General Standards/Core Exam Review

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Review/Test Structure

- Regulatory - 6 questions
- IPM – 4 questions
- Technical/terms/definitions – 18 questions
- Pesticide use – 6 questions
- Safety – 16 questions
Review/Test Structure

- 50 questions
- All are multiple choice
What is a Pest?
What is a Pesticide?
PESTICIDES
Insecticides Rodenticides Herbicides Miticides Algicides Nematocides Fungicides
Types of Pests

Insects
Types of Pests

Insect-like organisms
Types of Pests

Microbial organisms
Types of Pests

Weeds
Types of Pests

Vertebrates
Types of Pests

Mollusks
Categories of Pests

• Continuous
  – Nearly always present and require regular control
Categories of Pests

- Sporadic, migratory, or cyclical
  - Require control occasionally or intermittently
Categories of Pests

- **Potential**
  - Do not require control under normal conditions, but may require control in certain circumstances
Pest Control Goals

• Prevention – keep it from becoming a problem
Pest Control Goals

• **Suppression**
  – reduce pest numbers to an “acceptable” level
Pest Control Goals

- **Eradication** – destroy entire pest population in an area
Integrated Pest Management

• The combining of appropriate pest control tactics into a single plan to reduce pests and their damage to an acceptable level
Integrated Pest Management

- To solve pest problems:
  - Identify pest and determine if control is warranted
Integrated Pest Management

• To solve pest problems:
  – Select pest control methods based on benefits, risks, and effectiveness of each available method of control
Integrated Pest Management

• To solve pest problems:
  – Choose strategy that is most effective and causes the least harm to people and the environment
Integrated Pest Management (IPM) for Pests of Turf and Ornamentals

Reactive

Toxicity

Proactive

Hard Chemical: Direct toxins, kill on contact, by ingestion or fumigation, broad-spectrum – carbamates, organophosphates
Softer on environment: soaps, oils, diatomaceous earth, neem

Biochemical: hormones, enzymes, pheromones, insect growth regulators (IGRs)
Microbial: Bacillus thuringiensis (Bt)

Exclusion, Physical removal:
Insects - traps, barriers, wash
Weeds - mulch, till, hoe, pull
Diseases - prune

Plants Selection for Site & Pest Resistance, Sanitation, Watering/Pruning/Fertilizing, Diversity

Microbial: products are living organism bacteria, fungi, nematode, & virus
Biological: Parasites, predators, pathogens

Physical - Mechanical

Biological

Chemical

Cultural
IPM Practices

• *To develop an effective pest management program…*
  
  – *First step! Identify pests correctly*
IPM Practices

• Monitor and scout for pests and their biological controls
IPM Practices: Follow Control-Action Guidelines

- Biology and Identification of Pests and Beneficials
- Preventative Practices
- Monitor Pest Populations
- An Action Decision Must be Made
- Evaluation and Follow-up

Action Threshold (take action to prevent unacceptable injury)
IPM Practices

- Prevent pest problems
  - Select pest resistant plants
IPM Practices

- Use different practices together (integrate)
IPM Control Methods

Natural controls:

- climate, natural enemies, geographic barriers, food and water supply, shelter
IPM Control Methods

Applied controls:

- host resistance
- cultural
- biological
- mechanical
- chemical
Host Resistance

- Host has physical characteristics that protect the plant
Host Resistance

- Host is more vigorous or tolerant than other varieties
Host Resistance

- Chemicals in the host protect the host
Cultural Control

- Crop rotation
- Mowing, cultivating to reduce weeds
- Harvest timing
Cultural Control
Cultural Control
Cultural Control
Biological control: predators, parasites, pathogens
Mechanical Control

- Traps
Mechanical Control

Light, heat, refrigeration
Chemical Control
Integrated Pest Management

- Cultural
- Physical - Mechanical
- Biological
- Chemical
Pest Control Failures

• Pest resistance occurs when pesticides are applied repeatedly in the same situation.
Pest Control Failures

• Incorrect dosage
Pest Control Failures

• Incorrect pest ID
Pest Control Failures

- Incorrect timing
Pest Control Failures

- Incorrect pesticide
Prevent Pesticide Resistance

• Rotate chemical classes of pesticides (use a different mode of action for each pest life cycle)
Pesticide Labeling

• If you remember nothing else, remember this – “The pesticide label is the LAW!!!”
Classification of Pesticide Uses

- **General:** formulations that can be purchased without a license
Classification of Pesticide Uses

• **Restricted-Use**: If it could cause harm to humans or to the environment unless it’s applied properly by a certified applicator.
  
  – Only a certified applicator may use or supervise the use of RUP’s.

**Restricted Use Pesticide**

Due to high acute toxicity to humans.
Classification of Pesticide Uses

• **Private Applicators:**
  Use or supervise use of RUPs to produce agricultural commodities on property owned or rented by themselves or their employer, or on the property of another person with whom they trade services.
Pesticide Names

- **Brand/trade name** – manufacturer’s name for the product
  - Pre-M
  - Pendulum
  - Southern Weedgrass

Coke or Pepsi?
Pesticide Names

• **Common name (generic)** – a shorter way of identifying the chemical, officially accepted by the EPA – i.e. pendimethalin
Pesticide Names

• **Chemical name** – identifies the chemical components and structure of the pesticide
  – N-(1-ethylpropyl)-3, 4-dimethyl-2, 6-dinitrobenzenamine
Sevin® SL

INTENDED FOR AGRICULTURAL OR COMMERCIAL USE
Includes Residential Turf Spot Treatments

ACTIVE INGREDIENT:
Carbaryl (1-naphthyl N-methylcarbamate) .... 43.0% by wt.

INERT INGREDIENTS: ......................... 57.0% by wt.
(Contains 4 Pounds Carbaryl Per Gallon)

EPA Reg. No. 432-1227-72112
Ingredient Statement

• Active ingredient
  – Common name
  – Chemical name
Ingredients Statement

- Inert (other) ingredients
  - NOT active
  - Must be listed by percentage, but not by name
  - Foaming agents, wetting agents, surfactants, etc.
## Dissecting a Label

<table>
<thead>
<tr>
<th>Brand/trade name</th>
<th>Sevin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ingredient statement</td>
<td>% active and inactive</td>
</tr>
<tr>
<td>Common name (active)</td>
<td>Carbaryl</td>
</tr>
<tr>
<td>Chemical name (active)</td>
<td>Napthyl N-methylcarbamate</td>
</tr>
<tr>
<td>Inert ingredients</td>
<td>Not always specified</td>
</tr>
<tr>
<td>Registration number</td>
<td>3120-280-AA</td>
</tr>
<tr>
<td>Establishment number</td>
<td>5840-AZ-1</td>
</tr>
<tr>
<td>Manufacturer name/address</td>
<td>DuPont, Wilmington, DE</td>
</tr>
<tr>
<td>Net contents</td>
<td>Pounds, ounces or gallons</td>
</tr>
<tr>
<td>Type of pesticide</td>
<td>Insecticide</td>
</tr>
<tr>
<td>Directions for use</td>
<td>Sites, rates, app. info., etc.</td>
</tr>
</tbody>
</table>
Signal Word

KEEP OUT OF REACH OF CHILDREN
DANGER — POISON

STATEMENT OF PRACTICAL TREATMENT
IF SWALLOWED - Induce vomiting by giving a tablespoonful of salt in a glass of warm water. Repeat until vomitus is clear. Call a physician immediately.

KEEP OUT OF REACH OF CHILDREN
WARNING-AVISO

CAUTION
HARMFUL IF SWALLOWED
AVOID CONTACT WITH THE SKIN, EYES AND CLOTHING. WASH THOROUGHLY AFTER USE. DO NOT CONTAMINATE FOOD OR FEED.
READ ALL LABEL DIRECTIONS BEFORE USING.
COMBUSTIBLE!—Do not use, store, spill or pour near heat or open flame.

Keep Out of Reach of Children
What do signal words mean?

• **CAUTION** – slightly toxic
What do signal words mean?

- **WARNING** – moderately toxic
What do signal words mean?

- **DANGER*** - highly toxic

  *with skull/crossbones/
  POISON = *acute illness*

  without = skin/eye irritation
Also on the front of the label

- EPA registration number
  - Manufacturer or company
  - Product

- EPA establishment number
  - Production facility

EPA Reg. No. 10163-169
EPA Est. No. 67545-AZ-1
Also on the front of the label

- Net contents – how much is in the container
  - Dry – pounds or ounces
  - Liquid – gallons, quarts, pints, fluid ounces
Also on the front of the label

• Name and address of the manufacturer
Also on the front of the label

- Type of pesticide:
Also on the front of the label

- Type of formulation
  - Wettable powder (WP)
  - Dust (D)
  - Emulsifiable concentrate (EC)
  - Granule (G)
Precautionary Statements

PRECAUTIONARY STATEMENTS

HAZARDS TO HUMANS AND DOMESTIC ANIMALS
WARNING-AVISO

May be fatal if swallowed, inhaled, or absorbed through the skin. Do not breathe dust or spray mist. Do not get in eyes, on skin, or on clothing.

PERSONAL PROTECTIVE EQUIPMENT (PPE)

Applicators and other handlers must wear:
- Long-sleeved shirt and long pants
- Waterproof gloves
- Shoes plus socks
- Chemical-resistant headgear for overhead exposure
- Dust/Mist filtering respirator (MSHA/NIOSH approval number prefix TC-21C), or a NIOSH approved respirator with any R.P. or HE filter.

Discard clothing and other absorbent materials that have been drenched or heavily contaminated with this product’s concentrate. Do not reuse them. Follow manufacturer’s instructions for cleaning/maintaining PPE. If no such instructions for washables, use detergent and hot water. Keep and wash PPE separately from other laundry.

USER SAFETY RECOMMENDATIONS

Users should:
- Wash hands before eating, drinking, chewing gum, using tobacco, or using the toilet.
- Remove clothing immediately if pesticide gets inside. Then wash thoroughly and put on clean clothing.
Statement of Practical Treatment

• First aid

• Includes instructions on how to respond to an exposure situation, including information for a doctor

• Located on the front of the label
HAZARDS TO HUMANS AND DOMESTIC ANIMALS

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USER SAFETY RECOMMENDATIONS

Users should:
- Wash hands before eating, drinking, chewing gum, using tobacco, or using the toilet.
- Remove clothing immediately if pesticide gets inside. Then wash thoroughly and put on clean clothing.
Environmental Hazards

ENVIRONMENTAL HAZARDS
This pesticide is extremely toxic to fish. Do not apply directly to water, to areas where surface water is present, or to intertidal areas below the mean high water mark. Do not contaminate water when disposing of equipment wash waters.
This product is highly toxic to bees exposed to direct treatment on blooming crops or weeds. Do not apply this product or allow it to drift to blooming crops while bees are actively visiting the treatment areas.
Physical or Chemical Hazards

• Storage concerns
  – Flammability
Physical or Chemical Hazards

- Storage concerns
  - Corrosiveness
Directions for Use

DIRECTIONS FOR USE
It is a violation of Federal law to use this product in a manner inconsistent with its labeling.
Do not apply this product in a way that will contact workers or other persons, either directly or through drift. Only protected handlers may be in the area during application. For any requirements specific to your State or Tribe, consult the agency responsible for pesticide regulation.

AGRICULTURAL USE REQUIREMENTS
Use this product only in accordance with its labeling and with the Worker Protection Standard, 40 CFR Part 170. This Standard contains requirements for the protection of agricultural workers on farms, forests, nurseries, and greenhouses, and handlers of agricultural pesticides. It contains requirements for training, decontamination, notification, and emergency assistance. It also contains specific instructions and exceptions pertaining to the statements on this label about personal protective equipment (PPE) and restricted-entry interval. The requirements in this box only apply to uses of this product that are covered by the Worker Protection Standard.
Do not enter or allow worker entry into treated areas during the restricted-entry interval (REI) of 24 hours.
PPE required for early entry to treated areas that is permitted under the Worker Protection Standard and that involves contact with anything that has been treated, such as plants, soil, or water is:
• Coveralls
• Waterproof gloves
• Shoes plus socks
• Chemical-resistant headgear for overhead exposure

DILUTION DIRECTIONS
The rate required for thorough, uniform coverage varies with plant growth at time of application. Apply recommended rate in adequate spray volumes to provide complete coverage of fruit and foliage.
• Dilute or concentrate applications can be made. Use conventional ground equipment.
• For aerial applications, apply in a minimum of 3 gals. of water per acre.

GENERAL CHEMIGATION INSTRUCTIONS
Apply this product only through one or more of the following types of systems: Sprinkler (including center pivot, lateral move, end tow, side (wheel) roll, traveler, solid set or hand move). Do not apply this product through any other type of irrigation system.
Crop injury, lack of effectiveness, or illegal pesticide residues in the crop can result from nonuniform distribution of treated water.
Do not connect an irrigation system (including greenhouse systems) used for pesticide application to a public water system unless the pesticide label-prescribed safety devices for public water systems are in place.
If you have questions about calibration, you should contact State Extension Service specialists, equipment manufacturers, or other experts. A person knowledgeable of the chemigation system and responsible for its operation, or under the supervision of the responsible person, shall shut the system down and make necessary adjustments should the need arise.

For Chemigation Systems
Connected to Public Water Systems
Public water system means a system for the provision to the public of piped water for human consumption if such system has at least 15 service connections or regularly serves an average of at least 25 individuals daily at least 60 days out of the year.
Do not apply Imidan 70-W through any irrigation system supplied by a public water system unless the water supplied from the public water system is discharged into a reservoir tank prior to pesticide introduction. There shall be a complete physical break (air gap) between the outlet end of the fill pipe and the top or overflow rim of the reservoir tank of at least twice the inside diameter of the fill pipe.
Before beginning chemigation, always make sure that the air gap exists and that there is no blockage of the overflow of the reservoir tank.
In addition, all directions and requirements specified for Sprinkler Irrigation Systems must be followed.

Sprinkler Irrigation Systems
Restricted Entry

AGRICULTURAL USE REQUIREMENTS

Use this product only in accordance with its labeling. The Worker Protection Standard, 40 CFR Part 190, contains requirements for the protection of workers on farms, forests, nurseries, and greenhouses from agricultural pesticides. It contains requirements for decontamination, notification, and emergency assistance. It also contains specific instructions and exceptions pertaining to the statements on this label about personal protective equipment (PPE) and restricted-entry interval. The requirements in this box only apply to uses of this product that are covered by the Worker Protection Standard.

Do not enter or allow worker entry into treated areas during the restricted-entry interval (REI) of 24 hours.

PPE required for early entry to treated areas that is permitted under the REI.

It is a violation of Federal law to use this product in a manner inconsistent with its labeling.

RE-ENTRY STATEMENT
Do not enter area within five days after application.
Storage and Disposal

**STORAGE AND DISPOSAL**

**DO NOT** contaminate water, food or feed by storage or disposal.

**STORAGE:** Store in a cool, dry place.

**PESTICIDE DISPOSAL:** Wastes resulting from the use of this product may be disposed of on site or at an approved waste disposal facility.

**CONTAINER DISPOSAL:** Completely empty bag into application equipment. Then dispose of empty bag in a sanitary landfill, or by incineration, or if allowed by State and local authorities, by burning. If burned stay out of smoke.

**SPILL OR LEAK:** A small spill can be handled routinely. Use adequate ventilation and wear an air-supplied respirator to prevent inhalation. Wear suitable protective clothing and eye protection to prevent skin and eye contact. Use the following procedures:

1. Sweep up spilled material being careful not to create dust.
2. Place sweepings in an open drum.
3. Generously cover the contaminated areas with a common household detergent. Using a stiff brush and small amounts of water, work the detergent into the spill material forming a slurry. Do not splatter on one’s self or bystanders. Completely avoid skin and eye contact with this material. Brush the slurry into cracks and crevices and allow to stand for 2 - 3 minutes.
4. Spread a suitable absorbent such as clay, sawdust, or kitty litter on the slurred liquid. Shovel absorbed material into an open drum.
5. Repeat if necessary.
6. Flush area with water while observing proper environmental considerations. Seal drum and dispose of contaminated material in an approved pesticide landfill.

Large spills must be handled according to a predetermined plan. For assistance in developing a plan, contact Gowan Company.
• **Active Ingredients:** chemicals that actually **control** the target pest
Types of Formulations

- Liquid formulations
- Dry formulations
- Solutions
- Aerosols
- Fumigants
Liquid Formulations – Pounds per Gallon

- Emulsifiable concentrates (EC or E)
- Solutions (S)
- Ready to Use (RTU)
- Concentrate Solutions (C or LC)
- Ultra-low-volume (ULV)
- Flowables (F or L)
Dry Formulations: Percent Active Ingredient

Dusts (D)
Baits (B)
Granular (G)
Wettable powder (WP or W)
**Soluble powder (SP or WSP) – form true solution**
Dry flowable (DF)
Water dispersible granule (WDG)
Pesticide Movement - Air

Air:
pesticide movement away from the release site into the air is called DRIFT
Pesticide Movement - Water

moves in through
drift, leaching,
and runoff from
nearby
applications

Leaching

Runoff

Groundwater
Pesticide Movement

On or in objects, plants or animals: pesticides may stick to plant surfaces
Pesticide Movement

pesticides may stick to shoes or objects
Pesticide Movement

pesticides may stick to animal fur
Pesticide Movement

pesticides may stick to other surfaces
Drift Control

- Droplet size!
- Spray pressure
- Drift control agent
- Nozzle selection
- Distance from target
- Wind speed and direction
## Spray Droplet Size and Its Effect on Spray Drift

<table>
<thead>
<tr>
<th>Droplet diameter</th>
<th>Type of droplet</th>
<th>Time required to fall 10 ft. in still air</th>
<th>Distance droplet will travel in falling 10 ft. (3mph breeze)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Fog</td>
<td>66 min.</td>
<td>3 miles</td>
</tr>
<tr>
<td>100</td>
<td>Mist</td>
<td>10 sec</td>
<td>409 feet</td>
</tr>
<tr>
<td>500</td>
<td>Light rain</td>
<td>1.5 sec</td>
<td>7 feet</td>
</tr>
<tr>
<td>1000</td>
<td>Moderate rain</td>
<td>1.0 sec</td>
<td>4.7 feet</td>
</tr>
</tbody>
</table>
Harmful Effects on Non-Target Plants and Animals

- From direct contact: poorly timed applications can harm honey bees and wildlife in or near a target site.
Harmful Effects on Non-Target Plants and Animals

From residues: part of the pesticide that remains in the environment for a period of time.
Pesticide Breakdown

- Sunlight
- Microbes
- Water
- Plants
Special Environmental Concerns: Protecting Ground Water

• Soil Permeability: influences how fast pesticides move downward
Special Environmental Concerns: Protecting Ground Water

- Solubility of the pesticide: the ability of the pesticide to dissolve in water
Personal Protective Equipment
Personal Protective Equipment

• Clothing and devices worn to protect your body from contact with pesticides or residues

• The pesticide label lists the minimum you must wear while handling the pesticide

• You are required by law to follow all PPE instructions on the pesticide label
Personal Protective Equipment

- Not all PPE will protect you from all chemicals
- Type of solvent in the chemical determines what type of PPE is resistant
- Rubber gloves will only protect you from water-based or dry pesticides
Hand and Foot Protection

• Leather, canvas or cloth shoes are a bad choice for applicators.
Hand and Foot Protection

• Avoid contaminating the inside of your gloves and footwear.
• Gloves, boots, or coveralls should not be worn with certain types of fumigants.
The job dictates how PPE should be worn.
The job dictates how PPE should be worn.
Eye Protection
Respirators
Cleaning PPE

- Dispose of single use PPE
- Wash reusable PPE with detergent and hot water, then dry.
- Wash your hands with soap and water.
Contaminated Clothing

- If you spill chemicals on your clothing, remove immediately.
- Place clothes in a plastic bag
- Wash your body with soap and water
- Put on clean clothes
Laundering Fabrics

- Separate from family wash
- Wash a few items at a time
- Rinse twice
- Line dry outside
Routes of Entry

- Skin
- Eyes
- Mouth
- Respiratory system
Hazard = Toxicity x Exposure
Skin

- Most pesticide exposures are to skin (dermal).
- Wash contaminated areas immediately with soap and water.
- Oil-based products will be most readily absorbed by your skin.
Eyes

• Immediately wash your eyes out with clean water for at least 15 minutes if pesticide gets into your eyes
Respiratory System

- Immediately get to clean air outside the treatment area
• If you swallow a pesticide you will need to follow the first aid directions on the label.
• Inducing vomiting can be harmful in some situations.
Effects of Pesticide Exposure

• **Acute** – within 24 hours after exposure
Effects of Pesticide Exposure

- **Delayed or Chronic** – after repeated exposures
Effects of Pesticide Exposure

- Allergic or Sensitization - reaction that others do not experience
Before you eat, drink, use the bathroom, chew gum, use tobacco, or do anything where you will touch your body.
Routine Decontamination

- Wash your hands with soap and water, then dry your hands.
Routine Decontamination

- Water, soap and paper towels should be carried at all times.
– Take breaks in a cool area
Heat Stress

Inform your supervisor if you are taking medications
Heat Stress

- Dress in loose-fitting, light colored clothing
Mixing, Loading & Calibration
Environmental Factors

- Surface moisture: moderate is best
- Rain or irrigation water: may move pesticides off target
- Temperature: low temps slow down or stop action; high temps increase the likelihood that some pesticides will vaporize
Safe Mixing & Loading Practices

- Protect your water source: the main purpose of an anti-siphoning device on your pump is to prevent water source contamination
- Always wear the proper PPE.
Mixing, Loading & Application

• Safe Mixing & Loading Practices
  – Keep the pesticide container below face level to avoid injury from splashing
  – If clothing is contaminated remove immediately, dispose of it, and wash yourself
Applying the Pesticide

- Make sure to inspect all equipment daily to insure personal safety
Combining Pesticides

• Always add pesticides to the diluent using the W-A-L-E Plan:
  – 1. Add Wettable powders & Water dispersibles
  – 2. Agitate thoroughly
  – 3. Add the Liquid products
  – 4. Add Emulsifiable concentrates last
• W-A-L-E: wettable, agitation, liquid, emulsifiables.
After Mixing, Loading and Application

• Always clean your equipment according to label instructions
• Always clean yourself
• Make sure that you keep appropriate records of the application
Applying the Correct Amount

• How much to apply
  – Under dosing
  – Over dosing

• If a pesticide label indicates a range of rates…

• **use the lowest possible label rate that achieves adequate pest control**
Transporting Pesticides

Transport in a non-passenger area of the vehicle. Keep vehicle attended.
Never transport with food or other items that might be contaminated.
Pesticide Storage
Safe Storage Guidelines

- Building designed for storage
- Outside marked with sign and placard
- Impervious flooring
- Good lighting
- Good ventilation
- Temperature/humidity control
- Log of stored pesticides
- Spill clean up supplies
- MSDS
- Fire extinguisher
- PPE
- Locked/secure!!!
Safe Storage Guidelines

• All chemicals should be stored in their original, labeled container.

• Pesticides should NEVER be stored in food or drink containers.
Disposal
Spill Clean Up

• Control
• Contain
• Clean Up
• Make sure to wear the right PPE!!
Control – Stop the Source
Control – Protect Others and Stay at the Site
Contain the Spill
Clean Up the Spill
Decontaminate Equipment

- Bleach
- Dishwasher detergent
- Water
After Cleaning Up the Spill

- Clean up the equipment
  - Use bleach, dish soap, and water
- Clean up yourself
  - Use soap and water
- Contact appropriate authorities if necessary
Florida Laws and Regulations

- Agencies responsible for laws and rules governing pesticide use in Florida
  - **Florida Dept. Of Community Affairs**: pesticide storage facilities that contain more than a TPQ of an active ingredient listed as extremely hazardous
  - **Florida Dept. Of Environmental Protection**: waste management and container burning
  - **Florida Dept. Of Agriculture and Consumer Services**: pesticide applicator licensing
Florida Laws and Regulations

Florida Mosquito Control Law, Chapter 388 F.S.- mosquito control, public health

Structural Pest Control Act, Chapter 482 F.S.- pest control, landscaping

Florida Pesticide Law, Chapter 487 F.S. – agriculture, ag-related areas
Pest Control Categories:

- Private applicator Ag
- Aerial applicator
- Ag row crop
- Ag tree crop
- Ag animal
- Soil/greenhouse fum.
- Raw Ag commodity fum.
- Regulatory
- Natural areas

- Forest pest control
- Ornamental & turf
- Seed treatment
- Aquatics
- Organotin paint
- Right of way
- Wood treatment
- Chlorine gas infusion
- Demo/Research
Types & Costs of Licenses

• Private - $100
• Public - $100
• Commercial - $250
Thank you!