MURPHY
FOREST MANAGEMENT

Treating Invasives

Presenter

Kellen Murphy

- Graduated the Ranger School in 2007
- Graduated SUNY ESF in 2009
- Owner - Murphy Forest Management, LLC
- Certified Commercial Applicator
  - Category 2 – Forest
  - Category 3a – Ornamental Turf

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Outline

Safety
- Worker Protection Standards
- Labeling
- PPE

Applications
- Hack and Squirt
- Foliar
- Basal Bark

Invasive Plant Species
- Japanese Knotweed
- Honey Suckle
- Buckthorn
- American Beech
- Oriental Bittersweet
- Ailanthus

Invasive Insect Species
- Hemlock Woolly Adelgid
- Spongy Moths

Drones
- Licensing
- Pros and Cons
- Local Professionals

Alternative Treatments
- Integrated Pest Management

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Worker Protection Standards

Established by the EPA to reduce pesticide poisonings and injuries among agricultural workers and pesticide handlers. It mandates occupational protections, such as:

- Safety posters and signage requirements
- Including the nearest emergency facility in safety plans
- Access to chemical information (name, EPA number, REI, etc.)
- Clearly communicating the location and description treated areas
- Handler, worker, and apprentice training
- Safety equipment and decontamination access (triple rinse, eye wash station, PPE)

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Chemical Labels

The EPA labeling requirements are found in Title 40 CFR § 156.10. They are intended to be the definitive authority on the chemical, carrying critical information like:

- Product name, active ingredient, and EPA registration number
- Restricted entry intervals and PPE requirements
- Application instructions based on targeted species and reason for application
- First-aid for exposure
- Disposal instructions

Chemical labels are required on anything containing pesticides, including application equipment.

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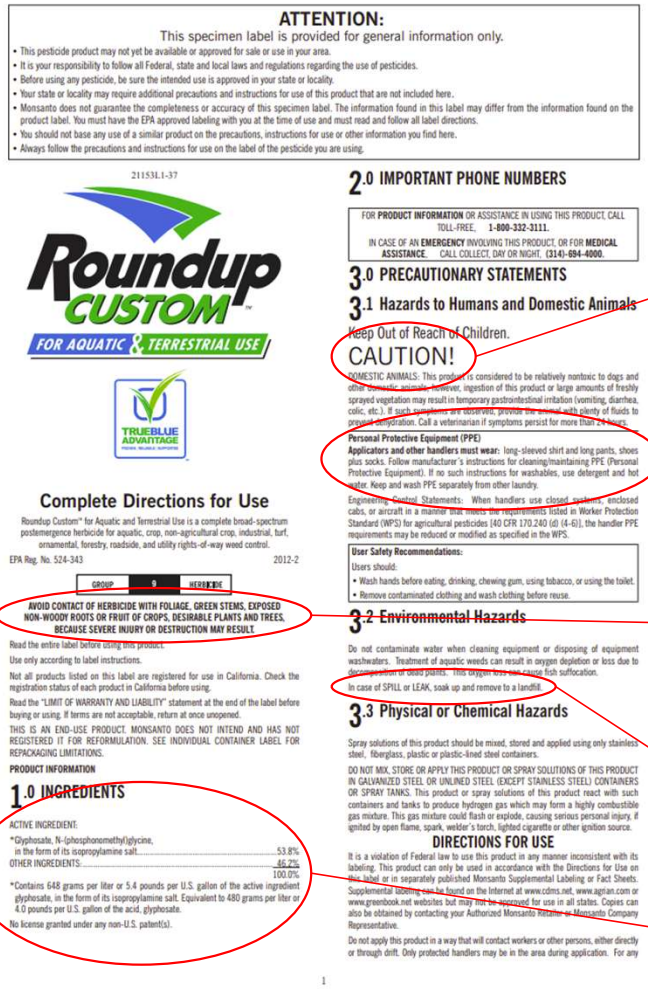

ATTENTION:

This specimen label is provided for general information only.

- This pesticide product may not yet be available or approved for sale or use in your area.
- It is your responsibility to follow all Federal, state and local laws and regulations regarding the use of pesticides.
- Before using any pesticide, be sure the intended use is approved in your state or locality.
- Your state or locality may require additional precautions and instructions for use of this product that are not included here.
- Monsanto does not guarantee the completeness or accuracy of this specimen label. The information found in this label may differ from the information found on the product label. You must have the EPA approved labeling with you at the time of use and must read and follow all label directions.
- You should not base any use of a similar product on the precautions, instructions for use or other information you find here.
- Always follow the precautions and instructions for use on the label of the pesticide you are using.

21153L1-37

Roundup CUSTOM

FOR AQUATIC & TERRESTRIAL USE

TRUEBLUE ADVANTAGE

Complete Directions for Use

Roundup Custom™ for Aquatic and Terrestrial Use is a complete broad-spectrum postemergence herbicide for aquatic, crop, non-agricultural crop, industrial, turf, ornamental, forestry, roadside, and utility rights-of-way weed control.

EPA Reg. No. 524-343 2012-2

GROUP 9 HERBICIDE

AVOID CONTACT OF HERBICIDE WITH FOLIAGE, GREEN STEMS, EXPOSED NON-WOODY ROOTS OR FRUIT OF CROPS, DESIRABLE PLANTS AND TREES, BECAUSE SEVERE INJURY OR DESTRUCTION MAY RESULT.

Read the entire label before using this product.

Use only according to label instructions.

Not all products listed on this label are registered for use in California. Check the registration status of each product in California before using.

Read the "LIMIT OF WARRANTY AND LIABILITY" statement at the end of the label before buying or using. If terms are not acceptable, return at once unopened.

THIS IS AN END-USE PRODUCT. MONSANTO DOES NOT INTEND AND HAS NOT REGISTERED IT FOR REFORMULATION. SEE INDIVIDUAL CONTAINER LABEL FOR REPACKAGING LIMITATIONS.

PRODUCT INFORMATION

1.0 INGREDIENTS

ACTIVE INGREDIENT:

*Glyphosate, N-(phosphonomethyl)glycine, in the form of its isopropylamine salt 53.8%

OTHER INGREDIENTS: 46.2%

100.0%

*Contains 648 grams per liter or 5.4 pounds per U.S. gallon of the active ingredient glyphosate, in the form of its isopropylamine salt. Equivalent to 480 grams per liter or 4.0 pounds per U.S. gallon of the acid, glyphosate.

No license granted under any non-U.S. patent(s).

2.0 IMPORTANT PHONE NUMBERS

FOR **PRODUCT INFORMATION** OR ASSISTANCE IN USING THIS PRODUCT, CALL TOLL-FREE, **1-800-332-3111.**

IN CASE OF AN **EMERGENCY** INVOLVING THIS PRODUCT, OR FOR **MEDICAL ASSISTANCE**, CALL COLLECT, DAY OR NIGHT, **(314)-694-4000.**

3.0 PRECAUTIONARY STATEMENTS

3.1 Hazards to Humans and Domestic Animals

Keep Out of Reach of Children.

CAUTION!

DOMESTIC ANIMALS: This product is considered to be relatively nontoxic to dogs and other domestic animals. However, ingestion of this product or large amounts of freshly sprayed vegetation may result in temporary gastrointestinal irritation (vomiting, diarrhea, colic, etc.). If such symptoms are observed, provide the animal with plenty of fluids to prevent dehydration. Call a veterinarian if symptoms persist for more than 24 hours.

Personal Protective Equipment (PPE)

Applicators and other handlers must wear: long-sleeved shirt and long pants, shoes plus socks. Follow manufacturer's instructions for cleaning/maintaining PPE (Personal Protective Equipment). If no such instructions for washables, use detergent and hot water. Keep and wash PPE separately from other laundry.

Engineering Control Statements: When handlers use closed systems, enclosed cabs, or aircraft in a manner that meets the requirements listed in Worker Protection Standard (WPS) for agricultural pesticides [40 CFR 170.240 (d) (4-6)], the handler PPE requirements may be reduced or modified as specified in the WPS.

User Safety Recommendations:

Users should:

- Wash hands before eating, drinking, chewing gum, using tobacco, or using the toilet.
- Remove contaminated clothing and wash clothing before reuse.

3.2 Environmental Hazards

Do not contaminate water when cleaning equipment or disposing of equipment washwaters. Treatment of aquatic weeds can result in oxygen depletion or loss due to decomposition of dead plants. This oxygen loss can cause fish suffocation.

In case of SPILL or LEAK, soak up and remove to a landfill.

3.3 Physical or Chemical Hazards

Spray solutions of this product should be mixed, stored and applied using only stainless steel, fiberglass, plastic or plastic-lined steel containers.

DO NOT MIX, STORE OR APPLY THIS PRODUCT OR SPRAY SOLUTIONS OF THIS PRODUCT IN GALVANIZED STEEL OR UNLINED STEEL (EXCEPT STAINLESS STEEL) CONTAINERS OR SPRAY TANKS. This product or spray solutions of this product react with such containers and tanks to produce hydrogen gas which may form a highly combustible gas mixture. This gas mixture could flash or explode, causing serious personal injury, if ignited by open flame, spark, welder's torch, lighted cigarette or other ignition source.

DIRECTIONS FOR USE

It is a violation of Federal law to use this product in any manner inconsistent with its labeling. This product can only be used in accordance with the Directions for Use on this label or in separately published Monsanto Supplemental Labeling or Fact Sheets. Supplemental labeling can be found on the Internet at www.cdms.net, www.agrian.com or www.greenbook.net websites but may not be approved for use in all states. Copies can also be obtained by contacting your Authorized Monsanto Retailer or Monsanto Company Representative.

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

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The label for this chemical is 30 pages, all filled with critical information. On just one page we find:

Signal words indicate the acute short-term toxicity.

PPE to be worn when using this chemical.

Immediate warning to prevent injury and/or destruction.

Action to take in the event of a spill or leak.

All ingredients.

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Personal Protective Equipment

All pesticides require some degree of PPE. At Murphy Forest Management, most of ours require boots, socks, pants, long-sleeve shirts, hats, chemical resistant gloves, and safety glasses.

Some pesticides may require additional PPE, like respirators or rubber aprons.

Application Techniques

Hack and squirt

Apply chemical into small hatchet cuts in the bark.

Mist-Blown Foliar

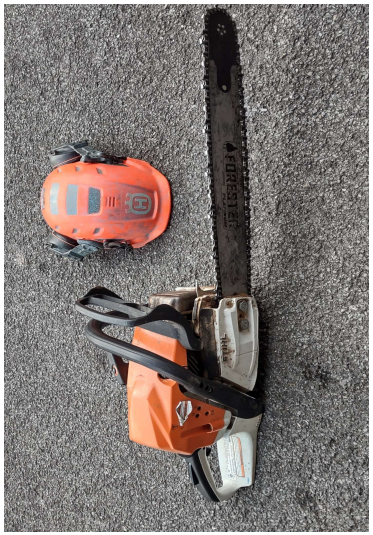
Apply chemical to leaves in a powered mist.

Backpack Foliar or Basal Bark

Apply chemical in a stream or spray.

Cut Stump

Apply chemical to cut stump.



Invasive Plants

Japanese Knotweed

Two-Stage application:

- May-June: Cut stems before flowering and apply Glyphosate (Roundup) to cut stem
  - Make sure the stems stay on site, it's easy to transport knotweed
- August-September: Apply Imazapyr (Arsenal) after resprouting

Japanese Knotweed is incredibly resilient

- Glyphosate will rarely work on its own
- One application per year is unlikely to be effective

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Invasive Plants

Honey Suckle

- Mist-blown foliar application, sometimes with cut stump if thick.
- Glyphosate is effective, but likely to need a second-year follow-up (0.75-2% solution).
  - Colorants and dyes are hard to see, and full coverage is required.
- Use a bump string or thinning rows, skid trails, etc. as application edges.

Similar application procedure for Multiflora Rose, Ferns, and Russian Olive.

Multiflora Rose

NY Fern

Russian Olive

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Invasive Plants

Buckthorn

- Responds best to Triclopyr (Garlon 3A and Garlon 4)
- Hack and squirt or cut stump application
- Dormant season treatments can kill tree before fruits appear in spring
- During Summertime treatments, berries will mature on tree after hack and squirt application

Follow-up foliar applications on seedlings and misses are often required.

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Interfering Plants

American Beech

American beech responds well to various applications based on certain factors. It can be treated during both growing and dormant seasons.

- Hack and squirt is most effective on 1” DBH to 10” DBH
  - Glyphosate (Rodeo) or Triclopyr (Garlon 3A or 4)
- Cut stump is best when the forester desires utilization or brush piles
  - Physically demanding, but great for upland birds, rabbits and rodents
- Basal bark is most effective on seedlings to 6” DBH
  - Triclopyr (Garlon 4) with basal oil and dye
- Mist blown foliar for 12’ tall or shorter thickets in growing season
  - Glyphosate or Triclopyr

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Invasive Plants

Oriental Bittersweet

- Can be treated during growing or dormant seasons
- Cut surface treatment, like grapevine or poison ivy
  - Chainsaw, sharp machete, and handheld sprayer
- Responds well to Garlon 3A (triclopyr) and Arsenal (imazapyr)
  - Off-label application requires approval from DEC (2ee)

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Invasive Plants

Ailanthus

- Can be treated during both growing and dormant seasons
- Responds well to hack and squirt, cut stump, basal bark, and/or foliar treatments
  - Pathfinder II is ready to use Triclopyr and Basal oil
  - Tordon is not labeled for use on Long Island
- Usually found in urban or suburban setting, but occasionally in the woods
- Treatment procedures are similar to those of other deciduous trees, such as striped maple, ironwood, black birch, and soft maple.
- Concern stems from interaction with Spotted Lantern Flies

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Invasive Insects

Hemlock Woolly Adelgid

The Chemicals

- Basal bark application of Dinotefuran (Safari 20G) and Imidacloprid (Quali-Pro or Criterion)
  - Dinotefuran is a fast acting, highly effective treatment lasting 1-2 years
  - Imidacloprid is slow acting, treating for 2-5 years
- Tank-mix chemicals and water with 25% basal oil for bark penetration

The Procedure

- Map the site with Avenza, Hunt ONX, etc.
- Measure tree diameters on each acre, marking each target tree with its diameter
  - Proper application rate is 256” DBH per acre, or ten 25.6” DBH hemlock trees per acre
  - It is unlikely that every tree can be treated. Select only the best trees on each acre.
- Calibrate the flow rate of the sprayer to apply the exact amount of chemical solution for the DBH of the target tree

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Invasive Insects

Spongy Moths and Tent Caterpillars

The Chemicals

- Bacillus Thuringiensis is a bacteria that kills many types of caterpillars including spongy moths, tent caterpillars, fall webworms, hornworms, and more
- Commonly used with drone, fixed wing or helicopter applications to mature trees and vegetable crops
- Applying Neem oil or Horticultural oil to egg masses before they hatch can be effective on short trees and shrubs, or scrape the mass into a jar of alcohol

The Procedure

- Bacillus Thuringiensis can be applied in a mist to the leaves and the caterpillars eat the bacteria along with the leaves
- Bacteria grows in a colony inside the caterpillar until it dies in 2 to 3 days
- Neem oil can be applied with a back sprayer or hand sprayer directly to egg masses if you can reach them

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Invasive Insects

Additional Pesticides

Dimilin (Diflubenzuron)

- For treatment of dipteran and lepidopteran infestations
- Safe for bees (non-neonicotinoid)
- Can be applied during flowering stage
  - Not for use on pears, stone fruits, tree nuts or non crop areas

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Drones

Drones have a niche opportunity in helping to control invasive species. They are a very flexible option that can enhance many types of services that traditionally could only be performed via fixed wing or helicopters. The unique spraying method allows for very accurate and high efficacy treatments to areas very close to sensitive areas.

Licensing Requirements

- Pilot must have Remote Pilot Certification, 2nd Class Medical Certificate along with documented training provided on part 137 operations by a qualified instructor.
- Business must obtain Part 137 Operating Certificate with chemical endorsement.
- Must have a Commercial Applicator in Category 11 along with the spraying Category type (Ornamental, Forest, Aquatic, Etc.) for NYS DEC requirements. The Applicator must be always on site. Minimum requirement for Pilot is Commercial Technician in Category 11 with direct supervision by Applicator.
- Must obtain multiple exemptions from FAA which depend on drone type and intended operation.
  - Estimated time to obtain: 8-20 months depending on drone type and intended operation.

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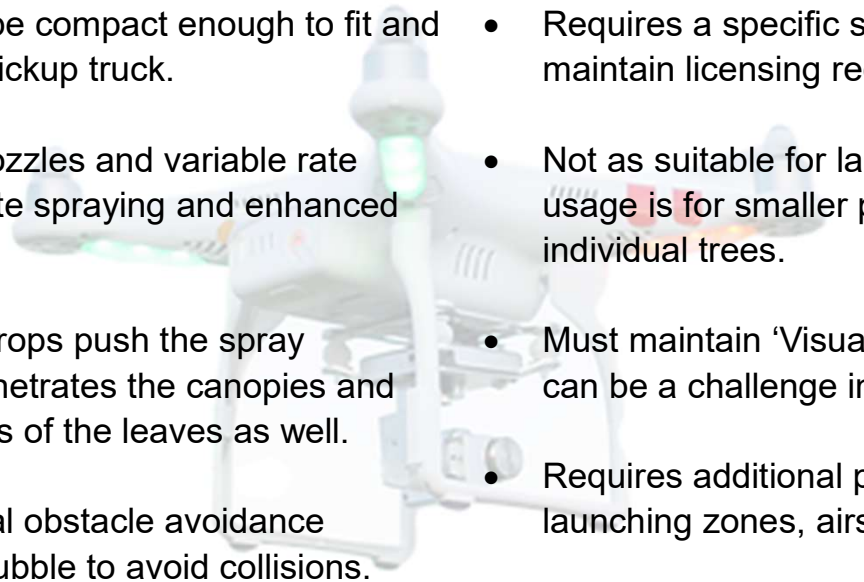
Drones



Pros

- Flexibility – A full setup can be compact enough to fit and operate from the back of a pickup truck.
- Precision – Swath widths, nozzles and variable rate pumps allow for very accurate spraying and enhanced drift management.
- Canopy Penetration – The props push the spray downwards which in turn penetrates the canopies and fully saturates the undersides of the leaves as well.
- Safety – Automated spherical obstacle avoidance systems maintain a safety bubble to avoid collisions.
- Compliance/Reporting – Flight logs show digital footprint to determine exact spray location and application rates.

Cons

- Requires a specific skillset and constant practice to maintain licensing requirements.
- Not as suitable for large/bulk acreage areas. Primary usage is for smaller plots around 5-10 acres or treating individual trees.
- Must maintain 'Visual Line Of Sight' at all times, which can be a challenge in some areas.
- Requires additional pre-flight planning to determine best launching zones, airspace requirements, etc.
- Long lead times between initial investment and ROI due to paperwork, licensing, etc.
  - Barrier to entry

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Drones

Summary

- Drones are making their way into the invasives management market.
- Current limited availability due to investment, skill, licensing, and reporting requirements.
- Excellent for smaller-scale jobs (10 acres or fewer), precision applications, and canopy penetration.
- Must follow additional regulations due to aviation component.

CNY DRONE SERVICES

Rick Jordan
Operations Manager

(315) 605-8004
info@cnydroneservices.com

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Other Options

- Prescribed fire
- Cut and let the deer eat the regrowth
- Slash wall
  - Excludes the deer
  - Allows native vegetation to out-compete the interfering vegetation

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Questions and Comments

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