

ABC's OF VEGETATION MANAGEMENT



Nutrien
Solutions

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ADJUVANTS

ACTIVATOR 90

ACTIVATOR 90 is the premier non-ionic surfactant available on the market today. This high-quality, high-concentration, low-foaming formulation allows the product to increase the performance of a wide range of chemicals.

FEATURES

- 90% active, non-ionic formulation that is biodegradable and non-flammable
- Exceeds chemical manufacturers' recommendations

GROWER BENEFITS

- The high HLB level of Activator 90 is highly water soluble and won't gel in your spray tank
- The unique blend of ingredients in Activator 90 breaks through natural barriers that affect pesticide performance

RATES

1-4 pts/100 gal



CHOICE TRIO is a non-AMS liquid water conditioner designed to aid in the performance of herbicides susceptible to the negative effects of hard water. Choice Trio performs via three modes of action: sequestering, chelating and complexing of all hard water cations.

FEATURES

- Water conditioner: sequestering; synthetic chelating and complexing
- Non-AMS formulation

RATES

1-2 qts/100 gal

TARGET CHEMISTRIES

Herbicides

GROWER BENEFITS

- Reduces the effects of hard water on herbicide performance without the use of AMS
- Effective on all hard water cations
- Can be used in applications where AMS is not recommended but water conditioning is required

CHOICE TRIO Application Rate Range



Choice Trio 3 Modes Choice Weather Master 2 Modes AMS 1 Mode

Lab demo visualizing negative effects of hard water on susceptible herbicides, such as glyphosate. The sample treated with Choice Trio shows no visual signs of hard water cation antagonism of the salt molecule.



CHOICE WEATHER MASTER is a water conditioning agent for use with agricultural chemicals. Designed for hard water conditions, this liquid formulation locks up hard water cations, allowing maximum herbicide performance. Compatible with all formulations of glyphosate.

FEATURES

- Contains multiple sequestering and complexing agents
- Convenient liquid formulation

RATES

2-4 pts/100 gal

TARGET CHEMISTRIES

Glyphosate

GROWER BENEFITS

- Reduces effects of hard water on herbicide performance
- Binds multiple hard water cations, such as calcium, manganese, magnesium and potassium
- Convenience of treating 1000 gallons with 2½ to 5 gallons of liquid instead of 100 to 200 pounds of dry product

Action of CHOICE Weather Master in Hard Water



Hard water with cations



Addition of certain active ingredients actually "lock-on" to the cations.



The addition of CHOICE Weather Master results in it "locking-on" to the hard water cations. This prevents hard water cations from interfering with the herbicide performance.

● Hard water cations ● Active ingredient ■ CHOICE Weather Master



COMPADRE is a non-ionic, non-foaming, and shear-tolerant drift control agent containing suspended antifoam/defoamer. Compadre may be used as a drift control adjuvant to enhance deposition, retention and control spray droplet size of agricultural and industrial chemicals.



FEATURES

- Contains Leci-Tech, a unique technology that assists overall spray performance
- Non-ionic formulation
- Shear-tolerant

RATES

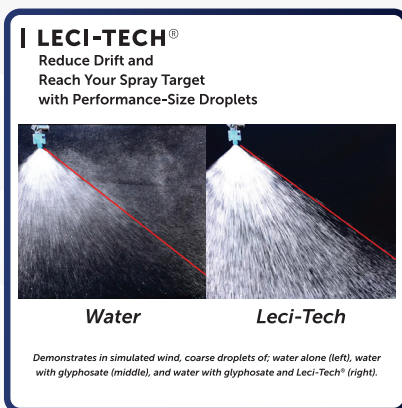
1 pt/100 gal spray solution

TARGET CHEMISTRIES

Loaded Glyphosate Formulations

GROWER BENEFITS

- **TO:** Drift reduction with performance-sized droplets
- **ON:** Droplet retention by adhesion and spreading
- **IN:** Increased penetration without cuticle disruption
- Contains an antifoam/defoam system
- Low use rates make Compadre cost-effective



GUNSMOKE is a premium-grade activator, water conditioner and acidifier designed to improve performance and speed of control of glyphosate.

FEATURES

- Contains a surfactant, an acidifier and a water conditioner

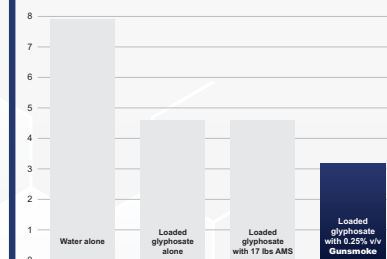
RATES

1-3 qts/100 gal

GROWER BENEFITS

- Greatly accelerates weed control in glyphosate tank mixes
- Gunsmoke is more convenient than dry AMS and provides similar to or better control than AMS

I Effect on Water pH with Loaded Glyphosate





HERBIMAX is a premium oil/surfactant that increases penetration and the activity of post-emergence herbicides.

FEATURES

- Can be applied by ground or air
- Petroleum-based oil
- Premium multi-component oil/surfactant system

RATES

1-4 pts/A

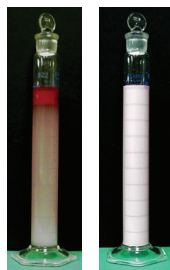
TARGET CHEMISTRIES

Post-Emergence Herbicides

GROWER BENEFITS

- Fertilizer-compatible emulsifier stabilizes spray tank solution
- Increases herbicide activity and penetration of the plant surface
- Easy-to-use, non-foaming formulation allows easy tank mixing and clean out of the spray tank

HERBIMAX® Emulsion Stability



After sitting for 10 minutes, Herbimax, on the right, holds a spray mixture together; competitive product's emulsion, left, broke down.



INFUSE is a proprietary vegetable-based soil adjuvant designed to hold soil-applied chemistry in the targeted areas longer, allowing for more consistent weed control.

FEATURES

- Vegetable-based soil adjuvant

RATES

Ground: 1-4 pts/A in 50-30 gal of spray

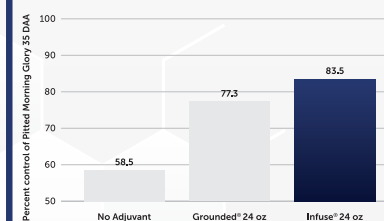
TARGET CHEMISTRIES

Soil Applied Chemistries

GROWER BENEFITS

- Extends residual control of soil chemistries
- Vegetable-based soil surfactant - crop safe
- Easily tank-mixed with various soil-applied chemistries

Evaluation of the Performance of Intimidator® Herbicide with Soil-Applied Adjuvants West Carroll Parish, LA: 5/5/2012





LI 700 is a non-ionic penetrating surfactant that reduces off-target spray drift and reduces spray water pH. Unique formulation technology and quality ingredients separate LI 700 from the imitators.



FEATURES

- Contains Leci-Tech, a unique technology that assists overall spray performance
- Formulated for use as a surfactant, penetrant, acidifying agent and drift reducer

RATES

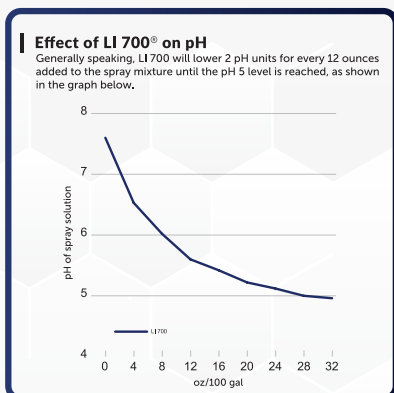
1-4 pts/100 gal

TARGET CHEMISTRIES

Herbicides, Defoliants, Desiccants;
Insecticides, Fungicides, Acaricides, Plant
Growth Regulators

GROWER BENEFITS

- **TO:** Drift reduction with performance-sized droplets
- **ON:** Droplet retention by adhesion and spreading
- **IN:** Increased penetration without cuticle disruption
- Acidification properties reducing spray solution pH, preventing pesticide degradation and maximizing performance
- Low-foaming surfactant and will not cause foam problems in the spray tank



LIBERATE is an uptake-enhancing surfactant blend. Liberate is designed for use with pesticides that recommend a non-ionic surfactant and works especially well with systemic chemistry, reducing driftable fines.



FEATURES

- Contains Leci-Tech, a unique technology that assists overall spray performance
- 100% active and odorless
- Target chemistries include sulfonyleurea herbicides, fungicides, and those chemistries requiring a neutral pH

RATES

1-4 pts/100 gal

TARGET CHEMISTRIES

Herbicides, Defoliants, Desiccants;
Insecticides, Fungicides, Acaricides, Plant
Growth Regulators

GROWER BENEFITS

- **TO:** Drift reduction with performance-sized droplets
- **ON:** Droplet retention by adhesion and spreading
- **IN:** Increased penetration without cuticle disruption
- Contains an antifoam/defoam component and will not cause foaming problems in the spray tank

LECI-TECH® Droplet Retention



Without Leci-Tech

Leci-Tech Inside

Demonstrates the effect of Leci-Tech chemistry on spray solutions by retaining more of the "performance-sized" droplets on the waxy leaf surface of Common Lambsquarters. Clay solution was used for a visual indicator.



MSO CONCENTRATE WITH LECI-TECH is a methylated seed oil containing the highest quality components available. The premium emulsifiers, along with Leci-Tech chemistry, provide uniform mixing for excellent performance as well as drift reduction, enhanced penetration and droplet adhesion. MSO Concentrate with Leci-Tech is designed for use with post-emergent herbicides and has consistently demonstrated increased penetration over conventional crop oil concentrates.



FEATURES

- Contains Leci-Tech, a unique technology that assists overall spray performance
- Formulated with premium emulsifiers

RATES

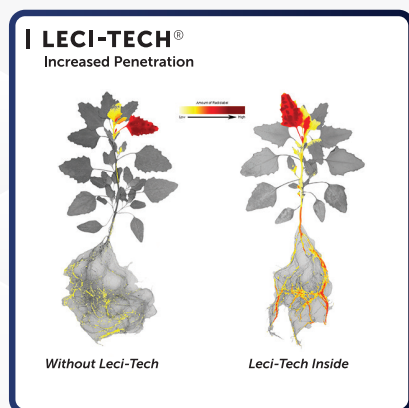
1-2 pts/A

TARGET CHEMISTRIES

Post-Emergent Herbicides

GROWER BENEFITS

- **TO:** Drift reduction with performance-sized droplets
- **ON:** Droplet retention by adhesion and spreading
- **IN:** Increased penetration without cuticle disruption
- Delivers increased plant uptake vs. standard MSO formulations



STRIKE FORCE is a proprietary adjuvant specifically researched and developed for your D-Treated (Dicamba & 2,4-D tolerant crops) acre. Containing patented technology, Strike Force is designed to maximize performance.



FEATURES

- Contains Leci-Tech, a unique technology that assists overall spray performance
- Formulated as a deposition aid, drift control agent, penetrant, antifoaming and defoaming agent, and water conditioning agent

RATES

2 qts/100 gal in a minimum of 10 gal/A spray solution

TARGET CHEMISTRIES

Dicamba and 2,4-D Tolerant Crops

GROWER BENEFITS

- **TO:** Drift reduction with performance-sized droplets
- **ON:** Droplet retention by adhesion and spreading
- **IN:** Increased penetration without cuticle disruption
- Water conditioning without AMS
- Bulk handling capabilities

Strikeforce® Maximizes Dicamba Performance on D-treated Crops When Mixed with Approved DRA Like Reign®

Anti foam/ Defoam	Deposition Aid/Sticker	Drift Control	Penetrant	Spreader	Water Conditioner	OTHER-see Description	Description
✓	✓	✓	✓	✓	✓	✓	Leci-Tech® chemistry specifically formulated to be used with the D-Treated (Dicamba & 2,4-D tolerant) crops.



TACTIC combines the spreading properties of organosilicone with a quality sticker for the best possible droplet retention on the leaf surface. Tactic sticks insecticides and fungicides to the leaf surface preventing pesticide loss due to droplet shatter or bounce, and protects from rain and irrigation wash-off.

FEATURES

- Produces excellent droplet deposition and rainfastness in minutes
- Works in high or low-volume sprays in ground or aerial applications

RATES

> 50 gal/A: 8-16 fl oz/100 gal
 10-50 gal/A: 16-24 fl oz/100 gal
 < 10 gal/A: 24-32 fl oz/100 gal

GROWER BENEFITS

- Resists wash-off from irrigation or rainfall
- Efficiently covers the leaf surface with the spreading ability of an organosilicone surfactant

TARGET CHEMISTRIES

Fungicides, Insecticides

TACTIC vs Competitor Trials North Carolina State University, September 2011



Control plot



Competitor plot



TACTIC plot



WEATHER GARD COMPLETE is a proprietary crop-based formulation containing a drift reduction agent, antifoam/defoamer, penetrant and water conditioner in one easy-to-use liquid formulation. Formulated and approved for use with all potassium salt-based glyphosate products.



FEATURES

- Contains Leci-Tech, a unique technology that assists overall spray performance
- 100% active and odorless
- Target chemistries include sulfonyleurea herbicides, fungicides and those chemistries requiring a neutral pH

RATES

1-2 qts/100 gal spray solution

TARGET CHEMISTRIES

Potassium Salt-Based Glyphosate

GROWER BENEFITS

- **TO:** Drift reduction with performance-sized droplets
- **ON:** Droplet retention by adhesion and spreading
- **IN:** Increased penetration without cuticle disruption
- Minimizes effects of hard water ions that can inhibit herbicide performance
- Stops and eliminates foam buildup for easier spray tank fills

To Effectively Treat
 1,000 Gallons of Water

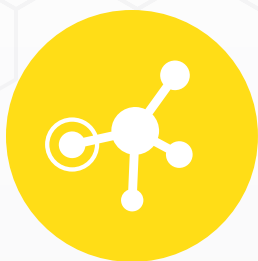


1 x 2.5 gal
 Weather Gard
 Complete



3 1/2 x 51 lb
 Bags of AMS





CHEMISTRY

CleanAMINE®

CLEAN AMINE® is a transparent, low-odor herbicide that uses amine technology to deliver proven results on over 70 weeds across a multitude of crops.

FEATURES

- Transparent and low-odor

GROWER BENEFITS

- Provides selective broadleaf weed control in certain crops, turf and non-crop areas

RATES

See label for specific use rates



EVADe 4 FL is a selective pre-emergent herbicide developed for season-long control of grass and broadleaf weeds in bare ground, conifer and hardwood seedling nurseries. Evade 4 FL provides the most cost-effective control over 30 weeds, including Crabgrass, Johnsongrass, Sprangletop, Kochia, Lambsquarters and Pigweed.

FEATURES

- Excellent control of Crabgrass and Johnsongrass
- Controls Kochia and Pigweed, as well as other weeds in a single application
- Non-staining formulation

GROWER BENEFITS

- Low-cost alternative, giving the most effective preemergent weed control to the end-user

RATES

See label for specific use rates



GAME UP plant growth regulator is an enhanced proprietary formulation of trinexapac-ethyl developed to better manage growth while providing increased resistance to stressful conditions.

FEATURES

- Microemulsion concentrate

GROWER BENEFITS

- Improves stress tolerance and edging of warm and cool season turfgrasses

RATES

See label for specific use rates

Intensity

POST-EMERGENCE GRASS HERBICIDE®

INTENSITY POST-EMERGENCE GRASS HERBICIDE is for use in controlling a wide variety of annual and perennial grasses in over 35 crops including soybeans, cotton, sunflowers, peanuts, sugar beets and alfalfa. Intensity Post-Emergence Grass Herbicide has a wide application window and has the flexibility to be tank mixed with most broadleaf herbicides and many insecticides.

FEATURES

- Emulsifiable concentrate
- Signal Word: Warning

GROWER BENEFITS

- Control of a wide variety of grasses
- Labeled on 35+ crops
- Wide window of application

RATES

6-16 oz/A



MAKAZE® is a fully loaded glyphosate with Leci-Tech Technology getting TO, ON & IN the plant, providing superior penetration into the leaf surface enabling greater uptake, translocation and rainfastness for a complete kill.

FEATURES

- Leci-Tech® Technology, getting TO, ON & IN the plant
- Superior leaf penetration
- Excellent crop safety on all Roundup Ready crops

GROWER BENEFITS

- TO: Drift reduction with performance-sized droplets
- ON: Droplet retention by adhesion and spreading
- IN: Increased penetration without cuticle disruption
- The most complete kill
- Greater uptake, excellent rainfastness
- Provides reliable performance

RATES

32 fl oz/A

BARK OIL

BARK OIL BLUE

BARK OIL BLUE is engineered for low-volume basal bark and stump treatments and is used only with oil-miscible woody plant herbicides with labels that permit dilution with oil.

FEATURES

- Remains effective at below freezing temperatures

GROWER BENEFITS

- Effective in controlling general mixed brush in addition to stumps

RATES

See label for specific use rates

REFERENCE GUIDE

Water Quality and Pesticide Performance: Managing Water Hardness and pH

Talk to your Nutrien Solutions representative about adjuvants that can correct water quality issues:

1. WATER CONDITIONING



- Performs with three modes of action: sequestering, synthetic chelating and complexing
- Reduces effects of hard water on herbicide performance without the use of AMS
- Effective on all hard water cations



- Multiple sequestering and complexing agents bind multiple hard water cations, such as calcium, manganese, magnesium and potassium
- Liquid formulation provides convenience of treating 1,000 gallons of spray solution with 2.5 to 5 gallons of liquid instead of 100 to 200 pounds of dry product
- Compatible with all forms of glyphosate

HARDNESS	PINTS CHOICE TRIO PER 100 GALLONS	PINTS CHOICE WEATHER MASTER PER 100 GALLONS
up to 300 ppm	2.25 (36 oz)	2.25 (36 oz)
400 ppm	3.00 (48 oz)	3.00 (48 oz)
500 ppm	3.75 (60 oz)	3.75 (60 oz)

2. PH ADJUSTMENT



Leci-Tech technology provides these benefits to pesticide spray solutions:

- *TO the plant:* Drift reduction with right-sized droplets.
- *ON the plant:* Droplet retention by adhesion and spreading.
- *IN the plant:* Increased penetration without cuticle disruption.
- Acidification properties reduce spray solution pH, preventing pesticide degradation and maximizing performance.

3. OTHER LOVELAND ADJUVANTS FOR WATER QUALITY:

Weather Gard Complete
Strike Force®
Vader®
Amaze Gold®
Flame®

Guns smoke®
Surfate®
Thrust®
Missile

WATER QUALITY ISSUES AND THE EFFECT ON PESTICIDE PERFORMANCE

There are many factors that can affect pesticide performance, but one that is often overlooked is water quality. Water is the primary carrier for pesticide applications and makes up over 90% of most spray solutions. Every effort should be made to get the most return from your pesticide investment, so be aware of the effect that water quality can have on pesticides.

It is important to note that water hardness and water pH (alkalinity) are two separate issues, each affecting pesticide spray performance differently.

The best way to tackle water-related pesticide efficacy issues is to first know your water source, and then take the necessary steps to correct water quality issues.

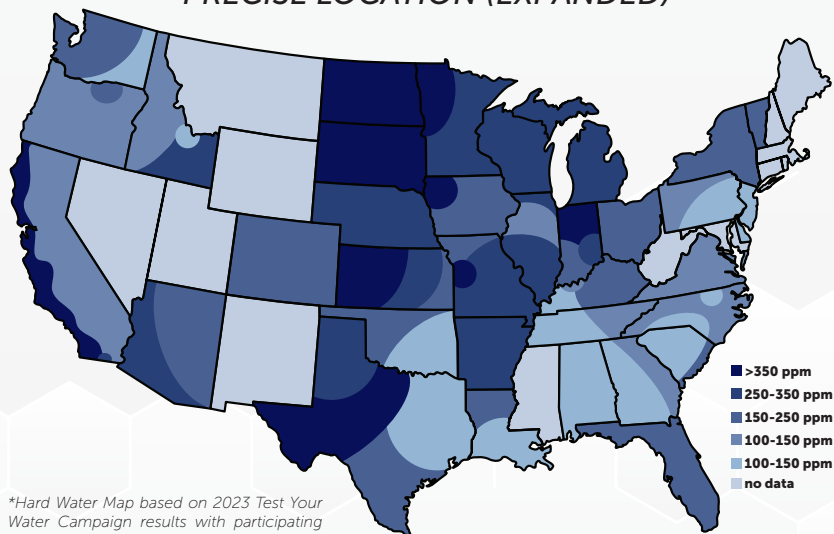
1. WATER HARDNESS

Defined: Water hardness is a measure of the total concentration of hard water ions, primarily calcium (Ca²⁺) and magnesium (Mg²⁺), which is often expressed as parts per million (ppm), grains per gallon, or milligrams per liter. Other hard water cations include iron, sodium and aluminum..

Problem: Hard water cations react with certain pesticides, especially herbicides, thereby reducing overall pesticide efficacy. Products most affected (but not limited to) are weak acid herbicides like glyphosate and 2,4-D.

Solution: Using a water conditioner such as Choice® Trio or Choice® Weather Master (see back page) that combats the hard water cations that negatively affect weak acid herbicides. Comparatively, ammonium sulfate (AMS) will combat only calcium hard water ions.

HARD WATER MAP
PRECISE LOCATION (EXPANDED)



*Hard Water Map based on 2023 Test Your Water Campaign results with participating LSM data.

2. pH (ALKALINITY)

Defined: pH is the value that describes the relative acidity or alkalinity of any solution. pH >7 is basic, pH =7 is neutral, and pH <7 is acidic.

Problem: Water pH plays an important role in the stability and efficacy of pesticides. A pesticide can begin degradation or breakdown the moment it is introduced to the spray solution. This process is called alkaline hydrolysis, which is permanent and irreversible. Alkaline hydrolysis is a process that breaks chemical bonds holding pesticides together and can reduce the life of a pesticide, and this reaction is significantly affected by water pH. Insecticide chemistries are most susceptible to alkaline hydrolysis from high water pH.

Solution: Use an adjuvant with a pH reduction component such as LI 700® (see back page) that will reduce the pH of the spray solution to around 5 which, in most cases, will take care of any disassociation issues. Do NOT reduce the pH of the spray solution when using sulphonylurea (SU) chemistries.

TESTING YOUR WATER IS AS EASY AS 1-2-3

Identifying hardness and pH in water can be done in seconds with instant-read test strips; or, you can get a more detailed report from a certified lab.

Talk with your Nutrien Ag Solutions representative about which option best suits your operation.

1. Determine the water source that you want to test.
2. Determine what testing method you would like to use and test it or send it in for testing.

Methods:

- Simple Test Strips that measure only pH or only water hardness or a combination of both.
 - Send water samples to a certified lab.
3. Determine the right product to use to correct the water quality issues you might have.
 - Water hardness: Water conditioners like Choice Trio or Choice Weather Master
 - pH: Adjuvant with acidification buffer like LI 700

THINGS TO REMEMBER:

- **Water quality can change.** It is important to test water 2 to 3 times per year, especially well water.
- **Instant strips measure total hard water cations as a group, not individually.** Measurements of hardness on instant-read hard water test strips are given in terms of the calcium carbonate equivalent (CaCO₃). This number represents all hard water cations, but some labs can and will break these out to each individual cation.
- **Always add the water conditioner to the tank first.** This allows the water conditioner to combat hard water cations before they can react with pesticides, which maximizes spray performance.

VEGETATION MANAGEMENT

Vegetation Management is a broad term used to describe control of unwanted vegetation, what most people commonly call weeds. We all know how weeds impact crops, but how can weeds impact agriculture outside of our customer's fields?



Here are a few examples of why Vegetation Management is important to our customers.

The Nutrien Solutions Vegetation Management Team contributes significantly to the corporate strategy of "Feeding the Future. Together." through multiple markets.

- ✓ **Forestry**
- ✓ **Aquatics**
- ✓ **Range & Pasture**
- ✓ **Roadside**
- ✓ **Railroad**
- ✓ **Utility**



WATER RESOURCES

Aquatic plant management is important to providing habitat for fish and wildlife. Healthy lakes and rivers and wetlands also influence water quality, sediment stability, and nutrient uptake.



WETLANDS

Vegetation Management is important to keeping wetlands healthy and diverse. Wetlands are important to aquifer recharge, water quality, flood control and fisheries.



RANGE & PASTURE

Controlling invasive vegetation in rangeland improves forage quality, helping cattle producers provide economical and reliable meat products for the United States and overseas.



WATERWAYS

Aquatic plant management keeps navigable waterways open for interstate commerce. It also keeps water delivery canals clear, which is critical to irrigated agriculture in the Western U.S.



ENERGY TRANSMISSION

Vegetation Management is critical to providing safe and reliable energy transmission for powering our homes, industries and agricultural producers.



TIMBER

Timber that Vegetation Managers help landowners produce provides building materials, boxes, containers and other packaging that is critical to growing, harvesting, storing and delivering food products around the world.



HIGHWAYS & RAILROADS

Vegetation Management within transportation Rights-of-Ways are important to maintaining safe and efficient roadways and railways.



AIRPORTS & AIRFIELDS

Vegetation Management at airports and airfields reduces habitat for animals. Birds and wildlife can be dangerous aviation strike hazards.

NOTES

Blank lined paper with a decorative border of hexagons and zig-zags at the top and bottom.

NOTES

[illegible]



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