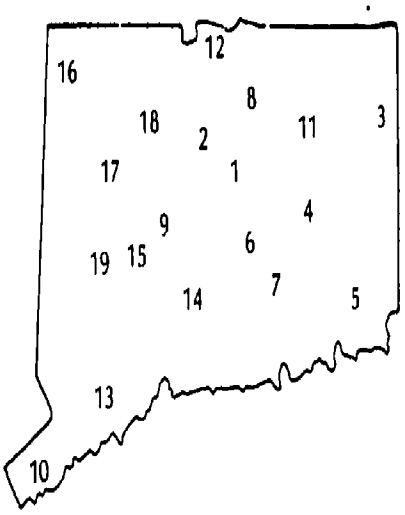
OCCUPATIONAL OPPORTUNITIES IN AQUACULTURE

Boat Builder
Coastal Waters Manager
Commercial Fisherman
Commercial Shellfishing
Fish Conservation Officer
Fish Hatchery Worker
Fisheries Technician
Marina Manager
Marine Equipment Mechanic
Seafood Wholesaler
Water Quality Inspector
Water Safety Instructor

FUTURE FARMERS OF AMERICA

- FFA is an integral part of high school agriculture education classes.
- Founded in 1928, today over 425,000 agriculture students are members of the FFA nationwide.
- FFA strives to develop agricultural leadership, cooperation, and citizenship in its members.



VOCATIONAL AGRICULTURE PROGRAM LOCATIONS:

1 – Glastonbury
2 – Hartford
3 – Killingly
4 – Lebanon
5 – Ledyard
6 – Middletown
7 – Moodus
8 – Rockville
9 – Southington
10 – Stamford
11 – Storrs
12 – Suffield
13 – Trumbull
14 – Wallingford
15 – Waterbury

16 – Region One – Falls Village
17 – Region Six – Litchfield
18 – Region Seven – Winsted
19 – Region Fourteen – Woodbury

OTHER VOCATIONAL AGRICULTURE PROGRAM AREAS INCLUDE:

Animal Science
Natural Resources
Agriculture Mechanics
Plant Science

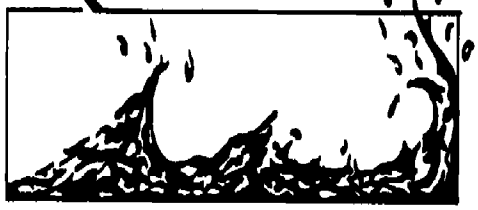
FOR MORE INFORMATION:

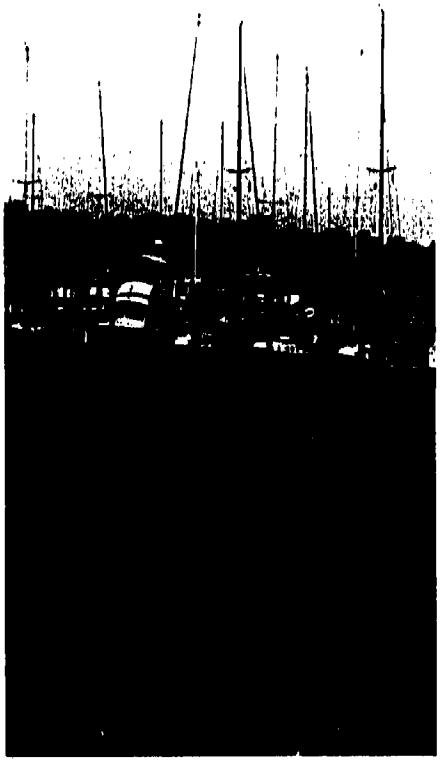
CONNECTICUT STATE
DEPARTMENT OF EDUCATION
BUREAU OF VOCATIONAL SERVICES
P.O. BOX 2219
HARTFORD, CT 06145

Or Your Local Vocational Agriculture Center

NEW!

AQUACULTURE





'For High School Students Who Want To Explore A Whole New World.'

Connecticut Vocational Agriculture Program

AT IS AQUACULTURE?

g new curriculum of the vocational gram exploring all of the varied skills ociated with making a living from

tion range from boat handling, repair fish, lobstering and shellfish culture

ENSIVE IS THE PROGRAM?

l classes for one or two periods each the remainder of the day taking regular urses. Students explore all phases of culture as freshmen and sophomores in AQUACULTURE as a junior and gram is also available to out of school ts.

ACADEMIC LEVELS AND UNITS

FRESHMEN:

Boat Handling
Boating Accidents
Career Awareness
Charts and Compass
First Aid
Future Farmers of America
Marine Life Components
Occupational Experience Program
Pipe and Pipe Fitting
Rope Splicing and Knots
Wood and Tools

SOPHOMORES:

Cranberry Culture
Fishing Gear
Flounder, Bluefish, Mackerel
Fresh and Tidal Water Surveys
Metals
Paint and Fiberglass
Small Gas Engines
Tides and Currents

JUNIORS:

Aquaculture Business Management
Boat Repair
Electronics
Outboard Engines and Boats
Saltwater Fishing
Shellfish Culture
Weather

SENIORS:

Boat Building
Fish Culture
Hydraulics
Independent Aquaculture Project
Lobstering
Piloting
Trailering

OUT OF SCHOOL YOUTH AND ADULTS:

Upgrading, Retraining and Specialized Courses

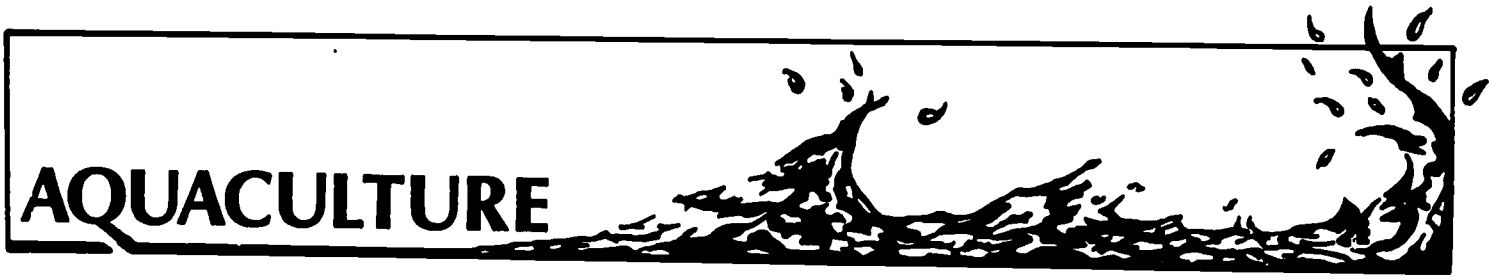
DOES THE PROGRAM INVOLVE HANDS-ON EXPERIENCE?

Classroom work is enhanced by a supervised occupational experience program. The student will have a work-experience program beyond the school day and/or the usual school year. The work-experience program must be in a field related to vocational agriculture/aquaculture studies.

WHERE DID THE AQUACULTURE PROGRAM ORIGINATE?

The program was designed by Connecticut educators and industry experts for Connecticut students. It recognizes the many opportunities for meaningful employment for adventurous young people who want to work in areas associated with Connecticut's rich shoreline and coastal waters.

JUST WHEN YOU THOUGHT
YOU DIDN'T KNOW ENOUGH
ABOUT THE UNDERWATER WORLD
COMES



AQUACULTURE describes all of the varied skills and industries associated with making a living from the sea. Courses range from boat handling, repair and building to lobstering, shellfish and cranberry culture.

The program was developed specifically *for* Connecticut students *by* Connecticut educators and industry experts. It recognizes the many opportunities for meaningful and rewarding employment for adventurous young people who want to work in areas associated with Connecticut's rich shoreline and coastal waters.

AQUACULTURE studies begin in the student's freshman year of high school and continue through the senior year. As part of the vocational agriculture program, you'll attend **AQUACULTURE** courses one or two periods each day, and spend the remainder of the day taking regular high school subjects.

Utilizing skills training from other vocational agriculture program areas, including natural resources and agriculture mechanics, the **AQUACULTURE** curriculum makes students aware of all they need to know in this fascinating field.

For more information on the **AQUACULTURE** program contact the vocational agriculture center in your area or write to:

Vocational Agriculture Consultant
Connecticut State Department of Education
Bureau of Vocational Services
P.O. Box 2219
Hartford, CT 06145

AQUACULTURE

"FOR HIGH SCHOOL STUDENTS WHO WANT TO EXPLORE A WHOLE NEW WORLD."

REVISING AND UPDATING THE NATURAL RESOURCES AND AQUACULTURE COMPONENTS OF THE CONNECTICUT VOCATIONAL AGRICULTURE CURRICULUM

Prepared by

AGRICULTURAL EDUCATION PROGRAM
DEPARTMENT OF EDUCATIONAL LEADERSHIP
SCHOOL OF EDUCATION
UNIVERSITY OF CONNECTICUT
STORRS, CONNECTICUT

Prepared for

CONNECTICUT STATE DEPARTMENT OF EDUCATION
DIVISION OF VOCATIONAL, TECHNICAL AND ADULT EDUCATION
BUREAU OF VOCATIONAL SERVICES
HARTFORD, CONNECTICUT

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Project Director

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Curriculum Specialist

FREDERICK W. BERGGREN
Writer
Aquaculture Curriculum

This project was supported by funds made available to Connecticut through P.L. 98-524.

June, 1986

PREFACE

This printing of the Natural Resources and Aquaculture components of the suggested Connecticut Vocational Agriculture Curriculum has been designed for use in the Connecticut Regional Vocational Agriculture Centers. These centers are multi-staffed with three or more teachers of Vocational Agriculture who have each developed an expertise in one or more of the major areas of agriculture. The curriculum is based on the major areas of agriculture as being Animal Science, Plant Science, Agriculture Mechanics and Natural Resources.

This printing includes a new major area of emphasis, namely, aquaculture. The aquaculture component has been added because of the increased recognition of the many and varied employment and entrepreneurship opportunities offered by the rich shoreline resource of Connecticut. As printed the aquaculture units could be taught as one of the major areas of specialization in a regional vocational agriculture center or as a specialty curriculum designed specifically to focus on vocational agriculture and marine science related occupations.

A full program of Vocational Agriculture is based on four years of enrollment. The student would, in the first two years, be enrolled in exploratory units of study covering all four major areas of study. Development of fundamental skills would be stressed during the exploratory units.

The third and fourth year of enrollment would be made up of an election of units designed to best prepare the individual student to meet his or her vocational objective in agriculture.

Students enrolled in the program will be involved in areas of study common to all of agriculture. These areas include career awareness, agricultural business management, leadership development through involvement in the Future Farmers of America chapter and the practical application of units studied through involvement with the supervised occupational experience program.

The Natural Resources and Aquaculture Components of the Connecticut Vocational Agriculture Curriculum are the first to be revised since the curriculum was first printed in the early 1980's. Plans have been made to revise and update other major areas of the Connecticut Vocational Agriculture Curriculum in subsequent years.

This revision includes the integration of a new section in each unit of instruction entitled, "Related Job Titles and Relevant Competencies" for both Natural Resources and Aquaculture. The section is designed to highlight for teachers and students the potential employment or entrepreneurship job titles and relevant competencies needed for employment or self-employment success. The job titles and relevant competencies were identified and validated in the National Agriculture Occupations Competency Study and are included as an integral part of the curriculum.

The curriculum is organized and color coded for ease of use. The Natural Resources Units are printed on pink paper, just as they were in the original printing. The Aquaculture Units are printed on green paper. The introductory material and Related Job Titles and Competencies are printed on white paper. The page numbers on the units of instruction are coded as follows:

ER - Exploratory Natural Resources
SR - Specialized Natural Resources
EAq - Exploratory Aquaculture
SAq - Specialized Aquaculture

Exploratory units are generally appropriate for students in the ninth and tenth grades, while specialized units are designed for students in grades eleven and twelve.

The Related Job Titles and Relevant Competencies have two page numbers. They are numbered consecutively at the top. The number at the bottom refers to the Page number in the National Agriculture Occupations Competency Study. This page number is maintained for easy reference to the original document.

The organization for sequence of instruction will be at the discretion of certified teachers, administration, and consulting committee members in each center in accordance with availability of staff and facilities. The primary objective is to serve the individual interests and needs of the students.

The original development of the Natural Resources Component of this curriculum involved the cumulative efforts of the staff of natural resources teachers in Connecticut Regional Vocational Agriculture Centers. Teachers authored the units of study. Each unit was pilot tested by a teacher other than the author. Editing to produce a common format has been done by the teachers. It has not been possible to bring into this revised curriculum all of the information which is available. However, teachers are encouraged to use the curriculum as their basic teaching document and to supplement and enrich the curriculum as appropriate.

The Aquaculture Component of this curriculum was developed by Frederick W. Berggren, a retired teacher of vocational agriculture. As a resident of the shoreline area, Mr. Berggren combined his teaching, practical and curriculum development experience in preparing the Aquaculture curriculum. Special credits are due Dr. Lance L. Stewart and Mr. Timothy C. Visel, of the Connecticut Marine Advisory Service for their input and review of the curriculum units developed.

The Related Job Titles and Relevant Competencies were identified for each unit of instruction by Julia Arab. Much time and effort was spent on identifying those validated activities needed by employed workers to help ensure that the curriculum is competency based.

ACKNOWLEDGMENTS

The Project Director wishes to express his appreciation to these who have contributed to the success and completion of the curriculum.

A sincere thank you is extended to the project staff of Fred Berggren and Julia Arab for the conscientious efforts throughout the project. Special recognition is due to Dr. Patrick B. Mullarney, Head, and Terry A. Mamunes, Secretary, Department of Educational Leadership, whose knowledge of University procedures and expert skills made the completion of the project possible.

Special appreciation is extended to Mr. Roger Lawrence, State Consultant, Vocational Agriculture, Dr. Valerie Pichanick, Project Officer and Mr. Errol Terrell, Chief, Bureau of Vocational Services, for their involvement in the initiation and direction of the study. I would also like to extend my gratitude to Carolyn W. Sikora for her efficiency and expertise in entering the curriculum on the word processor. Her efforts will make future revisions of the curriculum much easier.

Finally, to the teachers of vocational agriculture in Connecticut, for whom this curriculum is designed to serve, appreciation is extended for their cooperation in providing input and support throughout the study.

Dr. Alfred J. Mannebach
Project Director

TABLE OF CONTENTS

NATURAL RESOURCES CURRICULUM UNITS - EXPLORATORY

NATURAL RESOURCES CURRICULUM UNITS - SPECIALIZED

VI. Wood Processing

A. sawmills

1. types of mills
2. circular saws
3. band saws

B. sawing process
C. types of cuts and uses

1. end cut
2. radial cut
3. tangential cut

VII. Career opportunities

TEACHER ACTIVITIES:

1. Arrange field trips to different types of sawmill operations.
2. Request log grader to assist students in learning to grade logs.

STUDENT ACTIVITIES:

1. Review tree identification. Collect bark and wood of species to be studied.
2. List types of wood products with which they are familiar.
3. Field trips to see as many different types of mills as is possible and to view product manufacture.
4. Field trip to saw mill to observe and/or assist grader in grading logs.
5. Practical scaling of logs of varying sizes.
6. Field trip to lumber yard to view sales operation.
7. Identify wood samples.
8. Identify wood structure in diagrams and samples.

EVALUATION:

1. State of Connecticut: Primary Processors Forest Products Utilization, Department of Environmental Protection.
2. Local sawmills for field trips.
3. Local foresters.
4. Wood samples.
5. Log scale sticks.
6. Green lumber rule.

BIBLIOGRAPHY:

1. Bromley, W.S., Pulpwood Production, The Interstate Printers and Publishers, Inc., Danville, Illinois, 1976.
2. Dilworth, J.R., Log Scaling and Timber Cruising, Oregon State University Book Stores, Inc., 1977.
3. Harlow, William M., Inside Wood: Masterpiece of Nature, The American Forestry Association, 1970.
4. Panshin, A.J., et al, Forest Products Their Sources, Production and Utilization, McGraw-Hill Book Company, New York, 1962.
5. Panshin, A.J. and Carl de Zeeuw, Textbook of Wood Technology, Vol. I, 3rd. ed., McGraw-Hill Book Company, New York, 1964.
6. Wyman, Edgar P., Growing Christmas Trees in Connecticut, Extension Bulletin #72-20. College of Agriculture and Natural Resources, University of Connecticut, Storrs, Connecticut.
7. Wyman, Edgar P., Planting Forest Trees in Connecticut, Extension Bulletin #72-20. College of Agriculture and Natural Resources, University of Connecticut, Storrs, Connecticut.
8. Various literature is available through the following organizations:

American Wood Council
1619 Massachusetts Ave., NW
Washington, D.C. 20036

American Plywood Association
1119 A Street
Tacoma, Washington 98401

Canadian Wood Council
701-170 Laurier Ave. West
Ottawa, Ontario K1p5V5

Southern Forest Products Assoc.
P.O. Box 52468
New Orleans, Louisiana 70152

Western Wood Product Assoc.
700 Yeon Building
Portland, Oregon 97204

MEDIA:

1. Slide Series: Relationship of Hardwood Log and Lumber Grades, IMS, Cornell.

2. Wood Technology, series of transparencies on wood and wood products, DCA Education Products, Inc., 1969.

3. Maple Syrup Production, filmstrip, available through NASCO.

NATURAL RESOURCES CURRICULUM

UNIT: Forest Protection

LENGTH: 3 Weeks

WHEN TAUGHT: Grade 11 or 12, Fall

OBJECTIVES: The student will be able to:

1. identify major tree diseases in our forest region.
2. select the most appropriate control measure for a given disease.
3. perform the necessary prevention or control procedures to keep disease losses at a minimum.
4. identify major tree insects in our forest region.
5. select the most appropriate control measure for a given insect.
6. perform the necessary prevention or control procedures with accuracy needed to keep insect losses in the forest at a minimum.

RELATED JOB TITLES AND RELEVANT COMPETENCIES:

Forest Technician	485 (8)
Campground Maintenance Person	505 (8, 9)
Park Aide	506 (2, 3)
Forestry Aide	540 (1c, h, i, k, n)
Forest Insect Ranger	570-571 (3, 4, 5, 6)
Christmas Tree Grower	578-580 (1a, 1, 2a, 3, 4)

CONTENT:

I. Identifying major forest diseases

- A. identifying rot causing fungi
- B. identifying foliage diseases
- C. identifying stem diseases
- D. identifying root diseases

II. Developing disease prevention and control programs

- A. preventing forest diseases
- B. determining disease control methods

III. Determining the role of insects in the forest

A. determining importance of forest insects
B. identifying beneficial insects
C. identifying destructive insects

1. conifer and hardwood defoliators
2. tip, cambium, heartwood and root feeders
3. sap feeders
4. identifying disease vectors

D. identifying forest insects damage

IV. Selecting insect control methods

A. determining direct control methods

1. using mechanical methods
2. using chemical methods

B. determining indirect control methods

1. using silvicultural practices
2. using indirect biological and chemical controls

C. determining forest insect control regulations

V. Identifying other destructive agents

A. determining the effects of forest animals
B. determining the effects of man
C. determining the effects of natural phenomena

TEACHER ACTIVITIES:

1. Organize a field trip for observation and collection of samples.

2. "Dissect" a tree with a chain saw to show visible signs of disease and decay.

3. Organize field trips to forests/plantations exhibiting protective measures to prevent damage to trees by insects, diseases, man, animals and/or climatic factors.

STUDENT ACTIVITIES:

1. Make field observations of trees to show visible signs and symptoms of decay.

2. Develop a disease prevention program for a given forested area.

3. Locate, capture and identify forest insect pests.

4. Sketch damage caused to forest trees from insects and diseases.

5. Prepare a report on one major forest insect and disease to be given in class. Each student will be required to fill out a work sheet on each insect and disease.

6. If an insect infested area is available, have students perform mechanical or chemical measures to help control insect damages.

EVALUATION:

1. Rate students' collection and identification of 35 insects of insect damaged parts. The following information is to be known: common name, order, identification feature, plants damaged or beneficial results, economic importance, control and type of metamorphosis.

2. Rate presentation of information on important forest insects.

3. Evaluate students' identification of slides of the more common forest diseases.

4. Evaluate plan developed for a given forest area concerning insect and disease control.

RESOURCES:

1. Exterminator in local area.

2. Visit forest experiment station to observe their work with insects.

3. Use extension forester to discuss injury of forests from insects and control methods.

BIBLIOGRAPHY:

1. Anderson, Roger: Forest and Shade Tree Enotomology, John Wiley and Son.

2. Borror and White: A Field Guide to the Insects, Houghton Mifflin Co.

3. Diseases of Shade and Ornamental Trees.

4. Graham, S.A., Knight, F.B.: Principles of Forest Entomology, McGraw Hill.

MEDIA:

1. Films are available from Shell Film Library

   A. "Food or Famine"
   B. "Rural World"

2. Slides depicting signs of insect/disease/animal damage.

NATURAL RESOURCES CURRICULUM

UNIT: Forest Soils

LENGTH: 3 Weeks

WHEN TAUGHT: Grade 11 or 12, early Fall or Spring

OBJECTIVES: The student will be able to:

1. identify the physical and chemical properties of forest soils.
2. identify factors which promote and destroy forest soils.
3. judge land for proper use and maximum protection.

RELATED JOB TITLES AND RELEVANT COMPETENCIES:

Soil Conservation Aide	515-516 (6, 7, 11, 12)
Soil Conservation Technician	517-519 (1, 2, 3, 4, 9)
Forestry Aide	540 (2)
Christmas Tree Grower	578 (1a, e, f, k, l, 4)

CONTENT:

I. Development of forest soils

- A. classification of parent materials
- B. type of vegetation
- C. humus production

II. Physical properties

- A. soil texture
- B. soil structure
- C. soil porosity
- D. permeability

III. Chemical properties

- A. soil reactions
- B. essential nutrients for forest growth
- C. toxic agents in runoff areas
- D. mineral deficiencies

IV. Organisms of forest soils

A. bacteria and fungi
B. insects
C. earthworms and nematodes

V. Physical damage to forest soils

A. compaction and erosion

1. animal
2. harvesting equipment

B. forest fires
C. overgrazing in range lands

VI. Land use management

A. land judging

1. drainage classes
2. depth favorable to roots
3. fertility
4. planting difficulties
5. access limitations

B. forest lands as watersheds
C. planting and reforestation techniques
D. mapping

1. topography

TEACHER ACTIVITIES:

1. Use lecture periods to explain forest soils and how they influence tree growth.

2. Demonstrate the procedures for judging land use and if possible use dug pits on land lab.

3. Contact local soil conservation services to plan field trips and aid in land use classification.

4. Contact local town personnel in regards to large equipment (backhoe if available to dig soil pits).

5. Prepare laboratory projects on plant deficiencies and effects of germination on compacted forest soils.

STUDENT ACTIVITIES:

1. Maintain a notebook on lectures and discussions.
2. Answer study questions.
3. Take forest soil samples for class labs.
4. Test their forest samples for water holding capacity, chemical deficiencies, and various physical properties.
5. Evaluate test findings.
6. Develop a notebook on land use classification of local forests near school.

EVALUATION:

1. Review notebooks and homework.
2. Evaluate student learning through quizzes and tests.
3. Have students demonstrate laboratory techniques.
4. Evaluate recommendations of students after testing various forest soils.
5. Evaluate notebook on land use classification.

RESOURCES:

1. Contact local extension office and University of Connecticut for publications.
2. Invite local foresters and soil conservation people to give shop talks and help arrange field trips.
3. Lab and soil testing equipment.

BIBLIOGRAPHY:

1. Forbes, Reginald D., Forestry Handbook, Ronald Press, 1955.
2. USDA, Woodlands of the Northeast, Erosion and Sediment Control Guide.

MEDIA:

1. _____
2. _____

NATURAL RESOURCES CURRICULUM

UNIT: Forest Surveying and Land Measurement

LENGTH: 3 Weeks

WHEN TAUGHT: Grade 11 or 12, Fall or Spring

OBJECTIVES: The student will be able to:

1. identify and explain the type or types of legal surveys used in this state with accuracy specified by the instructor.
2. obtain distance on level ground (less than 2% slope) by pacing with less than 2% variation in 100 feet and by chaining with a steel tape and chaining pins with an allowable error of .02%.
3. obtain distance on sloping ground (over 2%) by pacing with less than 4% variation and by breaking chain using steel tape and chaining pins with an allowable error of one foot in 500 feet.
4. measure angles with the steel tape.
5. establish predetermined angles or bearings using a transit or a surveyor's compass to within one degree.
6. determine the land area, within one acre per twenty acres, of areas having triangular, rectangular, trapezoidal, trapezium or curved boundaries using land measurements and set formulas.

RELATED JOB TITLES AND RELEVANT COMPETENCIES:

Forestry Technician	483 (1, 2)
Surveyors Apprentice	487-488
Land Use Planning Technician	491-492 (3, 6, 7)
Soil Conservation Technician	518 (2f, g, 3)
Forestry Aide	541 (2)
Wood Producer	550 (1c, j, m)

CONTENT:

I. Identifying types of public land surveys

A. using the metes and bounds system
B. using the rectangular system
C. interpreting deeds and legal descriptions

II. Making linear measurements on level ground

A. pacing
B. chaining

1. identifying units of measure
2. identifying the equipment and its proper use
3. caring for the equipment
4. recording field notes

III. Making linear measurements on sloping ground

A. pacing
B. breaking chain

IV. Differential leveling

A. using the level

1. transporting instruments safely
2. setting up the instrument
3. adjusting the instrument

B. reading the rod

1. red numbers - feet
2. black numbers - inches or tenths of feet
3. black and white spaces - hundredths of feet

V. Establishing angles and bearings with a transit or compass

A. transporting the instrument safely
B. setting up the instrument
C. reading the compass and vernier

VI. Determining acreage in land areas

A. measuring boundaries
B. making calculations

VII. Mapping

TEACHER ACTIVITIES:

1. Demonstrate the use and care of all equipment.

2. Set up surveying courses for student exercise.

STUDENT ACTIVITIES:

1. Determine the type of legal survey used in the state and practice locating specified sites or land areas from deeds or land descriptions.

2. Chain a 100 foot distance on level ground, determine the number of paces needed to pace the distance, and calculate the length of each pace.

3. Chain and pace a specified distance on sloping ground to determine the effects of slope on length of pace.

4. Practice reading the Philadelphia rod.

5. Do a differential leveling exercise on a predetermined course.

6. Map their work to practice mapping skills, especially the use of scales.

EVALUATION:

1. Evaluate students' description of the basic types of legal surveys.

2. Have each student measure distances by pacing ground. Evaluate the students by chaining the same distances with accuracy to be within limits set in the performance objectives.

3. Have each student measure distances by pacing on sloping ground. Evaluation should be in accordance with the limits set in the performance objectives.

4. Have each student establish angles using a transit or compass with accuracy to e within one degree of the specified angle.

5. Rate students' solution to a differential leveling problem.

6. Rate students' ability to determine the land area in acres of regularly and irregularly shaped land areas by making all necessary measurements needed for calculation and using set formulas.

RESOURCES:

1. Transit and rod or a staff compass.
2. Steel tape and chaining pins or gunter's chain.
3. Hand compass.
4. Field notebooks.
5. Deeds or legal land descriptions.
6. Level.
7. Rod.

BIBLIOGRAPHY:

1. Conservation Aide IV - Surveying. Ohio Agricultural Education Curriculum Materials Service, The Ohio State University, Columbus, Ohio, 1972.
2. Davis, S., Elementary Plane Surveying, McGraw-Hill, 1960.
3. Forbes, R.D., Forestry Handbook, Ronald Press, 1955.
4. Schwab, Glenn O., Frevert, Richard K., Barnes, Kenneth K., and Edminster, Talcott W., Elementary Soil and Water Engineering, John Wiley and Sons, New York, New York, 1965.

MEDIA:

1. VEP filmstrips, Cal-Poly:

"Use of the level: Setting up the Instrument"
"Use of the level: Reading the Rod"
"An Exercise in Differential Leveling"

NATURAL RESOURCES CURRICULUM

UNIT: Gamebird Propagation

LENGTH: 3 Weeks

WHEN TAUGHT: Grade 11 or 12, Fall

OBJECTIVES: The student will be able to:

1. identify and select gamebird species to propagate that an economic evaluation indicates would be profitable.
2. given the species and desired number of birds to be propagated, develop a breeding, reproduction, and incubation program that will produce gamebirds with less than 10% loss.
3. carry out a plan for brooding a designated species of gamebirds which will result in a minimum loss of birds.
4. develop a feeding system and balance rations for a given lot of growing birds and breeders which will maximize gains per pound of feed and minimize waste.
5. prescribe and implement a plan for preventing and/or curing common diseases and parasites which afflict gamebirds.
6. using special crates and catching nets, handle and transport gamebirds in a manner which will prevent injury and feather loss.

RELATED JOB TITLES AND RELEVANT COMPETENCIES:

Game Farmer	531-534

CONTENT:

I. Selecting the species to propagate

- A. identifying gamebird species and characteristics
- B. determining sources of eggs or chicks
- C. determining market demand
- D. evaluating costs and returns
  1. fixed costs
  2. variable costs
  3. gross returns
  4. net returns

II. Breeding and reproduction methods

A. identifying the parts of the reproductive system of male and female birds
B. identifying mating systems

1. purposes of outbreeding
2. purposes of inbreeding
3. purposes of crossbreeding
4. purposes of line breeding

C. incubating gamebird eggs

1. controlling light
2. controlling heat
3. controlling humidity

III. Brooding and rearing gamebirds

A. selecting the housing and equipment

1. determining the types and sizes of housing needed
2. selecting the ventilation system
3. determining insulation requirements
4. selecting the lighting, watering and feeding systems
5. maintaining the housing and equipment

B. managing the brooder

1. determining temperature requirements
2. determining floor and water space requirements
3. determining litter requirement
4. developing the feeding system

IV. Feeding gamebirds

A. identifying the digestive system parts and their functions
B. identifying the six classes of nutrients, their functions and sources
C. identifying gamebird nutrient requirements

1. chicks
2. growing poults
3. breeders

D. formulating rations

1. determining availability and costs of feeds
2. determining nutritional value
3. determining palatability and ease of feeding

V. Controlling diseases

A. identifying and controlling contagious and non-contagious infectious diseases

1. recognizing symptoms
2. determining causes
3. identifying prevention techniques
4. prescribing treatment and control

B. identifying non-infectious diseases

1. identifying nutritional diseases

a. recognizing symptoms
b. determining causes
c. identifying prevention techniques
d. prescribing treatment

2. identifying traumas
3. identifying inherited diseases and defects

C. identifying and controlling parasites

1. identifying internal parasites

a. recognizing the symptoms
b. determining prevention techniques
c. prescribing treatment and control

2. identifying external parasites

a. recognizing the symptoms
b. determining prevention techniques
c. prescribing treatment and control

D. maintaining sanitation

1. controlling moisture
2. disinfecting
3. maintaining proper litter

VI. Handling and transporting gamebirds

A. catching the birds
B. handling birds
C. protecting birds during transportation

TEACHER ACTIVITIES:

1. Have available slides, mounts, pictures and books to aid students in bird identification.

2. Demonstrate proper dissection technique.

3. Arrange field trips to local game farms to observe facilities.

4. Contact a resource person to explain disease symptoms and to direct post mortum examinations by students.

5. Arrange with the Department of Environmental Protection to release pen raised birds.

STUDENT ACTIVITIES:

1. Use slides, mounts, movies and field trips for gamebird identification.

2. Dissect a male and female bird; draw and label the parts.

3. Hatch gamebird eggs in the classroom with an incubator and raise the birds on the school land laboratory or on a class member's land.

4. Take a field trip to game farms to observe facilities used for brooding and rearing gamebirds.

5. Dissect a bird's digestive system and draw and label the parts.

6. Practice formulating rations for chicks and growing poults.

7. Use a resource person to explain disease symptoms in live birds and assist the students in performing a post-mortum examination.

8. Release the gamebirds produced in a previous activity when they are of appropriate maturity under supervision of conservation officer.

EVALUATION:

1. Have each student prepare a budget for raising a selected species and number of gamebirds from incubation to market. The budget should contain fixed and variable costs as well as gross and net returns.

2. Have the students identify the parts of the male and female reproductive systems of gamebirds on diagrams prepared by the teacher.

3. Specify a species and number of gamebirds for which the students are to indicate the housing requirements, space requirements, and other environmental conditions that would be needed to promote the birds' health and vigor.

4. Have the students develop a suitable ration for a species of gamebirds at a designated age. The ration should be evaluated as to its nutritional value, cost, and palatability.

5. Develop a matching test in which the students will match common gamebird diseases with their cause, vector, prevention methods or cure.

6. Have the students list the safety precautions they should use when handling and transporting gamebirds to prevent injury or feather loss.

RESOURCES:

1. Refrigerator.

2. Dissecting trays and kits.

3. Tissue forceps.

4. Thumb forceps.

5. Wire mesh strainers.

6. Rubber aprons.

7. Demonstration incubator brooder.

8. Housing, pens, and equipment for raising gamebirds.

BIBLIOGRAPHY:

1. Catalog of Game Breeding Information, current edition, National Shooting Sports Foundation, Riverside, CA.

2. Managing Gamebirds, Bulletin No. 3-692, Michigan State University Extension Service, East Lansing, Michigan, 1972.

3. Sheid, Dan W., Raising Game Birds, NASCO.

MEDIA:

1. Gamebird Management, 2 part filmstrip depicts management of pen reared and wild birds. Available from Vocational Education Productions.

NATURAL RESOURCES CURRICULUM

UNIT: Introductory Taxidermy (Fish)

LENGTH: 3 Weeks

WHEN TAUGHT: Grade 11 or 12, November, December

OBJECTIVES: The student will be able to:

1. prepare fish specimens as live mounts using techniques of plaster cast molding.
2. perform plastic and/or resin casting and cast cleaning.
3. finish and paint mounts.
4. mount specimen on wall

RELATED JOB TITLES AND RELEVANT COMPETENCIES:

Commercial Fisherman	497 (5)
Hunting and Fishing Guide	513 (10)
Conservation Officer	530 (13)

CONTENT:

I. Determination of the relationship of taxidermy to natural resources occupations

A. types of applications

1. museum taxidermy
2. trophy taxidermy
3. novelty taxidermy

B. experience required
C. economic potential
D. skills required for proficiency

II. Skills development

A. preliminary preparation of fish

1. color photographs from different angles with repeats
2. sketch and notes of body coloration
3. skin protection of freshly caught fish
4. freezer wrapping, freezer placement

B. preparing fish molds

1. selection of molding plaster grade
2. mixing technique for molding plaster
3. preparing fish for molding plaster

    a. slime removal
    b. skin tightening
    c. show side selection
    d. pectoral and ventral fin removal
    e. belly contouring
    f. shelf building
    g. body positioning
    h. mouth molding

4. plaster application

    a. first layer technique
    b. second layer reinforcement
    c. second layer application/reversal and backside layer application
    d. fin molding
    e. separating mold halves

5. preparing plaster mold for resin casting

    a. shellac application for pinhole detection
    b. shellac/alcohol mix application(s) to reduce porosity
    c. backside mold half preparation

        i. fin mold removal (dorsal and anal fins)
        ii. back "cutaway" for mounting board

    d. mixing and applying "separator" to mold
    e. selecting and mixing proportions of catalyst and resin

6. application of the resin

    a. first application technique

        i. powdered glass mixture
        ii. thickened paste

    b. second application technique

        i. fiberglass or equivalent cloth application
        ii. liquid consistency

c. separation of finished casts from mold
d. trimming cast excess, filling imperfections
e. attaching halves together
f. filling imperfections along seam line/cutting excess

7. fin attachment, glass eye replacement
8. body painting

a. paint type and selection
b. base paint applications
c. body painting techniques

i. oil paint blending
ii. finish spray overcoating

TEACHER ACTIVITIES:

1. Arrange a field trip to a local museum for students to view different types of live mount specimens.

2. Demonstrate skills in preparing fish and fish molds, resin casting fin attachment, eye placement and body painting.

3. Acquire enough specimens for class use.

STUDENT ACTIVITIES:

1. Locate local taxidermists, museums, and novelty shops.

2. Speak with local taxidermist.

3. Prepare fish specimen for plaster, mix plaster, prepare sand box, pour and reinforce plaster.

4. Prepare plaster molds for resin, mix and apply resins, attach both halves and perform finishing techniques for mounting.

5. Perform research on illustrations and photographs from books and magazines.

6. Use assorted tools for shaping and molding.

7. Research the going rate for live mount specimens.

EVALUATION:

1. Have student demonstrate skills needed to make a plaster mold of acceptable quality.

2. Have student list all of the tools and supplies needed to perform a "resin cast taxidermy operation".

3. Student should describe the method of making a "resin cast" duplicate of a fish specimen.

4. Student should construct a "resin cast" duplicate. Evaluation should be made of each phase of the construction: mold, cast, cast finishing and cast painting.

RESOURCES:

1. Peabody Museum, Yale University, New Haven, Connecticut.

2. Taxidermists local to the area.

3. J.W. Elwood Supply Co., Inc. (Taxidermists' supplies), 1202 Harney, Box 3507, Omaha, Nebraska, 68103.

4. Herters', Inc., Mitchell, South Dakota.

5. Marine supply center, (for items such as epoxy resin, plaster of paris, etc.)

6. Supplies needed:

glycerine	beeswax
epoxy resin	vaseline
plaster of paris: artist grade	parafin
isopropyl alcohol	shellac
sand: fine	files, sandpaper (fine)
electric drill	grinding bits
powdered alum	vinegar
newspaper	dental picks
spray paints: white and	brushes
silver base paints, pearl	cups for resin and paint
matte, clear spray plastic	fiberglass cloth
fresh or frozen fish specimens	artists oil paints
(1 1/2 pounds or more)	paint thinner
	artist's Japan drier

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2. Herters Guide to Modern Taxidermy, Herters, Inc., Mitchell, South Dakota.

3. McClane, A.J., The Fisherman's Encyclopedia.

4. Migdalski, Edward C., How to Make Fish Mounts and Other Fish Trophies, Ronald Press, New York, New York, 1960.

NATURAL RESOURCES CURRICULUM

UNIT: Outdoor First Aid

LENGTH: 3 Weeks

WHEN TAUGHT: Fall, Winter, or Spring - Grades 11, 12

OBJECTIVES: The student will be able to:

1. identify the importance, scope and limitations of first aid in treating accident victims in agricultural resources occupations. The effects of personal injuries to persons employed in agricultural occupations, especially those working in remote areas, can be minimized with the use of proper first aid techniques and compliance with safety procedures.

2. use the following first aid techniques in simulated situations with competency indicated in the First Aid Textbook:

   A. treating wounds
   B. treating sprains and fractures
   C. treating for shock
   D. treating poisoning
   E. treating poisonous bites and plant poisoning
   F. treating burns
   G. administering artificial respiration
   H. transporting injured persons

RELATED JOB TITLES AND RELEVANT COMPETENCIES:

Commercial Fisherman	497 (5, 6)
Campground Manager	502 (6)
Campground Maintenance Person	505 (11)
Park Maintenance Person	509 (2)
Hunting and Fishing Guide	513 (7)
Sawyer	556 (2)
Sawmill Worker	559
Forest Fire Ranger	565 (3)
Forest Fire Fighter	568 (6)
Fire Warden	572 (1, 8)
Forest Fire Suppression Crew Leader	576 (3, 4)

CONTENT:

I. Determining the Scope of First Aid

A. identifying agricultural resources occupations requiring first aid skills
B. identifying types of first aid skills needed in agricultural resources occupations
C. identifying the limitations of first aid
D. identifying individual responsibility and liability
E. identifying safety procedures needed in specialized areas of agricultural resource occupations.

II. Using First Aid Techniques

A. treating wounds

1. identifying type of wound
2. identifying and using first aid methods

B. treating sprains and fractures

1. identifying symptoms
2. identifying and using first aid methods

C. treating for shock

1. identifying signs and symptoms
2. identifying causes
3. identifying and using first aid methods

D. treating burns

1. using first aid on thermal burns
2. using first aid on chemical burns
3. treating sunburn and excessive heat problems
4. treating excessive cold problems

E. treating poisoning

1. common chemical poisons and their effects
2. identifying signs and symptoms
3. administering first aid

F. treating poisonous bites and plant poisoning

1. identifying the cause of the poisoning

a. identifying poisonous snakes in the region
b. identifying poisonous arachnids and insects
c. identifying poisonous plants

2. administering first aid

6. Demonstrate the method to make lures (attached).

7. Introduce and discuss methods to preserve and care for nets.

8. Discuss uses and maintenance of rods, reels, lines, etc.

9. Supervise student projects.

STUDENT ACTIVITIES:

1. Complete worksheets and maintain notebooks.

2. Learn and practice making knots and bends to attach hooks, poppers, and lures to line.

3. Demonstrate skills in making flies, poppers, and lures.

4. Make flies, poppers, and lures.

5. Repair and fabricate nets.

6. As a class project, construct a fyke net, gill net, and/or tunnel net. Develop list of necessary materials and estimate costs.

7. Determine appropriate rod, reel, and line for various types of fishing.

8. Practice care and maintenance of equipment.

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16. Technical Manual TM 5-268, TM 5-20H, Chief of Engineers, United States Army, War Department, Washington, D.C.

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*These and other books on commercial fishing can be ordered through International Marine Publications Company, 21 Elm Street, Camden, Maine 04843--write for their book catalog.

AQUACULTURE CURRICULUM

UNIT: Marine Life II - Flounder, Bluefish, Mackerel

LENGTH: 4 weeks

WHEN TAUGHT: Grade 10

CONCEPT: Studies of marine life habitats are necessary to determine abundance or scarcity of particular species.

OBJECTIVES: The student will be able to:

1. describe the general characteristics of these popular fish types in Connecticut.
2. discuss probable life span.
3. explain the use, applications, and limitations of the otter trawl.
4. demonstrate reading and interpreting of salinometer information.
5. use the measuring board and calipers to determine length.
6. determine wet weight.
7. use the weight: length ratio to determine minimum size.
8. examine and determine sex, weight, length, and probable age of a mature flounder.
9. describe the food web from larva to maturity of each.
10. draw a food web for one of these.
11. as an adjunct, determine age of bi-valves.
12. discuss methods used for catching these fish.
13. develop further competency with depth finder.
14. write a report analyzing future availability of these.

RELATED JOB TITLES AND RELEVANT COMPETENCIES:

Fish Conservation Officer	475-476 (1, 2, 6, 9, 10)
Fish Research Technician	480-482 (1, 3, 4, 5, 6, 7, 9)
Commercial Fisherman	496-497 (1, 2, 6, 7, 8, 10)
Fisheries Technician Marine	499-500 (1, 5, 6, 9)
Hunting and Fishing Guide	511-512 (2, 3, 4, 5)
Conservation Aide	525-526 (2, 3, 6, 10)
Conservation Officer	529-530 (3, 6)
Wildlife Technician	536-537 (2, 3, 4, 6, 10, 13, 14)

CONTENT:

1. General Characteristics: Flounder, Bluefish, Mackerel

   a. body shape and physical characteristics
   b. average length and weight when caught
   c. living conditions
   d. pollutants subjected to
   e. carnivores most eaten
   f. spawn habits
   g. herbivores consumed by larvae
   h. summer migrations
   i. living hazards

2. Otter Trawl to Sample Epifauns

   a. definitions
   b. construction and limitations
   c. boat handling while using
   d. determine conditions limiting use
   e. state laws

3. Salinometer

   a. definition
   b. how constructed
   c. affected by temperature
   d. reading
   e. interpretation of data

4. Determine Length, Weight, and Sex of Marine Animals

   a. factors that cause variations in length or weight
   b. weight:length ratio as an indicator for minimum allowable catch size
   c. construction and use of measuring board
   d. construction and use of calipers
   e. capturing for marking and tracking

5. Measuring Weight

   a. general statements
   b. wet
   c. dry
   d. ash
   e. shell vs. tissue
   f. crustaceans

6. Determine Sex

   a. ovaries vs. testes
   b. eggs vs. sperm
   c. smooth or rough

7. Counting Growth Rings (Circuli) to Determine Age of Fish and Bi-valves:

   a. factors affecting size and age
   b. summer and winter
   c. fish scales
   d. bi-valves--distinct annuli

8. Tracing Marine Food Web

   a. components
   b. pollutants and their transmission

9. Pollutants of Long Island Sound

   a. rivers
   b. streams
   c. sewage
   d. manufacturing plants
   e. nuclear power plants

10. Sportsfishing in Long Island Sound

   a. types
   b. causes for concern
   c. dangers
   d. depth finder
   e. "set and drift technique"
   f. laws

TEACHER ACTIVITIES:

1. Assemble literature, audio-visual aids, charts, nautical charts, etc.

2. Lead discussions and secure resource personnel.

3. Announce report to be written and research that should begin.

4. Describe and demonstrate use of measuring board and calipers.

5. Demonstrate weighting by wet weight.

6. Illustrate weight:length ratio.

7. Assemble bi-valve shells for age determination.

8. Allow time for developing competencies to measure, weight, and age.

9. Have flounder available for inspection and examination.

10. Allow time to gain necessary information.

11. Contact Marine Advisory Service, Sea Grant Program, University of Connecticut, Avery Point, Groton, CT 06340, to gain expertise instructor and boat for occupational experience.

STUDENT ACTIVITIES:

1. Review notebook from Marine Life I.
2. Compile notebook of class discussions, teacher aids, handouts, completed worksheets, etc.
3. Develop competencies to measure, weight, determine ratio, and examine.
4. Enhance competency with depth finder and food webs.
5. Draw a food web for one.
6. Enhance competencies in Boat Safety, Boat Handling, and Navigation II.
7. Draw a picture of the flounder examined (to scale if desired); include all pertinent facts and/or characteristics.
8. Describe kind and age of bi-valves examined.
9. Research possible pollutants of Long Island Sound from rivers, streams, sewage, manufacturing plants, nuclear power plants, etc.
10. Research production of fish in the waters over the past 25 years.
11. Write a report describing your findings in relation to fish spawning, growth patterns, food webs, migration, and future availability.
12. Write appreciation letters to all who assisted in the unit.

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AQUACULTURE CURRICULUM

UNIT: Fresh and Tidal Water Surveys

LENGTH: 8 Weeks

WHEN TAUGHT: Grade 10

CONCEPT: In order to "clean up the water," it is necessary to know its properties and the cause of its pollution.

OBJECTIVES: The student will be able to:

1. determine the correct procedure for the analysis of lakes, ponds, swamps, peat bogs, tidal marshes, and estuaries.
2. explain the correct procedures for analysis of freshwater streams.
3. use a secchi disc, forel-ule scales, hydrometer, salinometer, and Van Dorn bottle.
4. make a bucket thermometer.
5. use a bathythermograph.
6. properly record all analysis data on appropriate sheets.
7. correlate field information with management practices.
8. use a seine net.
9. identify fish species, larvae, their habitat and food cycle.
10. classify aquatic plants.
11. determine chemical and physical qualities in various bodies of water.
12. measure peat depth.
13. write a report detailing corrective action to clean up a particular body of water.
14. discuss the role of organisms in relation to fish production.

RELATED JOB TITLES AND RELEVANT COMPETENCIES:

Catfish Farmer	58-60
Fish Conservation Officer	475-476 (3, 4, 8, 9)
Fish Research Technician	480-482
Forestry Technician	484 (2)
Conservation Aide	526-527 (2, 10)
Conservation Officer	529 (3, 4)
Wildlife Technician	536-537 (2, 5, 6, 10)

CONTENT:

1. Survey of Water

   a. planning
   b. map--base line
   c. map--traverse line
   d. bottom contours
   e. map symbols
   f. classification of bottom types
   g. classification of aquatic plants
   h. significance of map
   i. water supply
   j. water purity

2. Chemical Analysis

   a. temperature
   b. density
   c. pH
   d. salinity
   e. chemical pollutants

3. Physical Analysis

   a. color and turbidity
   b. transparency
   c. plankton
   d. bottom
   e. aquatic vegetation
   f. peat depth
   g. pollutants and contaminations
   h. fish autopsy

4. Improvement of Lakes and Ponds

   a. water level
   b. water retention
   c. sprawning
   d. shelter
   e. food
   f. erosion
   g. silt
   h. turbidity
   i. pollution
   j. fertility
   k. overpopulation
   l. competition
   m. diseases
   n. parasites

5. Stream Survey

   a. main drainage
   b. name of stream
   c. tributary relationship
   d. water supply
   e. width and depth
   f. volume of flow
   g. velocity
   h. temperature
   i. dams
   j. pools and shelters
   k. color and turbidity
   l. immediate shore
   m. bottom
   n. shade
   o. fish species
   p. spawning grounds
   q. pollution
   r. chemical analysis
   s. aquatic vegetation

6. Tidal Marshes

   a. formation
   b. physical and chemical properties
   c. plants
   d. larvae
   e. predators
   f. adjacent rocky shore--marine life
   g. adjacent sandy shore--marine life
   h. pollutants
   i. endangered
   j. destruction

7. Estuary

   a. definition
   b. salinity
   c. layered
   d. physical and chemical properties
   e. marine life
   f. plant life
   g. pollution
   h. predators

8. Stream Improvement

   a. shelter
   b. food
   c. spawning facilities
   d. survival
   e. predation
   f. water supply
   g. pollutants
   h. angling pressure
   i. stocking rates

TEACHER ACTIVITIES:

1. Provide literature and other resource materials.

2. Explain maps and map reading.

3. Discuss the classification of aquatic plants.

4. Demonstrate use of new equipment; allow student time for use.

5. Provide materials and demonstrate procedure to make bucket thermometer.

6. Instruct seine preparation and use.

7. Prepare handouts, worksheets, and analysis data sheets.

8. Arrange field trips; resource personnel.

9. Lead discussions that correlate with management practices.

10. Demonstrate analysis techniques.

11. Supply research materials for fish species.

12. Contact State Agency for Federal Surplus to obtain a bathythermograph.

13. Contact the Geological Society of America, Inc., for the "GSA Rock-Color Chart."

14. Contact Project Oceanology, Avery Point, Groton, CT 06340, for its "Sediment Sizing Chart," and their assistance.

15. Acquire identification guides to rocks and minerals.

STUDENT ACTIVITIES:

1. Survey bodies of water for total analysis.
2. Develop competencies with equipment and maps.
3. Prepare map and record data.
4. Visit, consult, and work with resource persons.
5. Study the life histories of the species.
6. Investigate pollution sources and recommend solutions.
7. Determine course of action to improve the environment.
8. Write a report detailing action to clean up a particular body of water.
9. Write appreciation letters to resource personnel.

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AQUACULTURE CURRICULUM

UNIT: Metals and Welding

WHEN TAUGHT: Grade 10

OBJECTIVES: The student will be able to:

1. identify common metals.
2. identify basic metal working tools.
3. use a tap and die, drill charts.
4. sharpen a twist, drill, plane blade or wood chisel, cold chisel and screwdriver.
5. safely operate the power grinder, power hacksaw, drill press and metal working hand tools.
6. use calipers, micrometers, rulers, scribers, and screw pitch gauge.
7. select the best type of welding equipment with respect to the job to be done.
8. select the proper type of electrode or filler rod for the job to be done.
9. make correct electric arc welds in mild steel and cast iron.
10. make correct oxyacetylene welds in mild steel and cast iron.
11. determine quality and strength of weld.
12. properly and safely care for welding equipment and supplies.
13. properly braze sheet metal and cast iron.
14. cut a hole in mild steel with the arc welder and oxyacetylene cutting torch.
15. properly rehandle a tool--preferably an axe.
16. reshape and sharpen an axe or hatchet, lawn mower blades and another cutting tool using gauges and correct procedures.
17. be aware of the danger involved in using dull, mushroomed or insecurely handled tools.

RELATED JOB TITLES AND RELEVANT COMPETENCIES:

Production Agriculture Mechanic	288-289 (1, 6, 7, 8)
Plant Maintenance Mechanic	357 (2f, 1 m, n, r, w, y)
Logging Skidder Operator	553 (5f, 1, 2)

CONTENT:

1. Safety

   a. eye protection needed
   b. protection, including hands and face
   c. fire extinguishers and how to use them
   d. fire blanket and use

2. Nut and Bolt Threading

   a. select round iron
   b. prepare round iron for using a die
   c. cut threads with a die
   d. select hand iron for a nut
   e. find center and center punch
   f. select correct drill for threaded rod
   g. select tap and die
   h. clean up when done

3. Sharpening Tools

   a. use a template
   b. check for sharpness

4. Metal Lathe

   a. select metal
   b. place in chuck
   c. adjust cutter
   d. calculate depth of cut
   e. adjust cutter
   f. place angle on lathe
   g. finish piece
   h. clean up

5. Selecting Electrodes

   a. type of welder
   b. kind of metal
   c. thickness of metal
   d. position of joint

6. Striking an Arc

   a. scratching
   b. taping

7. Running a Bead

   a. tiltelectrode in line of travel
   b. clean metal between beads
   c. cooling for strength

8. Kinds of Welds

   a. flat
   b. horizontal
   c. fillet

9. Welding with Oxyacetylene

   a. safe setup
   b. adjusting flame for welding, brazing, and cutting
   c. correct angles

10. Brazing

   a. proper metal
   b. select pressures and top
   c. use oxydizing flame
   d. use bronze rod and flux

11. Safety in Tool Sharpening and Fitting

   a. grinder use
   b. grinder care--dressing and truing wheels, adjusting tool rest
   c. tools--mushroomed heads, loose handles, dull tools, injuries
   d. guards

12. Reshaping and Sharpening an Axe or Hatchet

   a. laying out curve
   b. grinding out nicks
   c. using gauge to grind blade to proper taper
   d. using files and stones to sharpen blade

13. Sharpening Other Tools

   a. use of gauges
   b. reshaping
   c. honing
   d. testing for sharpness

14. Replacing Handles

   a. removing broken handles
   b. cleaning eye
   c. shaping handle and checking alignment
   d. resawing kerf
   e. wedging
   f. finishing and sealing

TEACHER ACTIVITIES:

1. Hand out prepared directions for each exercise.

2. Demonstrate:

   a. use of chart for tap and die
   b. use of drill, tap and die, measuring tools, and template
   c. sharpening a twist drill, cold chisel, plane blade
   d. placing stick in metal lathe
   e. adjusting metal lathe
   f. measuring stock

3. Show slides, film strips and discuss types of weld and proper operation of equipment.

4. Demonstrate:

   a. ways to strike an arc
   b. running a bead
   c. setting up oxyacetylene equipment
   d. flame adjustments
   e. cutting
   f. welding with oxyacetylene
   g. brazing with oxyacetylene

5. Secure materials to work with.

6. Preassign at least one week before section begins: each student will obtain and bring to class one tool to sharpen and one to rehandle; bring a handle.

7. Show examples of dull, mushroomed, and properly handled tools. Emphasize cost, inconvenience, and danger factors.

8. Demonstrate proper method of sharpening and refitting tools.

9. Observe and supervise student activities.

10. Evaluate students' projects.

STUDENT ACTIVITIES:

1. Complete exercises assigned.

2. Bring in tools to be sharpened.

3. Follow all safety procedures.

4. Practice:

   a. running a bead
   b. padding
   c. welding two pieces of metal together--flat weld
   d. lighting a blow pipe
   e. running a fusion weld
   f. welding two pieces of metal together with oxyacetylene and filler rod
   g. brazing two pieces of metal together

5. Obtain tools for fitting and handles before section begins.

6. Maintain a notebook of notes and handouts.

7. Fit one handle.

8. Reshape and sharpen an axe or hatchet.

9. Sharpen one other tool.

10. Sharpen lawn mower blades.

11. Make some type of simple guard for a cutting tool.

12. Make a handle holder to protect handles from vise jaws.

13. Make an axe taper gauge.

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AQUACULTURE CURRICULUM

UNIT: Wood II - Paint and Fiberglass

WHEN TAUGHT: Grade 10

CONCEPT: The "finishing" of a wood project is often as important as the construction phase.

OBJECTIVES: The student will be able to:

1. discuss safety procedures learned during Wood I.
2. improve competencies with use of power saws.
3. operate safely other power tools.
4. discuss the various grits of sandpaper; conditions which determine the grit used.
5. determine when hand sanding or which power sander should be used for a particular situation.
6. discuss and determine use of wood fillers, seam compounds, and glazing compounds.
7. prepare a surface for painting, varnishing, or fiberglassing.
8. determine the kind and amount of paint, varnish, or fiberglass and resin needed for a particular project.
9. select, mix, and apply paint.
10. mix resin and apply fiberglass.
11. replace a broken window pane correctly.
12. draw plans to scale for a student project which must include painting and fiberglassing.
13. determine cost of the project.
14. secure materials, construct, and finish the project.

ELATED JOB TITLES AND RELEVANT COMPETENCIES:

Production Agriculture Mechanic	289 (5)
Land Use Planning Technician	491 (5)

CONTENT:

1. Safety Procedures

   a. personal habits
   b. tools--hand and power
   c. shop

2. Power Saws

   a. use
   b. care

3. Use and Care of Other Wood Power Tools

   a. router
   b. joiner
   c. planer
   d. lathe
   e. drill press
   f. sanders

4. Sandpaper

   a. grits
   b. hand sanding
   c. disc sander
   d. belt sander
   e. finish sander

5. Compounds

   a. wood fillers
   b. seam
   c. glazing

6 Fiberglassing

   a. properties--what made of an why
   b. properties of resin and its interaction with fiberglass
   c. uses of fiberglass
   d. determine amount of each needed by area to be covered
   e. temperature and humidity as factors for curing
   f. manner of application

7. Paints and Varnishes

   a. importance as a finishing product
   b. properties of each
   c. types of paint--indoor, outdoor, hull, bottom, etc.
   d. types of wood preservatives--varnish, polyurethane, cuprenol, etc.

e. compatibility factors of paints and varnishes.
f. selection of finisher most appropriate
g. estimating amount to be purchased
h. care needed before, during, and after application
i. use of masking tape
j. care, selection, and use of brushes, rollers, and sprays
k. temperature and humidity as factors for dying
l. application technique
m. cleaning and storage of paints and equipment

8. Glazing

a. importance
b. measuring glass
c. cleaning and cutting glass
d. prepare a sash and fit glass
e. brads and compound

9. Student Project which Includes Paint and/or Varnish, and Fiberglass

a. determine project
b. draw plans to scale
c. determine cost
d. obtain materials and equipment
e. construct
f. sand, fill, and sand
g. prime and paint
h. fiberglass, sand, and paint

TEACHER ACTIVITIES:

1. Conduct review discussion of safety from Wood I.

2. Allow time for use of power saws to enhance competencies.

3. Demonstrate use, care, and safety for other wood power tools.

4. Illustrate grits of sandpaper; have samples for examination and discussion of use.

5. Demonstrate use, care, and safety of power sanders.

6. Conduct discussions regarding choice of sander to use under different circumstances.

7. Discuss and illustrate applications of compounds.

8. Discuss and illustrate proper application of fiberglass and resin.

9. Conduct discussions of use, care, and purchase of paints and varnishes.

10. Illustrate proper use of brush, roller, and spray.

11. Supervise students' use of power tools, sanders, compounds, fiberglass, paint, and varnish.

12. Demonstrate correct way to remove broken glass pane and replace with a new one.

13. Supervise students' installation of new pane.

14. Accept or reject student's project drawing and specifications.

15. Supervise the selection and storage of materials.

16. Supervise the construction and finishing of the project.

STUDENT ACTIVITIES:

1. Participate in review work.

2. Develop competencies in use and maintenance of power tools.

3. Compile a notebook of all discussion work including any handouts.

4. Develop competencies for the application of compounds, sanding, paint, varnish, and fiberglassing.

5. Demonstrate ability to replace broken window pane.

6. Submit a project drawing with specifications for acceptance.

7. Construct and finish the product.

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AQUACULTURE CURRICULUM

UNIT: Small Gas Engines

LENGTH: 4 weeks

WHEN TAUGHT: Grade 10

CONCEPT: By introducing the principles of the internal combustion engine, the student will develop an understanding of design, operation, to overhaul, and trouble shoot small gasoline engines.

OBJECTIVES: The student will be able to:

1. explain the principles of operation (compression, carburetor, ignition) of two- and four-cycle engines.
2. select proper repair parts needed using service manuals, owner's manual and mircofilm.
3. practice proven methods on trouble shooting.
4. replace, clean, and regap spark plugs.
5. replace and adjust ignition points using proper tools.
6. test coil and condenser.
7. practice safety procedures.
8. identify types of carburetors.
9. adjust carburetor.
10. recognize the importance of clean fuel, oil, and lubrication.
11. prepare the engine for storage.

RELATED JOB TITLES AND RELEVANT COMPETENCIES:

Production Agriculture Mechanic	291-292 (10, 11, 12)
Tractor Mechanics Helper	302-303 (1, 3, 4, 5, 6, 7)
Small Engine Mechanic	311 (5, 6, 7, 8, 9, 10)

CONTENT:

1. Fundamentals of Gasoline Engine

   a. definition
   b. fuel, oils, lubrication
   c. cycle
   d. parts
   e. evaluation

2. Safety

   a. use of solvents
   b. handling of gasoline
   c. disconnect spark plug
   d. clamp engine to bench or engine stand
   e. proper use of tools and testing equipment

3. Use of References

   a. owner's, service, and parts' manuals
   b. use of microfilm
   c. cost determination

4. Carburetion

   a. types: gravity, vacuum, fuel pump
   b. clean carburetor
   c. choke, adjust
   d. air leaks
   e. air cleaner, function and clean
   f. linkage

5. Ignition

   a. basic electricity--magnetic systems
   b. clean, gap, regap, replace
   c. breaker points--gap, regap, replace
   d. test and replace condenser
   e. test and replace coil
   f. adjust air gap
   g. disassemble, identify, evaluate, assemble

6. Compression

   a. check compression
   b. clean head
   c. replace gasket
   d. torque head bolts
   e. inspect valves

7. Storage

   a. remove gas
   b. change oil
   c. lubricate cylinder
   d. clean air filter

TEACHER ACTIVITIES:

1. Provide manuals, handouts, textbooks, etc.

2. Lectures, readings, and demonstrations of:

   a. define operation of engines
   b. safety procedures
   c. ignition, carburetion, compression
   d. use of reference materials
   e. changing and gaping plugs
   f. inspecting wires
   g. testing coil and condenser
   h. adjusting carburetor
   i. installing points
   j. cleaning air filter

3. Supervise student safety and use of all equipment.

4. Supervise daily storage of equipment.

STUDENT ACTIVITIES:

1. Maintain notebooks of discussions, directions, visual aids and handouts.

2. Service engines.

3. Inspect, identify, assemble all systems.

4. Trouble shoot--ignition fuel problems.

5. Determine costs and order parts.

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AQUACULTURE CURRICULUM

UNIT: Navigation II - Tides and Currents

LENGTH: 8 weeks

WHEN TAUGHT: Grade 10

CONCEPT: To build on the objectives of Navigation I, additional variables must be included to allow for more sophisticated plotting of position or destination.

OBJECTIVES: The student will be able to:

1. discuss tides and their affect on navigation.
2. discuss tidal currents and their affect on navigation.
3. demonstrate the making and use of a course protractor.
4. demonstrate the making and use of a pelorus.
5. read and interpret tide charts and tidal current tables.
6. discuss and calculate boat speed in relation to "speed over the bottom: when current is in the same or opposite direction to the boat.
7. in direction of #6, calculate time it will take to propel between Point A & Point B with engines of variable speeds.
8. discuss and calculate boat speed in relation to speed over the bottom when current is at a right angle to the boat.
9. in direction of #8, calculate time it will take to propel between Point A & Point B with engines of variable speeds.
10. discuss and calculate boat speed in relation to speed over the bottom when current is at an oblique angle to the boat.
11. calculate time, in direction of #10, it will take to propel between Point A & Point B with engines of variable speeds.
12. determine depth by lead line and depth finder.
13. practice plotting with added variables.

3. Tow Vehicles

   a. power
   b. cooling
   c. transmission
   d. brakes
   e. suspension
   f. side mirrors
   g. electrical hookup

4. Hitches

   a. class
   b. weight carrying
   c. tongue weight
   d. safety chains

5. Operation

   a. on the road
   b. at launch site
   c. launching
   d. retrieving
   e. maintenance
   f. through obstacle course

TEACHER ACTIVITIES:

1. Use lecture and discussion periods to acquaint students with safety and proper maintenance.

2. Show safety films.

3. Demonstrate driving and backing techniques.

4. Observe student activities.

5. Provide resource materials.

6. Evaluate performance by quiz and driving skills.

7. Secure Motor Vehicle and insurance permission to allow for this unit.

STUDENT ACTIVITIES:

1. Maintain notebook.

2. Perform routine safety checks and maintenance.

3. Develop competencies to safely launch and retrieve a trailered boat.

4. Develop competencies to discuss all areas and to maintain.

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CATFISH FARMER

Other Titles: Fish Farmer, Fingerling Farmer, Fee Lake Operator, Live Hauler, Fish Farm Worker.

Job Description:

The occupation of Catfish Farmer involves a wide range of activities in the management and operation of farms producing catfish. The size of the farms varies considerably. Responsibilities may depend on the extent of diversification on the farm in producing other crops. Most catfish farmers are self-employed. Examples of the kind of work done may include designing, laying out, and constructing water facilities; securing necessary financial support and budgeting expenditures; managing water; feeding fish; controlling parasites and diseases; selecting and managing breeding stock; spawning and rearing fingerlings; and harvesting, grading, and marketing fish.

Competencies Identified and Validated

N = 32*

Competencies		Weighted Mean**
1.	Establish water facilities.	2.6
	a. Select site for ponds, raceways, etc.	3.4
	b. Plan layout of water facilities.	3.0
	c. Construct ponds.	3.0
	d. Repair damaged water facilities.	3.0
	e. Establish vegetative cover to maintain water facilities.	2.4
	f. Install culture tanks and troughs.	2.4
	g. Construct vats.	2.3
	h. Construct pens and cages.	2.1
	i. Construct troughs.	2.1
2.	Secure water.	3.1
	a. Compute volume of water needed.	3.7
	b. Determine sources of water.	3.3
	c. Conduct water chemistry tests.	3.1
	d. Maintain water pumps.	3.0
	e. Install water pumps.	2.6
3.	Manage water.	3.4
	a. Detect oxygen depletion.	3.9
	b. Correct oxygen depletion problems.	3.8

* Responses from 32 Catfish Farmers in 14 states. Survey conducted by Department of Agricultural and Extension Education, Mississippi State University, Mississippi State, Mississippi 39762.

** 4.0 = Essential; 3.0 = Important; 2.0 = Of Some Importance; 1.0 = Not Important; 0 = Does Not Apply.

c.	Control water contamination.	3.5
d.	Prevent off-flavor in fish.	3.3
e.	Control aquatic weed growth.	3.1
f.	Control muddy water.	2.8
4.	Establish farm.	3.4
a.	Obtain necessary equipment and facilities.	3.7
b.	Secure needed finances.	3.6
c.	Budget financial resources.	3.5
d.	Employ needed labor.	3.4
e.	Submit required government reports.	2.6
5.	Understand catfish biology.	2.9
a.	Identify different species of catfish.	2.9
b.	Identify external parts of catfish.	2.8
6.	Feed catfish.	3.2
a.	Determine amount to feed.	3.7
b.	Select form of feed to use.	3.4
c.	Select methods of feeding.	3.1
d.	Balance rations.	2.8
7.	Operate equipment.	2.9
a.	Operate water pumps.	3.3
b.	Operate aerators.	3.2
c.	Operate water regulation devices.	3.2
d.	Operate truck.	3.2
e.	Operate powered booms for lifting fish.	2.8
f.	Operate feeding equipment.	2.7
g.	Operate outboard motorboat.	2.6
h.	Operate seine haulers.	2.6
i.	Operate farm tractor.	2.4
8.	Control diseases and parasites.	3.7
a.	Determine symptoms.	3.8
b.	Treat fish.	3.8
c.	Select treatment.	3.7
d.	Calculate chemical treatments.	3.7
e.	Diagnose problems.	3.5
9.	Control pests.	3.0
a.	Control trash fish.	3.3
b.	Control fish predators (snakes, birds, etc.).	2.9
c.	Identify trash fish.	2.9
10.	Manage broodfish.	3.3
a.	Determine sex of catfish.	3.6
b.	Select broodfish.	3.3
c.	Calculate number of broodfish needed.	3.3
d.	Locate sources of broodfish.	3.2
e.	Improve broodfish stock.	3.1

11.	Spawn fish.	2.9
	a. Establish nests.	3.3
	b. Select fish to spawn.	3.3
	c. Collect egg masses.	3.0
	d. Transport egg masses.	3.0
	e. Observe spawning.	2.5
	f. Control spawning time of fish.	2.2
12.	Hatch eggs.	3.4
	a. Check water temperature.	3.5
	b. Manage artificial hatching facilities.	3.4
	c. Handle egg masses.	3.3
13.	Rear fry.	3.1
	a. Feed fry.	3.5
	b. Handle fry.	3.2
	c. Determine number of fry.	3.0
	d. Determine size of fry.	2.8
14.	Rear fingerlings.	3.1
	a. Feed fingerlings.	3.7
	b. Determine number of fingerlings.	3.1
	c. Determine size of fingerlings.	2.9
	d. Classify fingerlings by length.	2.8
15.	Grow food fish.	3.1
	a. Determine stocking rate.	3.6
	b. Manage open ponds.	3.5
	c. Select fingerlings.	3.4
	d. Manage raceways.	2.7
	e. Manage tanks.	2.5
	f. Manage cages.	2.4
16.	Harvest fish.	3.2
	a. Select method of harvesting.	3.5
	b. Select type of harvest to use (partial or complete).	3.4
	c. Set seine.	3.2
	d. Haul seine.	3.2
	e. Lift fish.	3.1
	f. Use live car.	2.9
17.	Market fish.	3.4
	a. Locate market outlets.	3.5
	b. Select method of marketing.	3.4
	c. Haul fish.	3.3
	d. Grade fish.	3.2
18.	Process fish.	3.4
	a. Establish selling price.	3.9
	b. Check fish for off-flavor.	3.7
	c. Dress fish.	2.6

AGRI-CHEMICAL OCCUPATIONS

AGRI-CHEMICALS MANAGER

Other Titles: Plant Manager, Area Supervisor, Office Manager, Sales Manager, Retail Unit Manager, Plant Superintendent, Lead Operator, Store Manager.

Job Description:

The Manager is responsible for implementing and enforcing policies which will maximize profitability and efficiency for the local retail outlet, through effective sales, maintenance, safety, and distribution programs; hires and dismisses employees; orders and maintains adequate amounts of product; and is ultimately responsible for equipment purchases and repairs. Usually under the supervision of the Regional Sales Representative (or similar title).

AGRI-CHEMICALS FIELD TECHNICIAN

Other Titles: Assistant Manager, Soil and Crop Specialist, Senior Serviceman.

Job Description:

The Field Technician is required to be competent in all operations of the local retail outlet so that they may temporarily substitute for the Manager in all aspects of that job except for major financial matters such as purchasing equipment or product and hiring and dismissing employees.

AGRI-CHEMICALS SERVICE MECHANIC

Other Titles: Service Person, Chief Mechanic, Equipment Manager, Maintenance Supervisor.

Job Description:

The Service Mechanic is responsible for a constant awareness of physical condition of all equipment needed to effectively operate the local retail outlet. This includes being able to operate all blending, handling, application, transferring, and storing equipment; assemble and maintain all such equipment.

Competencies Identified and Validated

Competencies	Weighted Means by Occupation** Manager N = 23 *	Field Technician N=20*	Service Mechanic N = 13*
1. Learn safety rules.	3.4	2.8	2.7
a. Read and obey safety precaution provided on equipment and on packages.	3.8	3.6	3.2
b. Follow an accepted procedure in case of an accident (emergency telephone numbers, first aid center, etc.).	3.8	3.1	3.2
c. Be familiar with information regarding laws and regulations governing the use of chemicals.	3.7	3.0	3.8
d. Determine where and how to store the chemical.	3.7	2.8	2.2
e. Eliminate or minimize safety hazards by instructing employees and customers in safe working procedures.	3.6	3.1	2.5
f. Determine equipment needs for safe disposal of the chemical container.	3.5	2.6	2.5
g. Pass state "Pesticide Safety Licensing".	3.4	3.0	1.7
h. Have knowledge of weight limits and special machinery.	3.3	2.3	3.2
i. Prepare proper proportions of chemical and carrying agents.	3.1	2.8	2.0
j. Place in hospital the books on chemical ingredients and treatment or antidote for poisoning.	3.0	2.2	1.3
k. Select and check respirators for cleanliness, effectiveness, and proper fit.	3.0	2.2	3.0

* Responses from persons employed in the Agri-Chemical Occupations in five north central states. Survey conducted by Agricultural Education Section, Purdue University, West Lafayette, Indiana 47907.

** 4.0 = Essential; 3.0 = Important; 2.0 = Of Some Importance; 1.0 = Not Important; 0 = Does Not Apply.

Competencies	Manager	Field Technician	Service Mechanic
1. Check application equipment for leaks, clogged lines, and improper nozzles and/or other malfunctions.	3.0	3.2	3.5
2. Know soil science relationships.	3.0	3.0	1.6
a. Recognize weeds in row crops, pastures, forests, and ponds.	3.4	3.3	2.1
b. Formulate herbicide-fertilizer mixtures.	3.4	2.7	1.5
c. Identify soil deficiencies from symptoms of growing plants.	3.0	2.8	1.6
d. Recommend treatment to adjust pH to appropriate levels.	3.0	3.1	1.1
e. Explain the function of various chemical elements in plant growth.	2.9	2.8	1.7
f. Determine which surfactants or wetting agents may be best for specific applications.	2.9	2.9	1.0
g. Take soil samples for chemical analysis.	2.7	3.2	1.8
3. Understand merchandising products and services.	3.2	2.9	1.6
a. Recognize a farmer's potential as a producer.	3.7	3.2	1.5
b. Determine relative amounts of different kinds and types of chemicals to be applied per acre.	3.6	3.3	2.5
c. Calculate the pesticide and/or application bill for a customer.	3.4	2.8	1.1
d. Compute costs and returns in determining the use of agricultural chemicals.	3.4	2.9	1.5
e. Compute amounts of active ingredients of chemicals to be used.	3.4	3.2	1.9
f. Receive money, prepare necessary records to provide receipts for customers, and provide control.	3.2	3.0	1.6

Competencies	Manager	Field Technician	Service Mechanic
g. Maintain suitable stock inventories and arrangement.	3.2	2.0	1.8
h. Name private and public laboratories and agencies available for analysis and/or consultations.	3.0	2.4	0.9
i. Maintain security of files, merchandise, and equipment.	3.0	3.6	1.6
j. Have a working knowledge of chemical manufacturing.	2.7	2.5	1.5
k. Conduct field trials on new chemicals, and determine profitability and effectiveness.	2.6	2.9	1.6
4. Be able to calibrate equipment.	3.1	3.1	3.1
a. Read and interpret package labels, rate of application, and other methods.	3.5	3.5	2.9
b. Calibrate volume, pressure, and output of equipment.	3.1	3.5	3.4
c. Plan alternative methods of chemical applications.	3.1	3.0	2.2
d. Adjust mixing apparatus to maintain proper solution quality.	3.1	3.1	3.3
e. Describe appropriate applications of various nozzles: flat fan, even fan, flooding, boomless, off center, solid cone, hollow cone, and whirl chamber.	3.0	3.4	3.5
f. Adjust height and width to achieve desired distribution patterns.	3.0	3.1	3.4
g. Use calibration charts to set up the sprayer for adequate coverage.	3.0	3.2	3.2
h. Follow operator's manual for adjustments.	2.9	3.0	3.5
i. Weigh and measure small quanitities of chemicals.	2.9	3.0	2.8

Competencies	Manager	Field Technician	Service Mechanic
5. Know pest control procedures.	3.2	3.1	2.0
a. Recognize symptoms of pesticide damage and residues due to error of application or selection of pesticides.	3.5	3.4	2.2
b. Identify fungi and bacteria on plants and animals and their symptoms.	3.4	3.5	2.4
c. Consider together, the pest, the hose being attached, and the approved chemicals available, then recommend to the customer the most efficient method, considering environment and control.	3.4	3.3	2.2
d. Recognize symptoms of insects and nematodes (chewing, sucking, and biting).	3.2	3.3	2.2
e. Calculate the "economic injury level" for the customer.	3.2	2.9	1.6
f. Identify common insects, weeds, diseases, and other pests and their damage common to the area.	3.1	3.1	2.3
g. Recommend treatment for animals and poultry suffering from parasites.	2.9	2.4	0.9
6. Purchase, maintain, and repair equipment.	2.3	2.5	3.3
a. Protect company against liability claims by adequate insurance policies.	3.4	2.7	2.2
b. Call on customers in the slack season to develop sales for the retail outlet.	3.3	3.1	2.3
c. Inspect all operating equipment according to established procedures and recommend repairs as needed.	3.3	2.6	3.7
d. Describe characteristics of equipment which affect compatability with chemicals.	3.0	2.8	3.5

Competencies	Manager	Field Technician	Service Mechanic
e. Use appropriate service equipment and tools needed to maintain or assemble new equipment.	2.9	2.6	3.6
f. Deliver liquid or dry material to customer operating custom applicating equipment where necessary.	2.9	2.6	2.4

AGRI-CHEMICAL OCCUPATIONS

AGRI-CHEMICALS WAREHOUSE MAN

Other Titles: Assistant Plant Manager, Serviceman, Chemical Warehouseman.

Job Description:

The Warehouseman is responsible for maintaining an accurate inventory at all times; storing compatible chemicals in proper temperature of facility at all times; possess a working knowledge of chemicals' reactivity, volatility, and stability levels; providing for an appealing display area and arrangement; operating and maintaining storage, handling, and transfer of equipment. Usually under the supervision of the Manager and Assistant Manager.

AGRI-CHEMICALS TROUBLE SHOOTER

Other Titles: Assistant Sales Manager, Assistant Sales Representative, Scout.

Job Description:

The Trouble Shooter is responsible for promotion and sale of product and services within assigned area; soil sampling, crop inspection, pesticide performance evaluation, and yield prediction; handling complaints, comments, and suggestions of customers relative to products and services of retail outlets. Usually supervised by Manager.

AGRI-CHEMICALS SALES CLERK

Other Titles: Office Clerk, Store Clerk, Clerk-Typist, Bookkeeper.

Job Description:

The Sales Clerk must be able to: prepare and receive orders from customers; prepare customer invoices; operate weighing equipment; receive money and maintain necessary inventory and financial records; prepare statistical reports for forecast purposes; operate and maintain all office equipment; make recommendations to customers on a limited basis. Sales Clerks are responsible to the Manager.

Competencies Identified and Validated

Competencies	Weighted Means by Occupation** Warehouse Man N = 15*	Trouble Shooter N = 16*	Sales Clerk N = 21*
1. Learn safety rules.	3.2	2.9	2.7
a. Determine where and how to store the chemical.	3.8	3.1	2.5
b. Follow an accepted procedure in case of an accident (emergency telephone numbers, first aid center, etc.).	3.8	3.2	3.2
c. Determine equipment needs for safe disposal of the chemical containers.	3.7	2.7	2.5
d. Read and obey safety precautions provided on equipment and on packages.	3.7	3.5	3.3
e. Eliminate or minimize safety hazards by instructing employees and customers in safe working procedures.	3.7	3.3	3.3
f. Select and check respirators for cleanliness, effectiveness, and proper fit.	3.4	2.2	2.6
g. Pass state "Pesticide Safety Licensing".	3.3	3.3	3.0
h. Be familiar with information regarding laws and regulations governing the use of agrichemicals.	3.3	3.1	3.3
i. Have knowledge of weight limits and special machinery.	2.7	2.8	2.6
j. Prepare proper proportions of chemical and carrying agents.	2.6	3.0	2.5

* Responses from persons employed in the Agri-Chemical Occupations in five north central states. Survey conducted by Agricultural Education Section, Purdue University, West Lafayette, Indiana 47907.

** 4.0 = Essential; 3.0 = Important; 2.0 = Of some Importance; 1.0 = Not Important; 0 = Does Not Apply.

Competencies	Warehouse Man	Trouble Shooter	Sales Clerk
k. Check application equipment for leaks, clogged lines, and improper nozzles and/or other malfunctions.	2.3	2.9	2.4
l. Place in hospitals the books on chemical ingredients and treatment or antidote for poisoning.	1.7	2.1	1.8
2. Know soil science relationships.	2.2	2.7	2.5
a. Formulate herbicide-fertilizer mixtures.	3.7	2.4	3.0
b. Take soil samples for chemical analysis.	2.7	2.7	2.6
c. Determine which surfactants or wetting agents may be best for specific application.	2.0	2.7	2.2
d. Recognize weeds in row crops, pastures, forests, and ponds.	1.9	2.9	3.0
e. Identify soil deficiencies symptoms of growing plants.	1.8	2.9	2.3
f. Recommend treatment to adjust pH to appropriate levels.	1.6	2.7	2.2
g. Explain the function of various chemical elements in plant growth.	1.5	2.5	2.4
3. Understand merchandising production and services.	2.2	2.3	2.5
a. Maintain suitable stock inventories and arrangement.	3.6	1.8	2.6
b. Maintain security of files, merchandise, and equipment.	2.7	1.8	3.6
c. Recognize a farmer's potential as a producer.	2.6	2.9	2.5
d. Calculate the pesticide and/or application bill for a customer.	2.4	2.7	2.4
e. Determine relative amounts of different kinds and types of chemicals to be applied per acre.	2.2	2.7	3.5

Competencies	Warehouse Man	Trouble Shooter	Sales Clerk
f. Receive money, prepare necessary records to provide receipts for customers, and provide control.	2.1	2.0	3.7
g. Name private and public laboratories and agencies available for analysis and/or consultations.	2.0	2.0	1.8
h. Compute amounts of active ingredients of chemicals to be used.	1.9	2.7	2.7
i. Compute costs and returns in determining the use of agricultural chemicals.	1.8	2.7	2.7
j. Have a working knowledge of chemical manufacturing.	1.6	1.9	2.4
k. Conduct field trials on new chemicals and determine profitability and effectiveness.		2.3	1.7
4. Be able to calibrate equipment.	2.3	3.0	2.6
a. Read and interpret package labels: rate of application, time of application, and alternative methods.	2.9	3.3	3.7
b. Follow operator's manual for adjustments.	2.7	3.1	2.6
c. Calibrate volume, pressure, and output of equipment.	2.5	3.4	2.7
d. Use calibration charts to set up the sprayer for adequate coverage.	2.3	3.5	2.3
e. Plan alternative methods of chemical application.	2.2	3.5	2.3
f. Weigh and measure small quantities of chemicals.	2.1	2.5	2.4
g. Adjust mixing apparatus to maintain proper solution quality.	2.1	2.6	2.0
h. Adjust height and width to achieve desired distribution patterns.	1.7	2.5	2.1

Competencies	Warehouse Man	Trouble Shooter	Sales Clerk
i. Describe appropriate applications of various nozzles: flat fan, even fan, flooding, boomless, off-center, solid cone, hollow cone, and whirl chamber.	1.7	3.1	2.4
5. Know pest control procedures.	1.9	3.1	2.8
a. Recognize symptoms of pesticide damages and residues due to error of application or selection of pesticides.	2.4	3.5	3.0
b. Identify fungi and bacteria on plants and animals and their symptoms.	2.2	3.4	3.0
c. Consider together, the pest, the hose being attached, and the approved chemicals available, then recommend to the customer the most efficient method, considering environment and control.	2.1	3.4	3.2
d. Recognize symptoms of insects and nematodes (chewing, sucking, and biting).	1.9	3.3	2.8
e. Identify common insects, weeds, diseases, and other pests and their damage common to the area.	1.7	3.2	2.6
f. Recommend treatment for animals and poultry suffering from parasites.	1.7	1.7	2.1
g. Calculate the "economic injury level" for the customer.	1.5	2.8	2.8
6. Purchase, maintain, and repair equipment.	2.3	2.5	2.1
a. Use appropriate service equipment and tools needed to maintain or assemble new equipment.	2.6	2.9	1.8
b. Deliver liquid or dry material to customer operating custom applicating equipment where necessary.	2.5	2.5	2.1

Competencies	Warehouse Man	Trouble Shooter	Sales Clerk
c. Follow greasing and oiling instruction of operator's manual using grease guns and oil cans, packing bearings, etc.	2.5	2.7	2.1
d. Describe characteristics of equipment which affect compatability with chemicals.	2.4	2.5	2.5
e. Inspect all operating equipment according to established procedures and recommend repairs as needed.	2.3	2.7	1.7
f. Repair and maintain sprayer parts, fumigators, and equipment.	1.9	2.5	2.8
g. Repair and/or maintain dusters.	1.7	1.7	1.6
7. Develop managerial abilities.	1.7	2.4	2.8
a. Handle customer complaints within limits established through company channels.	2.8	2.8	3.4
b. Council and advise farmers to assist in increasing their profitability.	2.3	2.7	3.5
c. Call on customers in the slack season to develop sales for the retail outlet.	1.9	2.5	2.6
d. Evaluate and report competitive pricing policies and activities within the area and recommend corrective action.	1.8	2.7	2.3
e. Implement and administer company approved credit and collection policies.	1.2	2.1	3.1
f. Formulate an advertising campaign to promote sale of an agri-chemical product on a broad basis.	0.9	1.9	2.6
g. Protect company against liability claims by adequate insurance policies.	0.9	2.1	2.4

GRAIN, FERTILIZER, FEED AND SEED SALES BUSINESS OCCUPATIONS

COUNTERMAN

Other Title: Salesman.

Job Description: Must have a wide knowledge of farming and ranching and a good understanding of local livestock and crop production practices and problems. Thoroughly familiar with all products which the business stocks for sale. Knows most customers. Fills customer orders and completes record of sales. Keeps inventory of stock on hand and reorders items in short supply. Is usually employed by privately owned firms, businesses, and organizations.

HELPER

Other Title: Worker.

Job Description: A general knowledge of farming and ranching is needed by this employee. He follows instructions of supervisors in filling customers orders, stocks supplies, and assists other employees of the business when his services are needed. He helps to keep buildings clean and orderly, helps load trucks, drives trucks and other equipment used in the business. Is usually employed by privately owned firms, businesses, and organizations.

SALES AND SERVICE REPRESENTATIVE

Other Title: Salesman.

Job Description: A thorough knowledge of farming and ranching is a must for this employee. He should quickly recognize the specific needs of prospective customers and provide them with alternative solutions to their needs which the business he represents can provide. He must have a knowledge of the customer's ability to pay for purchases and the amount of credit which may be offered to various customers. He must have a thorough knowledge of all materials, supplies, and items his company offers for sale, the quantity on hand, their location, and price. He must be considerate with customers and promote good customer relations with the business he represents which is usually privately owned.

BOOKKEEPER

Other Title: Secretary.

Job Description: Must have a general knowledge of farming and ranching. Must have good knowledge of keeping financial accounts and records including purchases, sales, charge accounts, monthly billings, and federal and state tax reporting. Is responsible for inventory control. Must have skill in typing. Is usually employed by privately owned firms, businesses, and organizations.

DRIVER

Other Titles: Truck Driver, Deliveryman.

Job Description: Should have a good general knowledge of farming and ranching. Must be familiar with location of customer's farms and ranches including location of nearby towns and centers of transportation including railroads. Must know how to properly load and unload trucks quickly and safely. Should possess a thorough knowledge of the proper operation and maintenance of trucks, and understand the mechanics of gasoline engines. Must be a skilled and safe driver of trucks and autos; be tactful with customers and promote good customer relations. Must have a good knowledge of all materials and supplies his business sells. Is usually employed by privately owned firms, businesses, and organizations.

Competencies Identified and Validated*

	Weighted Means by Occupation**				
	N 36	N 36	N 41	N 41	N 34
Competencies	Counterman	Helper	Sales & Service Representative	Bookkeeper	Driver
. Possess desirable personal qualities and qualifications.	3.5	3.3	3.0	3.3	3.1
a. Demonstrate the ability to get along with others.	3.6	3.9	4.0	3.5	3.2
b. Demonstrate the ability to work on his own.	4.0	3.3	2.5	3.4	3.3

* Responses from persons employed in these occupations or their work supervisors in 16 states. Survey conducted by Department of Agricultural Education, North Dakota State University, Fargo, North Dakota 58102.

** 4.0 = Essential; 3.0 = Important; 2.0 = Of Some Importance; 1.0 = Not Important; 0 = Does Not Apply.

Competencies	Counterman	Helper	Sales & Service Representative	Bookkeeper	Driver
c. Demonstrate a willingness to work.	3.4	3.3	3.7	3.3	3.3
d. Demonstrate the ability to project a desirable image for the firm.	3.5	3.0	3.8	3.3	3.3
e. Demonstrate personal integrity as an employee of the firm.	3.5	3.3	3.8	3.6	3.4
f. Budget time.	3.0	2.6	3.5	3.4	2.9
g. Maintain a satisfactory attendance record.	4.0	3.2	3.4	3.4	3.2
h. Demonstrate desirable job attitude about the organization when working with fellow employees, potential customers and customers.	3.6	3.2	3.6	3.3	3.3
i. Demonstrate a willingness to learn or take supervision.	3.2	3.2	3.4	3.4	3.1
j. Demonstrate the ability to follow directions of supervisor.	2.4	3.4	3.3	3.4	3.2
k. Demonstrate acceptable personal appearance and personal hygiene.	3.1	2.7	3.5	3.3	3.1
l. Schedule jobs.	2.7	2.1	3.3	2.9	2.5
m. Accept routine tasks without becoming disinterested.	2.9	3.0	3.0	2.2	2.9
2. Practice good human relations.	2.9	2.4	2.9	2.6	2.8
a. See and report the customer's point of view.	3.0	2.5	3.4	2.6	2.9
b. Empathize with customer.	2.8	2.3	2.4	2.5	2.6
3. Animal science - nutrition.	1.8	0.6	2.4	0.3	0.5
a. Recommend feeding programs which will eliminate problems of chemical residues in meat, milk and eggs.	1.9	.8	2.7	.3	.6
b. Balance rations for different types of livestock and poultry of various ages.	1.9	.7	2.6	.3	.5
c. Recommend the use of additives and medications in compliance with FDA standards.	2.1	.8	2.7	.3	.5
d. Formulate feeds so as to balance economically grains grown on the farm.	1.9	.7	2.7	.3	.5

ompetencies	Counterman	Helper	Sales & Service Representative	Bookkeeper	Driver
e. Explain the purpose of feed additives and medications.	2.2	.8	2.6	.3	.5
f. Determine feed needs in terms of nutrients for growth, production and reproduction.	1.9	.7	2.5	.3	.6
g. Read and explain the meaning of the ingredients listed on a feed tag.	2.1	.9	2.6	.5	.7
h. Recommend feed additives and medication in relation to cost and suitability.	2.1	.6	2.6	.3	.5
i. Evaluate livestock quality and recommend compatible feeding programs.	2.1	.5	2.4	.2	.5
j. Determine suitability of feeds for ruminants, nonruminants.	2.2	.6	2.5	.2	.5
k. Plan alternative feeding programs for different types of livestock using feeds available in the area.	1.9	.5	2.6	.3	.4
l. Substitute various feed ingredients in balancing rations.	1.8	.5	2.4	.3	.5
m. Compute feed required for pound of gain for each major livestock group.	1.8	.5	2.4	.2	.5
n. Classify feeds in terms of nutrients and energy value.	1.7	.5	2.4	.2	.5
o. Determine the form (pelleted, rolled, ground, etc.) in which feeds should be prepared for livestock and poultry.	1.7	.6	2.4	.2	.5
p. Determine the quality of hay and silage in terms of feeding value (judgment, lab analysis, etc.).	1.6	.4	2.5	.2	.5
q. Classify feeds according to mineral content.	1.5	.4	2.2	.3	.5
r. Compute the conversion of nitrogen from non-protein to protein.	1.4	.4	2.3	.4	.5
s. Trace the passage of feed through digestive processes of various animals.	1.3	.4	2.0	.2	.4

Competencies	Counterman	Helper	Sales & Service Representative	Bookkeeper	Driver
t. Analyze feeds for fats, nitrogen-free extract, fiber and ash.	.8	.4	1.6	.3	.4
4. Animal science - animal care and handling.	1.7	.8	2.5	.5	1.0
a. Assist with planning alternative systems of livestock management.	1.6	.5	2.5	.4	.7
b. Identify hazards that may cause fire, injury or poisoning to livestock and poultry.	1.7	1.0	2.4	.5	1.3
5. Animal science - identification and disease control.	1.5	.5	2.3	.2	.5
a. Identify symptoms in animals and birds suffering from deficiencies of essential nutritive elements in feeding rations.	1.4	.7	2.4	.2	.7
b. Identify and plans corrective measures for common livestock diseases and parasites.	1.5	.5	2.4	.2	.5
c. Recommend treatment for animals and poultry suffering from parasites.	1.9	.5	2.4	.2	.5
d. Post animals or birds to determine internal parasites.	1.1	.4	1.8	.2	.3
6. Plant science - general knowledge.	2.2	.9	2.6	1.3	.5
a. Compute weight loss incurred in drying grain.	2.3	1.1	2.3	2.2	.5
b. Compute cost of drying grain.	2.2	1.0	2.3	2.2	.4
c. Recommend accepted crop management practices to improve volume of grain produced.	2.5	.9	3.0	.9	.5
d. Explain crop adaptation in terms of factors related to soil, climate and economics.	2.2	.8	2.8	.6	.5
e. Assist in planning alternative cropping systems.	1.9	.7	2.8	.6	.4
7. Plant science - seed propagation.	1.5	1.1	1.5	.5	.5
a. Analyze seed samples and properly label for sale.	1.5	1.0	1.6	.6	.5
b. Test seed for germination.	1.4	1.2	1.3	.4	.4

Competencies	Counterman	Helper	Sales & Service Representative	Bookkeeper	Driver
8. Plant science - fertilizer.	2.3	.9	2.7	.6	.5
a. Recommend a fertilizer program (timing, placement, etc.).	2.8	.9	3.0	.5	.6
b. Determine relative amounts of different kinds and types of fertilizers to be applied per acre.	2.9	.9	3.1	.6	.6
c. Formulate fertilizer to specification.	2.2	.9	2.4	.7	.5
d. Assist with planning alternative measures of fertilizer applications.	2.3	.9	2.8	.6	.5
e. Substitute fertilizer ingredients according to economic and agronomic conditions.	1.9	.8	2.5	.6	.4
f. Formulate herbicide-fertilizer mixtures.	2.1	.9	2.8	.5	.3
g. Explain the process of manufacturing fertilizers.	1.8	.8	2.2	.5	.6
9. Plant science - hazards (insects, weeds, damage and contamination).	2.3	1.6	2.7	.5	1.0
a. Identify various types of grain damage.	2.6	2.4	2.6	.6	1.1
b. Identify materials that might contaminate grain because of odors.	2.5	2.0	2.5	.6	1.6
c. Identify sources of grain contamination and recommend complete programs of grain sanitation.	2.6	1.6	2.7	.6	1.3
d. Treat grain properly and safely for insect control.	2.1	2.2	2.1	.5	1.2
e. Recommend weed control programs.	2.6	.8	3.1	.6	.6
f. Identify weeds and weed seeds commonly found in crops grown locally.	2.3	1.3	2.9	.4	.7
g. Identify and classify insect damage.	2.1	1.3	2.9	.4	.8
h. Identify seed-borne diseases.	1.9	1.0	2.8	.4	.3

Competencies	Counterman	Helper	Sales & Service Representative	Bookkeeper	Driver
10. Plant science - agricultural chemicals.	2.4	1.1	2.9	.6	.6
a. Recommend proper time to use chemicals (weeds, crops, insects, etc.).	2.9	1.1	3.1	.7	.7
b. Time chemical applications to avoid residue problems.	2.5	1.1	2.9	.6	.6
c. Interpret chemical labels.	2.7	1.3	3.1	.8	.8
d. Compute amounts of active ingredients of chemicals to be used.	2.6	1.2	3.1	.6	.6
e. Recommend insecticides needed.	2.7	1.2	3.1	.6	.5
f. Name sources of information regarding laws and regulations governing the use of agricultural chemicals.	2.4	1.2	2.9	.8	.7
g. Explain the function of various chemical elements in plant growth.	2.1	.9	2.6	.5	.5
h. Weigh and measure relatively small quantities of chemicals.	1.6	1.1	2.1	.5	.7
11. Agricultural mechanics - special equipment maintenance.	2.1	1.7	1.6	.7	1.2
a. Care for and maintain scales.	2.1	1.7	1.6	.7	1.2
12. Agricultural mechanics - equipment, supplies and materials recommendations and selections.	2.1	1.4	2.0	.8	1.1
a. Select proper equipment to combat fire.	1.9	1.9	1.8	1.0	2.1
b. Recommend crop varieties that will maximize returns in terms of yield and market acceptance.	2.5	1.1	3.0	.6	.6
c. Recommend the kinds of equipment commonly needed in a grain, feed, seed and fertilizer facility.	1.8	1.2	2.1	.4	.7
13. Agricultural mechanics - equipment operation - various specialized equipment.	2.1	2.6	1.6	1.0	1.7
a. Weigh grain as it arrives at the elevator.	2.8	2.3	1.9	2.1	2.2

Competencies	Counterman	Helper	Sales & Service Representative	Bookkeeper	Driver
b. Operate seed-treating and seed-cleaning equipment.	1.6	2.5	1.2	.4	1.2
c. Operate and adjust equipment commonly used in a grain, feed, seed and fertilizer facility.	2.0	2.9	1.6	.4	1.6
L4. Agricultural mechanics - equipment operation - testing and analysis devices.	2.9	2.5	1.8	1.7	1.1
a. Use balances, moisture testers, screens and dockage machines used in grading grain.	3.1	2.5	2.0	2.1	1.1
b. Operate and read devices for detecting heating of grain in storage (hot spots).	2.6	2.5	1.6	1.3	1.0
L5. Agricultural mechanics - equipment operation - major equipment.	2.0	2.0	2.0	.8	1.5
a. Draw a representative sample of grain from a truck or car.	3.1	3.0	1.9	1.6	1.9
b. Calibrate farm implements to apply specific amounts of chemicals.	1.5	1.7	2.2	.4	1.4
c. Recommend and make machinery adjustments which will result in harvesting quality grain.	1.4	1.2	1.9	.3	1.1
L6. Agricultural mechanics - equipment operation - office equipment.	3.2	1.6	3.4	3.6	1.8
a. Use the telephone for business transactions.	3.2	1.6	3.4	3.6	1.8
L7. Agricultural mechanics - agricultural buildings and convenience - construction.	1.0	.6	1.8	.4	.5
a. Diagram efficient facility lay-outs for modern grain, feed, seed and fertilizer operations.	.9	.6	1.6	.5	.4
b. Plan and develop mechanical feeding systems.	1.0	.5	1.9	.3	.5

Competencies	Counterman	Helper	Sales & Service Representative	Bookkeeper	Driver
18. Agricultural mechanics - soil and water management - soils.	1.9	1.1	2.4	.5	.5
a. Interpret soil tests.	2.2	1.1	2.8	.7	.5
b. Take soil samples for fertilizer analysis.	1.6	1.7	2.5	.4	.9
c. Recommend treatment to adjust pH to appropriate levels.	2.1	1.2	2.6	.6	.4
d. Explain the importance of soil pH to plant adaptability.	2.3	1.1	2.6	.5	.5
e. Identify soil deficiencies from symptoms of growing plants.	1.9	1.0	2.6	.5	.5
f. Test soils for pH levels.	1.5	.9	2.1	.4	.5
g. Determine the adaptability of soils to crops to be grown.	1.8	1.0	1.7	.4	.4
h. Identify soils problems that may be due to lack of drainage or lack of water.	1.6	1.0	2.5	.4	.5
19. Agricultural business management and marketing - general management.	2.1	1.3	2.5	2.0	.9
a. Understand federal and state laws regarding grain, feed, seed and fertilizer business.	2.7	1.9	3.0	2.5	1.5
b. Understand the legal responsibilities of a business serving the public.	2.7	2.0	3.0	1.7	1.6
c. Develop objectives for the business that can be used by management to promote business growth.	2.0	1.4	2.4	2.0	.8
d. Explain and use contracts and other legal instruments needed in the business operation.	2.2	1.2	2.6	2.5	.6
e. Understand the types of business organization.	2.0	1.1	2.5	2.2	.7
f. Understand the advantages and disadvantages of different types of business organization.	1.9	.9	2.1	2.2	.7
g. Understand and is able to apply the basic requirements for starting a business.	1.5	.8	2.1	2.1	.5
h. Explain how environmental factors affect the feed efficiency of livestock enterprises.	2.0	.9	2.6	.7	.7

Competencies	Counterman	Helper	Sales & Service Representative	Bookkeeper	Driver
20. Agricultural business management and marketing - financial management - analysis and assessment.	1.6	.9	2.2	1.9	.5
a. Prepare and interpret a financial statement for the business.	1.1	1.3	1.7	2.8	.4
b. Understand the sources of capital for each type of business.	1.1	.6	1.6	2.4	.4
c. Estimate customer wants and needs from past records.	2.4	1.2	2.7	2.4	.8
d. Compute costs and returns in determining the use of agricultural chemicals.	2.2	.8	2.6	1.5	.4
e. Develop a hedging program appropriate for a country elevator.	1.1	.6	1.2	1.3	.3
f. Determine from crop reports potential volume of grain produced in elevator trade territory.	1.7	.9	2.1	2.0	.5
g. Analyze costs and returns of such improvement projects as drainage, liming, fertilizers.	1.5	.6	3.2	.8	.4
21. Agricultural business management and marketing - financial management - purchasing and budgeting.	1.4	.6	2.0	1.3	.3
a. Use business goals for preparing a total business budget.	1.3	.7	1.7	2.0	.3
b. Prepares a livestock or poultry feeding budget, estimating feed costs, value of product and return over feed costs.	1.5	.5	2.2	.8	.3
c. Prepare advertising budget.	1.3	.5	1.8	1.6	.3
d. Prepare a budget, estimating costs of production and returns per acre or major crops produced in area.	1.6	.6	2.4	.8	.3
22. Agricultural business management and marketing - financial management - credit.	1.6	.7	2.3	2.1	.4
a. Develop a sound credit policy for a grain, feed, seed and fertilizer business.	1.6	.9	2.0	1.8	.5

Competencies	Counterman	Helper	Sales & Service Representative	Bookkeeper	Driver
b. Evaluate financial statements to determine credit risks of farmers and ranchers.	1.6	.8	2.4	2.3	.4
c. Compute the cost of granting credit.	1.5	.7	2.2	2.2	.4
d. Identify and recommend sources of credit available in the community.	1.7	.5	2.4	2.0	.4
23. Agricultural business management and marketing - financial management - marketing.	1.6	.8	2.1	1.2	.4
a. Determine the possible returns from different methods of selling grain.	1.7	.8	2.1	1.6	.4
b. Explain the relationship of cash grain prices to futures.	1.6	.7	2.1	1.7	.3
c. Locate sources of market information.	1.8	.8	2.1	1.6	.4
d. Interpret market information in market bulletin, newspapers and radio.	1.9	.9	2.3	1.5	.6
e. Understand and is able to apply the basic principles of economics to the distribution and marketing of grain, feed, fertilizer and seed.	1.8	.8	2.4	1.7	.5
f. Identify economic and environmental factors that influence types of livestock and poultry which should be produced in an area.	1.5	.6	2.3	.8	.4
g. Develop a basis chart for various commodities.	1.3	.6	1.4	1.5	.3
h. Conduct a market survey.	1.7	.6	2.2	1.3	.4
i. Assist farmers and ranchers in determining the most economical ways to market livestock.	1.5	.5	2.3	.7	.5
j. Determine when livestock are ready for market.	1.2	.6	2.0	.4	.6
k. Suggest how livestock producers can use the futures market as a market tool.	1.5	.5	2.1	2.4	.6

Competencies	Counterman	Helper	Sales & Service Representative	Bookkeeper	Driver
24. Agricultural business management and marketing - financial management pricing.	2.1	1.2	2.1	2.4	.6
a. Price grain based on grade, weight and quality.	2.1	1.4	2.1	2.4	.7
b. Understand the role of prices in the marketplace.	2.5	1.5	2.6	2.1	.9
c. Compute margins.	2.0	1.0	2.0	2.5	.5
d. Compute markup.	2.1	1.2	2.0	2.5	.5
e. Explain the relationship of markup to margin.	1.7	.9	2.0	2.6	.5
25. Agricultural business management and marketing - financial management - profits.	2.1	1.1	2.6	2.7	1.0
a. Understand how each type of business organization divides its profits or losses.	1.8	.9	2.1	2.6	.8
b. Understand the importance and the function of business profits.	2.4	1.2	3.1	2.7	1.2
26. Merchandising - salesmanship and selling.	3.8	1.4	3.2	1.9	.9
a. Quote grain prices to farmers.	3.3	1.6	3.0	2.7	1.1
b. Close a sale.	3.3	1.4	3.4	2.3	.9
c. Demonstrate the steps of successful selling.	2.7	1.3	3.2	1.8	.8
d. Demonstrate the techniques for successful farm and ranch calls.	2.3	1.4	3.2	1.0	1.0
e. Demonstrate the use of different types of sales techniques (telephone, face-to-face, etc.).	2.9	1.4	3.3	1.6	.9
27. Merchandising - promotion.	2.0	.7	2.7	.7	.5
a. Organize a facility for effective merchandising.	2.3	1.0	2.3	1.1	.5
b. Organize and conduct sales meetings.	1.8	.8	2.9	.7	.5
c. Plan and conduct fertilizer and agricultural chemical demonstrations.	2.2	.8	2.8	.6	.5

Competencies	Counterman	Helper	Sales & Service Representative	Bookkeeper	Driver
d. Plan and carry out promotion days.	2.3	.8	2.8	.8	.5
e. Recognize potential customers identified from market studies.	2.3	.9	2.9	1.1	.8
f. Plan and conduct feeding demonstrations.	1.5	.6	2.7	.5	.5
g. Organize and conduct clinics for customers and staff members.	1.7	.5	2.7	.6	.4
h. Prepare and present demonstrations.	1.8	.7	2.7	.5	.4
i. Prepare and present public speeches.	1.7	.6	2.6	.7	.4
28. Merchandising - displays and advertising.	2.2	.8	2.1	1.0	.4
a. Develop a monthly advertising calendar.	1.9	.6	2.0	1.0	.4
b. Develop displays.	2.4	1.0	2.2	1.0	.4
29. Merchandising - stock control and inventory.	2.4	1.4	1.7	2.3	.8
a. Develop an effective system of inventory control.	2.4	1.4	1.7	2.3	.8
30. Merchandising - quality control.	1.7	1.8	1.6	.9	.8
a. Grade grain according to USDA Grain Standards Act.	2.9	2.1	2.0	1.8	1.0
b. Blend various qualities of grain to meet grade.	2.0	2.5	1.6	.9	1.2
c. Use aeration, drying and turning techniques to preserve grain quality.	1.9	2.6	1.5	.8	1.0
d. Conduct various types of tests to determine protein in grain.	1.1	1.3	1.3	.4	.6
e. Prepare seed to meet state certification laws.	1.2	1.4	1.3	.6	.6
f. Conduct field inspection for producing certified seed.	.9	.9	1.7	.6	.5
31. Merchandising - receiving, packaging and labeling.	1.8	1.3	1.7	1.0	.8
a. Label and market seed in accordance with state laws.	1.7	1.4	1.8	.8	.8

Competencies	Counterman	Helper	Sales & Service Representative	Bookkeeper	Driver
b. Prepare labels for treated seed to meet government regulations.	1.8	1.1	1.6	1.1	.7
32. Merchandising - shipping.	1.3	3.3	1.1	.5	2.7
a. Load cars or trucks with grain for shipment.	1.3	3.3	1.1	.5	2.7
33. Clerical - writing letters and reports.	1.7	.9	2.2	2.3	.7
a. Prepare clear, concise written reports.	2.2	1.3	3.0	3.4	1.2
b. Prepare letters to customers.	2.1	.9	2.6	3.2	.4
c. Write advertising.	1.6	.8	2.1	2.1	.6
d. Prepare news releases.	1.4	.7	1.6	1.5	.6
e. Prepare radio and TV scripts.	1.3	.7	1.8	1.4	.6
34. Clerical - business forms.	2.8	1.6	1.5	3.4	1.0
a. Prepare warehouse receipts.	2.3	1.2	1.3	3.5	.5
b. Prepare scale tickets.	3.0	2.1	1.7	3.6	1.3
c. Write up sales tickets.	3.3	2.0	2.2	3.3	1.3
d. Prepare Bills of Lading.	2.6	1.6	1.3	3.5	1.0
e. Prepare purchase orders.	3.0	1.3	1.7	3.3	.7

CAMPGROUND MANAGER

Other Titles: Camp Coordinator, Resident Manager, Superintendent of Parks, Camping Director, Park Maintenance Supervisor.

Job Description:

Supervises the campground maintenance person's weekly work schedule, prepares the weekly camp programs, orders supplies, manages the campground accounts and records, makes periodic reports, schedules camp sites, monitors the safety and health of camp visitors, enforces campground regulations, interprets campground policies and serves as a public relations person for the campground.

Competencies Identified and Validated

N = 32*

Competencies	Weighted Mean**
1. Supervises activities of the campground maintenance person and temporary field personnel.	3.4
a. Interpret directions and plans.	3.7
b. Maintain open communications with employees and administrators.	3.6
c. Enforce employee safety regulations and standards.	3.5
d. Plan and supervise work schedules.	3.5
e. Demonstrate a general understanding of the tasks performed by all employees under his supervision.	3.5
f. Train new personnel.	3.4
g. Interpret appropriate federal, state, and local labor laws.	3.3
h. Maintain working conditions under existing contract agreements.	3.2
2. Schedule the weekly campground activities of visitors and employees.	1.7
a. Prepare daily and long range maintenance plans.	3.0
b. Call in private contractors when necessary.	2.5
c. Provide local entertainment.	1.2
d. Invite guest craftsmen to the camp.	1.2
e. Prepare craft workshops.	1.1

* Responses from 32 Campground Managers in 20 states. Survey conducted by Department of Agricultural Education. The Pennsylvania State University, University Park, Pennsylvania 16802.

** 4.0 = Essential; 3.0 = Important; 2.0 = Of Some Importance; 1.0 = Not Important; 0 = Does Not Apply.

	f. Schedule camp sporting events.	1.1
3.	Order weekly campground supplies.	2.6
	a. Order parts for camp equipment, including those recommended by the camp maintenance person.	3.0
	b. Maintain camp food supplies.	2.5
	c. Maintain camp medical supplies.	2.3
4.	Manage the campground accounts and records and make periodic reports.	2.7
	a. Keep weekly records of campground money.	3.0
	b. Account for all campground money.	3.0
	c. Make periodic reports to the campground owner and discuss camp finances.	2.9
	d. Handle all incoming money from the campground facilities.	2.8
	e. Sell the camp visitors overnight stickers.	1.7
5.	Schedule camp site use.	2.8
	a. Explain the policies of the campground.	3.3
	b. Check their arrival and departure times.	2.8
	c. Assign campers to specific camp sites.	2.7
	d. Give the campers a map of the campgrounds.	2.3
6.	Monitor the safety and health of camp visitors.	2.8
	a. Use established fire-fighting techniques.	3.2
	b. Protect the campers from dangerous animals and other hazards.	3.1
	c. Recognize the need for medical assistance.	3.1
	d. Be certified to administer first-aid.	2.6
	e. Recognize certain signs of physical fatigue.	2.0
7.	Enforce campground regulations.	3.1
	a. Explain camp rules when necessary.	3.4
	b. Call local or state police for assistance.	3.3
	c. Direct camp visitors to specific areas.	3.0
	d. Patrol campground areas.	2.9
8.	Perform public relations work.	2.0
	a. Explain general program and specific objectives of programs to individuals and groups.	2.7
	b. Prepare informative reports and other literature for public use.	2.3
	c. Act as a resource person in program area.	2.0
	d. Write news releases.	1.7
	e. Participate in radio and TV programs.	1.2

CAMPGROUND MAINTENANCE PERSON

Other Titles: Parks Worker, Regional Supervisor - Forest and Parks, Park Maintenance Worker I, Park Caretaker, Park Superintendent.

Job Description:

The Campground Maintenance Person has above average skills in the areas of plumbing, electricity, carpentry, and masonry. This person maintains campground buildings and facilities, as well as the turf and forested area around the campground. Small equipment maintenance and repair, swimming pool maintenance, and administering first-aid, are also part of this individual's work.

Competencies Identified and Validated

N = 32*

Competencies	Weighted Mean**
1. Maintain and repair the camp water system.	2.7
a. Recognize any damage to the water system.	3.6
b. Repair damaged water futures and lines.	3.5
c. Maintain the water system.	3.3
d. Call a plumber when the need arises.	2.8
e. Maintain the camp water pumps.	2.8
f. Check and control algae growth in the water source.	2.1
g. Collect water samples for state evaluation monthly.	1.8
h. Conduct chlorination of drinking water periodically.	1.7
2. Maintain and repair the camp sewage system.	2.8
a. Recognize damage or problem in the sewage system.	3.6
b. Call for assistance when needed.	3.6
c. Maintain the sewage system.	3.2
d. Be licensed to operate a treatment plant when applicable.	0.8
3. Maintain and repair camp structures and follow a scheduled maintenance and repair program.	2.9
a. Make general repairs.	3.6

* Responses from 32 Campground Maintenance Persons in 20 states. Survey conducted by Department of Agricultural Education. The Pennsylvania State University, University Park, Pennsylvania 16802.

** 4.0 = Essential; 3.0 = Important; 2.0 = Of Some Importance; 1.0 = Not Important; 0 = Does Not Apply.

b.	Paint camp buildings, benches, tables, chairs, signs, and bridges.	3.4
c.	Build new camp buildings, benches, tables, chairs, signs, and bridges.	2.3
d.	Maintain craft and sports equipment.	2.2
4.	Maintain and repair walks, parking areas, roads, and campsites.	2.8
a.	Maintain and repair campsites.	3.3
b.	Make minor repairs to walks, parking areas, and roads.	2.9
c.	Maintain gravel, asphalt, and non-paved roads.	2.8
d.	Mix concrete.	2.6
e.	Pour concrete and finish cement.	2.5
5.	Maintain sanitary conditions.	2.7
a.	Remove rubbish from the campground areas.	3.6
b.	Maintain and disinfect comfort facilities.	3.2
c.	Maintain and clean bath houses.	2.9
d.	Control rodents.	2.8
e.	Apply insecticides to control mosquitos, flies, and ants.	2.7
f.	Be licensed to apply chemicals.	0.8
6.	Mow lawns, open fields, and grassed play areas.	3.0
a.	Use safety standards relating to the operation.	3.3
b.	Become familiar with the operator's manual for each piece of equipment.	3.2
c.	Adjust equipment under field conditions for maximum efficiency.	3.0
d.	Prepare machines and equipment for storage.	3.0
e.	Service mowing machinery and equipment.	2.9
f.	Attach accessory equipment to a basic power unit.	2.8
7.	Repair small equipment.	3.2
a.	Recognize malfunctions in small equipment.	3.4
b.	Make repairs as needed.	3.2
c.	Order replacement parts.	3.2
d.	Recommend major repairs and the need for assistance.	3.2
e.	Recommend acquisitions of new equipment.	3.0
8.	Control and clear weeds including poisonous plants.	2.0
a.	Mow weeds.	2.7
b.	Use a scythe and other brush clearing tool.	2.5
c.	Be licensed to apply herbicides.	1.0

9.	Treat damaged trees and shrubs for insects and diseases.	2.2
	a. Remove dead trees and limbs.	2.7
	b. Recognize tree insects, diseases, and their effects.	2.0
	c. Spray trees for insects and diseases.	2.0
10.	Maintain and repair the camp swimming pool.	1.7
	a. Check the pool for physical hazards.	2.0
	b. Recognize any damage to the pool.	1.9
	c. Use lifesaving equipment.	1.6
	d. Check the chlorine content of the water.	1.6
	e. Winterize the pool.	1.5
	f. Clean the pool daily.	1.5
11.	Monitor safety and health of camp visitors.	2.4
	a. Recognize the need for medical assistance.	3.0
	b. Protect the campers from various animals and other hazards.	2.7
	c. Identify poisonous plants and snakes.	2.5
	d. Perform artificial respiration.	2.4
	e. Be certified to administer first-aid.	2.3
	f. Recognize certain signs of physical fatigue.	2.2
	g. Organize search parties.	1.4
12.	Use established fire-fighting techniques.	3.3
	a. Call for assistance.	3.6
	b. Use an axe, chainsaw, and shovel.	3.5
	c. Extinguish flames and embers.	3.4
	d. Suppress fire by felling trees.	2.5

PARK AIDE

Other Titles: Park Worker, Park Groundskeeper, Groundskeeper.

Job Description:

Works directly under the Park Maintenance Person. This person mows the grass, clears weeds, treats trees, and maintains any established existing planting beds. Also, the job includes building and comfort station maintenance, minor repair of park equipment, fire-fighting, enforcing the law, and assisting park visitors.

Competencies Identified and Validated

N = 40*

Competencies	Weighted Mean**
1. Mow lawns, open fields, and grassed play areas.	3.0
a. Use safety standards relating to the operation of a particular piece of machinery.	3.4
b. Recognize malfunctions in equipment.	3.1
c. Service machinery and equipment according to the operator's manual.	3.0
d. Become familiar with operator's manual for each piece of equipment.	3.0
e. Adjust equipment under field conditions for maximum efficiency.	2.9
f. Attach accessory equipment to basic power unit.	2.8
g. Prepare machines and equipment for storage.	2.6
2. Control and clear weeds including poisonous plants.	2.0
a. Mow weeds.	2.8
b. Use a scythe and other brush clearing tools.	2.6
c. Apply herbicides.	2.4
3. Treat damaged trees and shrubs for insects and disease.	2.4
a. Remove dead trees and limbs.	2.9
b. Recognize tree insects and diseases and their effect.	2.2
c. Spray trees for insects and disease.	2.2

* Responses from 40 Park Aides in 15 states. Survey conducted by Department of Agricultural Education, The Pennsylvania State University, University Park, Pennsylvania 16802.

** 4.0 = Essential; 3.0 = Important; 2.0 = Of Some Importance; 1.0 = Not Important; 0 = Does Not Apply.

4.	Establish and maintain planting beds.	2.0
	a. Mulch plants.	2.1
	b. Dig the soil.	2.0
	c. Prepare the soil for planting.	2.0
	d. Remove dead plants and plant new ones.	2.0
	e. Plant flowers.	1.9
	f. Weed and hoe flowers.	1.8
5.	Cut and maintain trails.	2.9
	a. Remove fallen trees.	3.0
	b. Remove small brush.	3.0
	c. Use chain saw, axe, and brush hook.	2.9
	d. Maintain trail surface.	2.8
6.	Maintain sanitary conditions.	2.9
	a. Maintain and disinfect comfort facilities.	3.3
	b. Remove rubbish from the park areas.	3.2
	c. Maintain and clean bath houses.	3.0
	d. Apply insecticides to control mosquitoes, flies, and ants.	2.2
7.	Maintain and repair benches, tables, chairs, and signs.	2.8
	a. Replace broken parts.	3.0
	b. Paint existing benches, tables, chairs, and signs.	2.9
	c. Use small hand tools.	2.9
	d. Build new benches, tables, chairs, and signs.	2.3
8.	Maintain and repair roads and park walks.	2.6
	a. Sweep walks.	2.7
	b. Patch holes in the roads.	2.7
	c. Clear ditches along roads.	2.6
	d. Clear snow.	2.5
	e. Help build new roads and walks.	2.3
9.	Maintain park water systems.	3.0
	a. Report plumbing problems.	3.5
	b. Recognize plumbing problems.	2.9
	c. Assist in repair of plumbing problems.	2.6
10.	Answer questions and assist visitors.	2.7
	a. Interpret park rules and regulations.	3.1
	b. Direct visitors to points of interest.	3.1
	c. Protect the park from negligent people.	3.1
	d. Enforce park regulations.	2.3
	e. Direct traffic.	2.1

11.	Maintain and repair park buildings.	2.6
	a. Make minor repairs.	3.0
	b. Paint buildings.	2.8
	c. Mix and pour concrete.	2.4
	d. Help build new buildings.	2.1
12.	Use established fire-fighting techniques.	3.3
	a. Report fires.	3.7
	b. Use and maintain fire tools and equipment.	3.2
	c. Apply first-aid techniques.	3.1

PARK MAINTENANCE PERSON

Other Titles: Park Technician, Park Information Technician.

Job Description:

Enforces park rules and regulations as well as interpreting them; directs park registration and assigns camper facilities; maintains the water supplies and facilities, toilet facilities, park buildings, trails, shrubs, and trees, turf areas, and playground equipment; assists campers and constructs certain equipment (tables and benches) as the need arises; administers first-aid, organizes search parties, fire-fighting squads, and supervises the Park Aide or Aides.

Competencies Identified and Validated

N = 47*

Competencies	Weighted Mean**
1. Understand and interpret park rules and regulations.	2.2
a. Assist visitors concerning park rules.	3.0
b. Patrol park grounds.	2.3
c. Enforce park rules.	2.3
d. Call state or local police enforcement agencies.	2.1
e. Direct traffic.	2.0
f. Supervise camper facility assignments.	2.0
2. Monitor safety and health of park visitors.	2.7
a. Recognize hazards to visitors.	3.4
b. Call for medical assistance.	3.0
c. Be certified to administer first-aid.	2.8
d. Perform artificial respiration.	2.7
e. Identify poisonous plants and snakes.	2.6
f. Recognize certain signs of physical fatigue.	2.5
g. Organize search parties.	2.2
3. Maintain and repair park facilities at a sub-journeyman level and follow a scheduled maintenance and repair program.	3.2
a. Maintain and repair water systems.	3.3
b. Maintain and repair sewage systems.	3.3

* Responses from 47 Park Maintenance Persons in 18 states. Survey conducted by Department of Agricultural Education, The Pennsylvania State University, University Park, Pennsylvania 16802.

** 4.0 = Essential; 3.0 = Important; 2.0 = Of Some Importance; 1.0 = Not Important; 0 = Does Not Apply.

c.	Maintain and repair park buildings and comfort facilities.	3.3
d.	Maintain and repair electrical systems.	3.2
e.	Maintain trails and walks.	3.1
f.	Maintain and repair concrete and masonry.	3.0
g.	Maintain and repair mowing equipment.	3.0
h.	Maintain grass and trees in the park.	3.0
4.	Supervise the Park Aide(s).	3.1
a.	Interpret directions and plans.	3.2
b.	Demonstrate a general understanding of the tasks performed by all employees in this area of work.	3.2
c.	Enforce department employee safety regulations and standards.	3.1
d.	Plan and supervise work schedules.	2.9
e.	Train new personnel.	2.9
f.	Maintain working conditions under existing contract.	2.9
5.	Use carpentry and masonry skills.	3.0
a.	Use small hand tools.	3.3
b.	Use a hammer, saw, power saw, square, and level to construct park structures.	3.2
c.	Read a blueprint or sketch.	2.8
d.	Build and repair block structures in the park.	2.6
6.	Organize rubbish removal and park sanitation.	2.9
a.	Check showers and comfort stations for sanitation.	3.3
b.	Supervise trash pick-up and disposal.	3.0
c.	Present basic environmental practices to Park Aide(s) and visitors.	2.6
d.	Warn campers about litter violations.	2.5
7.	Answer questions pertaining to the park.	2.8
a.	Answer questions pertaining to the local area.	3.0
b.	Point out interesting sites within the park.	2.9
c.	Direct visitors to comfort stations.	2.9
d.	Direct visitors to natural phenomenon.	2.5

HUNTING AND FISHING GUIDE

Other Titles: Camp Guide, Packer, Outfitter, Hunting Preserve Guide, Professional Guide.

Job Description:

This person is involved in planning and supervising hunting and fishing trips. The guide prepares itineraries, travel routes, equipment, food and provisions. The individual arranges for, and operates motor vehicles and watercraft, or handles horses used during trips. This person understands hunting and fishing laws, firearms use, and tackle and gear equipment needs. The guide selects campsites, prepares meals, and administers first-aid as part of the job.

Competencies Identified and Validated

N = 31*

Competencies	Weighted Mean**
1. Plan hunting and fishing trips.	2.9
a. Organize and lead the hunting or fishing parties.	3.6
b. Select specific areas for hunting or fishing to be done.	3.5
c. Estimate needs and select proper provisions to be used.	3.1
d. Map and plan trip routes.	2.8
e. Obtain proper licenses for members of the party.	2.8
f. Plan trip itineraries.	2.7
g. Arrange for lodging or camping areas.	2.7
h. Plan and provide methods of transportation.	2.6
i. Estimate cost of trips.	2.3
2. Use and understand firearms, gear, tackle, and other equipment used on trips.	3.2
a. Supervise safe use of equipment demonstrating proper safety rules of hunting and fishing.	3.6
b. Recommend the proper equipment to be used for the type of hunting or fishing to be done.	3.4

* Responses from 31 Hunting and Fishing Guides from 18 states. Survey conducted by Department of Agricultural Education, The Pennsylvania State University, University Park, Pennsylvania 16802.

** 4.0 = Essential; 3.0 = Important; 2.0 = Of Some Importance; 1.0 = Not Important; 0 = Does Not Apply.

c.	Demonstrate proper use of equipment.	3.1
d.	Make minor repairs on equipment broken on trip.	2.8
3.	Understand state hunting and fishing laws.	3.6
a.	Supervise the taking of proper species, size, and limits of fish and game.	3.8
b.	Keep aware of new law changes.	3.8
c.	Observe and prevent party members from violating laws.	3.6
d.	Explain the proper type of equipment that legally can be used in an area.	3.6
e.	Have a knowledge of public and private lands, and identify types of legal game.	3.6
f.	Inform group on the legality of using dogs, horses, or hunting birds in specific areas.	3.0
4.	Operate water craft and all terrain vehicles.	3.4
a.	Display proper safety habits in operation of craft and vehicles.	3.6
b.	Possess operator's license for all types of craft and vehicles to be used.	3.5
c.	Respect all boating laws.	3.5
d.	Maintain watercraft and vehicles in working order.	3.3
e.	Load all equipment properly.	3.3
f.	Read and interpret maps to obtain bearing or directions.	3.3
g.	Service equipment and make minor adjustments on trip.	3.2
5.	Display basic knowledge of common fish and game animals.	3.0
a.	Identify all species and sexes of desired game animals in area.	3.5
b.	Identify most desired food and habitat of fish and game.	3.1
c.	Display basic understanding of life cycle and mating habits.	2.7
d.	Identify game animals and their predators from tracks and other signs.	2.7
6.	Use pack animals and saddle stock.	2.8
a.	Demonstrate proper handling, care, and management of livestock and related equipment.	3.0
b.	Equip livestock with pack supplies and equipment for travel over all types of terrain.	2.7

7.	Maintain safety and health of the party.	2.8
	a. Recognize signs of and prevent physical fatigue.	3.2
	b. Be certified to administer first-aid.	3.1
	c. Display proper life saving technique in aquatic situations.	3.0
	d. Identify injuries and sicknesses and treat properly.	2.9
	e. Display survival methods used on hunting and fishing trips.	2.8
	f. Organize search parties.	2.5
	g. Identify proper water and nature edible plants.	2.0
8.	Select and set up campsites.	2.8
	a. Prepare meals.	2.9
	b. Select proper sites for placing camps.	2.8
	c. Set up tents and other shelters.	2.8
9.	Perform public relations work.	2.3
	a. Explain trip programs and objectives to individuals and groups.	2.8
	b. Estimate costs and prepare bills.	2.5
	c. Prepare informative reports and nature talks for public.	1.6
10.	Use correct field dressing and preserving techniques of game.	3.5
	a. Field dress and preserve game.	3.5

SOIL CONSERVATION AIDE

Other Titles: Conservation Aide, Biological Aide.

Job Description:

The Soil Conservation Aide assists in helping land owners and operators apply soil and water conservation practices, accompanies supervisor to the field and gathers data for development of conservation plans, performs simple work with a farm or hand level in laying out terraces or contour lines. Acts (as Rodman and Chainman) in surveying; from notes approved by supervisor, transposes information to aerial photographs, measures aerial photographs by use of planimeter and makes simple computations, colors land use capability maps and makes simple rough tracings of farm maps for use in preparing finished farm conservation maps, keeps daily records of activities, assists supervisor in working with land owners and operators in planting trees, grass seed, sod or stolons, as assigned, works on preparation and maintenance of accomplishment records and reports for the unit, and performs related duties as assigned.

Competencies Identified and Validated

N = 35*

Competencies	Weighted Mean**
1. Gather field data for farm plans and conservation practices.	2.9
a. Gather drainage area data.	3.4
b. Locate and identify farm and field boundaries.	3.2
c. Make simple sketches.	3.1
d. Record physical and topographical data of farms.	3.1
e. Record acreage in fields by making measurements and talking with landowners.	2.9
f. Interpret basic soil differences.	2.8
g. Determine cropping rotations and systems.	2.6
h. Record the number and type of livestock.	2.1
2. Lay out and inspect routine conservation practices.	3.2
a. Assist in laying out contour strips, grass waterways, diversion terraces, and cropland terraces.	3.5

* Responses from 35 Soil Conservation Aides in 16 states. Survey conducted by Department of Agricultural Education, The Pennsylvania State University, University Park, Pennsylvania 16802.

** 4.0 = Essential; 3.0 = Important; 2.0 = Of Some Importance; 1.0 = Not Important; 0 = Does Not Apply.

b.	Check compliance of conservation practices to specifications.	3.4
c.	Assist and guide equipment operators in installing these routine practices.	3.1
d.	Make recommendations of acceptability for applied conservation practices.	2.9
3.	Act as a chainman.	3.0
a.	Mark measuring points with keel, paint, sticks, scratches, tacks, or stakes.	3.3
b.	Measure distances between survey points, established or to be established, as directed by surveyor.	3.2
c.	Use steel or cloth tape and surveyor's chain.	3.1
d.	Cut and clear brush from survey lines.	2.6
4.	Act as a rodman.	3.4
a.	Hold level rod or stadia rod at designated points.	3.6
b.	Move rod or target on rod, following hand or verbal signals from instrument man.	3.5
c.	Call out readings to notekeeper or write station number and reading in notebook when distance is too great from instrument man.	3.4
d.	Carry and set stakes.	3.2
5.	Assist supervisor in working with landowners in planting trees, grass seed, sod, or stolons.	2.3
a.	Distinguish between various tree and seed species.	2.6
b.	Follow planting plan.	2.5
c.	Use tree planting equipment and tools.	1.7
6.	Make cross-sections and profiles.	3.4
a.	Measure distances between cross-sections.	3.4
7.	Compute volumes of earth for conservation practices.	2.9
8.	Transpose information from notes to aerial photographs.	3.0
a.	Transpose approved field notes into map symbols.	3.0
9.	Measure aerial photographs with a planimeter.	3.3
a.	Measure acreage.	3.4
b.	Record measurements on photos or in records.	3.4
c.	Use photo scales.	3.3

10.	Make simple rough tracings of farm maps.	3.2
11.	Color land use capability maps.	2.4
	a. Use color codes of capability maps.	2.6
	b. Ink soil survey field sheets.	2.0
12.	Help to prepare and maintain accomplishment records and reports.	3.4
	a. Prepare daily records of activities.	3.4

SOIL CONSERVATION TECHNICIAN

Other Titles: Land Use Technician, Soil Research Development Technician, Soil Engineering Technician, Roadside Development Technician, Biological Technician.

Job Description:

The Soil Conservation Technician is responsible for follow-up and maintenance activity on previously planned areas; guides and assists land owners and operators in the application and maintenance of conservation and group facility plans in light of changing conditions and serves as followup and maintenance technician on areas previously planned to insure continued compliance; makes simple adjustments in conservation practices when necessary, in accordance with standards set by planning technicians; makes surveys required for planning or application of conservation plans involving the use of hand level and tape; makes observations on the adequacy of applied practices as a result of cooperators' experience; aids land owners in pooling resources in order to establish and maintain conservation practices most efficiently; prepares necessary records and reports on work accomplished; supervises the work of assistants, and performs related duties as assigned. Usually employed by a governmental agency.

Competencies Identified and Validated

N = 31*

Competencies	Weighted Mean**
1. Collect soil samples.	2.8
a. Use an auger or probe and randomly collect core samples.	3.1
b. Complete field data sheet.	2.9
c. Record test pit information for building purposes.	2.5
2. Collect information for the development of farm or ranch conservation plans.	3.3
a. Determine significant erosion hazards and other problems related to the protection of the environment.	3.6
b. Locate and identify farm and field boundaries.	3.5

* Responses from 31 Soil Conservation Technicians in 20 states. Survey conducted by Department of Agricultural Education. The Pennsylvania State University, University Park, Pennsylvania 16802.

** 4.0 = Essential; 3.0 = Important; 2.0 = Of Some Importance; 1.0 = Not Important; 0 = Does Not Apply.

c.	Use topographical and aerial photographs.	3.5
d.	Service referral requests from ASCS.	3.4
e.	Record acreage in field by making measurements and talking with land owners.	3.2
f.	Gather drainage area data for watersheds.	3.2
g.	Record physical and topographical data.	3.1
h.	Determine cropping rotation and systems.	3.0
i.	Record the number and type of livestock.	2.9
3.	Perform preliminary survey and layout work.	3.3
a.	Use hand level or engineering level and tape.	3.7
b.	Determine volumes of earth.	3.6
c.	Study general lay-of-the-land (site conditions).	3.6
d.	Locate best site for engineering practices.	3.5
e.	Measure degree of slope.	3.3
f.	Interpret soils information.	3.3
g.	Evaluate degree of erosion.	3.2
h.	Make borings and vegetative studies of wet areas.	3.1
i.	Procure simple easements.	2.2
4.	Explain or demonstrate methods of applying conservation practices to land owner.	3.0
a.	Adapt conservation practices with modern farming methods.	3.3
b.	Explain the use of various equipment for the installation of practices.	3.2
c.	Differentiate between various seeding and land preparation methods.	3.1
d.	Relate fertilizing techniques and practices.	3.1
e.	Compare contour cultivation with conventional methods.	3.1
f.	Indicate how terracing saves soil and water.	3.1
g.	Show the importance of farm drains and water courses.	3.1
h.	Indicate where tree planting is advisable.	3.0
i.	Translate woodland improvement practices.	2.7
j.	Interpret benefits of seasonal and other simple irrigation practices.	2.6
k.	Compare various range practices.	2.5
5.	Prepare records and reports.	3.1
a.	Keep daily record of work accomplished.	3.7
b.	Maintain farm plan records.	3.2
c.	Assist with annual report.	3.0
d.	Write simple news reports.	3.0
e.	Prepare requisitions.	2.8

6. Supervise work of assistants.	3.1
a. Maintain open communications.	3.4
b. Help assistants set-up work schedules.	3.1
c. Provide technical information and data.	3.1
d. Provide human understanding as a first line supervisor.	3.0
7. Serve as a follow-through and maintenance technician for established practices.	3.4
a. Discuss with land owners the success or failure of established conservation practices.	3.5
b. Make field observations of established practices.	3.5
c. Make recommendations for the improvement and maintenance of practices.	3.5
d. Make simple adjustments to practices when necessary.	3.4
e. Aid land owners in pooling resources in order to maintain conservation practices most efficiently.	3.1
8. Use standard engineering handbooks, guides, designs, and procedures in selecting and adapting practices to fit local conditions.	3.7
a. Interpret design specifications and apply them.	3.7
b. Keep up-to-date with changing design specifications.	3.7
9. Prepare land capability maps from soil maps and data.	3.0
a. Use soil map symbols.	3.4
b. Read and interpret aerial photos.	3.4
c. Use soil loss calculator.	2.1
10. Meet frequently with land owners and operators.	3.3
a. Understand the basic crop and livestock practices of the area.	3.6
b. Practice basic public relations and human relations techniques.	3.5
c. Interpret land owner needs for conservation practices.	3.5
d. Evaluate information provided by land owners.	3.4
e. Assist in conducting tours.	2.6
11. Resolve routine working problems.	3.6
a. Make decisions based on knowledge and fact.	3.6
b. Accept decision-making responsibility.	3.6

WATER TREATMENT PLANT OPERATOR

Other Titles: Water Plant Operator, Superintendent - Water Supply, Assistant Director - Water Operations.

Job Description:

The main task of a Water Treatment Plant Operator is to see that the water discharged from the plant is at the proper level of purification. The individual controls the flow of raw water into plant by starting and regulating operation of electric motors, pumps, and valves. Adds specific amounts of chlorine, florine, ammonia, lime, and/or other chemicals to disinfect, deodorize, and clarify water, or adjust automatic devices which admit chemicals in controlled dosages. Filters impurified water and pumps purified water into water mains. Determines acidity and color of the water through standard color reaction tests. Keeps a daily inspection of the plant, and controls the maintenance of the alarm system in the pumping stations and deep wells; and in the pumps and motors. Keeps written records on such things as health reports, amount of water pumped, and the water level in the wells, and/or reservoirs. A majority of Water Treatment Plant Operators require certification, usually from their state government.

Competencies Identified and Validated

N = 37*

Competencies	Weighted Mean**
1. Monitor chlorinators.	3.3
a. Check chlorinator flow rate.	3.7
b. Take water samples to determine the chlorine and bacteria count.	3.6
c. Record chlorine and water discharge daily.	3.5
d. Check for chlorine gas leaks.	3.5
e. Weigh the daily amount of chlorine used by the chlorinator.	3.3
f. Send water samples to lab for analysis.	3.2
g. Maintain chlorinators.	3.1
h. Maintain booster pumps.	2.6
2. Monitor fluorinators.	2.1
a. Analyze florine content of a water sample using the color comparator.	2.6

* Responses from 37 Water Treatment Plant Operators in 18 states. Survey conducted by Department of Agricultural Education, The Pennsylvania State University, University. Park, Pennsylvania 16802.

** 4.0 = Essential; 3.0 = Important; 2.0 = Of Some Importance; 1.0 = Not Important; 0 = Does Not Apply.

b.	Wear a gas mask when adding floride to the solution tank.	2.4
c.	Record water intake into the fluorinator.	2.1
d.	Take a reading of the florine in the solution tank.	2.1
e.	Determine amount of water that enters into the solution tank.	2.0
f.	Add salt to clean pumps in the fluorinator house.	1.6
3.	Inspect pumping stations.	2.8
a.	Record oil level of the pump.	3.0
b.	Record 24 hour changes in pressure and flow meters.	3.0
c.	Check deep well pumps daily.	2.9
d.	Determine static water level in the pump.	2.8
e.	Check pressure systems of booster pumps.	2.6
f.	Control maintenance of the alarm systems.	2.5
4.	Inspect water tanks.	3.0
a.	Check 24 hour charts for tank levels.	3.4
b.	Record flow rate (in gallons per minute).	3.3
c.	Check water level of tanks, and start auxilliary well if additional water is needed.	3.1
d.	Check 7 day charts for tank levels.	2.7
e.	Control maintenance of the alarm system.	2.7
5.	Inspect water reservoirs.	2.5
a.	Take water sample.	2.9
b.	Check reservoir for debris and dead animals.	2.6
c.	Remove debris and dead animals.	2.5
d.	Locate leaks in the reservoirs.	2.5
e.	Recommend cleaning of the reservoirs.	2.2
f.	Check condition of fences.	2.1
6.	Perform maintenance activities.	2.4
a.	Maintain an overall inspection of the physical plant.	3.2
b.	Recommend replacement of worn equipment.	3.0
c.	Maintain and clean building.	2.9
d.	Change oil in pumps.	2.9
e.	Grease pumps.	2.9
f.	Check electrical systems.	2.8
g.	Maintain lawns, shrubs, and trees.	1.9
h.	Remove snow during winter months.	1.5
i.	Resurface roads.	0.9
7.	Locate and repair water mains.	2.5
a.	Contact fellow workers over two-way radio about possible break.	2.7
b.	Assist fellow workers in locating and repairing water main breaks.	2.3

WASTE WATER TECHNICIAN

Other Titles: Plant Bacteriologist, Superintendent of Waste Water, Waste Water Plant Operator.

Job Description:

The individual must make practical applications of the basic principles and laws of physics, chemistry, and the biological sciences, including the use of mathematics through analytical geometry, and calculus. Calculates percentages, ratios, and proportions; makes computations in arithmetic for recirculations of sludge from gallons to pounds. Changes 24 hour and weekly charts of integrated figures, and reads meters. Operates the equipment that is associated with the distribution of digested sludge, and keeps in condition odor control equipment. Assists the plant mechanic with repair work. Adjusts manual pumping controls, maintains chlorine application that disinfects sewage as it leaves the plant, and maintains chlorine residue. Works in grit removal, and maintains flow rates.

Competencies Identified and Validated

N = 37*

Competencies	Weighted Mean**
1. Compute figures on the circulation of sewage.	3.0
a. Apply parameters as indicated on the daily "Operator's Check List" provided on a shift-by-shift basis by the analyst.	3.3
b. Calculate percentages, ratios, and proportions.	3.1
c. Change 24 hour and weekly charts of integrated figures.	3.0
d. Convert cubic feet into pounds.	2.9
e. Convert sludge recirculation from gallons to pounds.	2.7
2. Analyze effluent.	3.2
a. Take chlorine residual test.	3.5
b. Take dissolved oxygen tests.	3.3
c. Determine BOD (Biological Oxygen Demand) of raw water.	3.0
d. Determine BOD (Biological Oxygen Demand) of discharged water.	2.9

* Responses from 37 Waste Water Technicians in 19 states. Survey conducted by Department of Agricultural Education, The Pennsylvania State University, University Park, Pennsylvania 16802.

** 4.0 = Essential; 3.0 = Important; 2.0 = Of Some Importance; 1.0 = Not Important; 0 = Does Not Apply.

3.	Perform maintenance activities.	2.1
	a. Maintain, lubricate, and repair various wastewater treatment plant equipment.	3.2
	b. Work with preventative maintenance procedures on plant equipment.	3.1
	c. Safeguard utility services and facilities.	2.6
	d. Maintain high pressure chlorination which includes piping chlorination and distribution systems.	2.4
	e. Perform cleaning duties throughout the plant, such as hosing down oil tanks and walk ways.	2.4
	f. Perform minor electrical repair as required in emergency situations.	2.3
	g. Calibrate, repair, maintain, and adjust various types of indicating and recording equipment.	2.2
	h. Maintain adequate inventory of spare parts.	2.2
	i. Perform general plumbing.	2.2
	j. Maintain a complete machinery history file on plant equipment which includes a cost breakdown of repairs.	2.2
	k. Maintain instrumentation in lab.	2.2
	l. Plan and install various pieces of new equipment.	1.8
	m. Use both electric and gas welding to repair, maintain, and improve various pieces of plant equipment.	1.6
	n. Cut grass and maintain trees and shrubs around the plant.	1.6
	o. Utilize vibration analyzer to diagnose equipment malfunctions not otherwise detectable.	1.5
	p. Check, adjust, and maintain the recording and integrating instrument used for billing purposes.	1.3
4.	Operate sludge circulation equipment.	2.8
	a. Check effluent pump operation.	3.3
	b. Draw sludge from collection hoppers throughout the plant.	3.2
	c. Adjust flow rate of the sludge recirculation and by-passing.	3.0
	d. Assist in operation of sludge thickner.	2.8
	e. Check odor control equipment.	2.7
	f. Adjust effluent pump rates.	2.6
	g. Recharge chemical feed tanks on both biological filtration and activated sludge.	2.3
5.	Work with grit removal.	2.7
	a. Remove grit from collection basins.	3.0
	b. Haul grit to disposal areas.	2.5

6.	Drive vehicles.	2.0
	a. Drive pick-up truck to secure needed parts and supplies.	2.4
	b. Drive plant tank truck in the distribution of digested sludge.	2.1
	c. Drive snow plow during winter months to clear roads around the plant.	1.4

CONSERVATION AIDE

Other Titles: Jr. Game Biologist, Game Propagator II, Private Shooting Ground Operator and Manager.

Job Description:

Assists in the operation of the game hatchery and general operation of a game farm. Maintains simple roads, trails and ditches on state or federal game lands. Aids wildlife manager or conservation officer in the disposing of nuisance stream obstructions, trapping game animals for experiments, trapping and banding game animals. Assists in maintaining a traveling wildlife exhibit. Plants farm-game habitat improvement plots. Aids in the operation of game animal checking stations during hunting seasons. Serves as a production assistant on state produced wildlife movies. Builds duck blinds on state hunting areas. Performs general building construction, maintenance and repair of buildings. Aids in fire prevention programs and fights fire on game forest lands and game areas. Aids wildlife managers and wildlife biologists in game surveys. Installs boundary fences and signs on game refuge lands. Supervises temporary employees as assigned. Performs preventative maintenance on conservation equipment. Usually employed by a governmental agency.

Competencies Identified and Validated

N = 43*

Competencies		Weighted Mean**
1.	Operate game farm and wildlife equipment.	2.9
a.	Use safety standards relating to operation of a particular piece of machinery.	3.4
b.	Service machinery and equipment according to operator's manual.	3.2
c.	Recognize malfunctions in equipment.	3.2
d.	Operate machinery and equipment under a variety of field conditions.	3.1
e.	Adjust equipment under field conditions for maximum efficiency.	3.0
f.	Become familiar with operator's manual for each piece of equipment.	2.9
g.	Attach accessory equipment to basic farm power unit.	2.9

* Responses from 43 Conservation Aides in 19 states. Survey conducted by Department of Agricultural Education, The Pennsylvania State University, University Park, Pennsylvania 16802.

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h.	Prepare machines and equipment for storage.	2.7
i.	Maintain records of maintenance and repair on machinery and equipment.	2.5
j.	Maintain a daily log of number of hours each piece of equipment is used.	2.4
2.	Measure and compute water flow.	1.2
a.	Use stream flow meter.	1.2
b.	Use conversion tables.	1.2
3.	Remove obstructions from ditches and streams.	2.2
a.	Use general earth moving hand tools.	2.5
b.	Operate earth moving equipment.	1.9
4.	Identify wildlife species.	2.7
a.	Identify species of animals.	2.8
b.	Identify species of birds.	2.7
c.	Identify feed plants for animals and birds.	2.7
5.	Assist in maintaining a mobile wildlife exhibit.	2.1
a.	Hold the required license for type of equipment operated.	2.5
b.	Drive responsibly and defensively at all times.	2.4
c.	Protect and secure load.	2.2
d.	Perform minor repairs.	2.1
e.	Maintain a favorable condition for live exhibit.	1.8
f.	Erect or place wildlife exhibit.	1.5
6.	Aid in operation of game animal checking stations during hunting seasons.	3.0
a.	Record location from which wildlife was taken.	3.1
b.	Inquire about numbers, sizes, and species of game animals, game birds, fish, or shellfish taken.	3.0
c.	Measure sizes and make visual checks for other biological data.	3.0
d.	Interview sportsmen at assigned check points.	2.8
7.	Serve as a production assistant on state wildlife movies.	1.5
a.	Perform duties as assigned.	1.6
b.	Maintain wildlife animals.	1.5
8.	Perform general construction maintenance and repair of wildlife facilities.	2.3
a.	Perform subjourneyman level skills in carpentry.	2.6
b.	Clean and sanitize buildings used in wildlife areas.	2.6