Pesticide Product Labels
What the label says….and Why

Dr. Jeff Birk
BASF Corporation
Regulatory Manager
Regulation of Pesticides

• The pesticide industry is regulated by the USEPA.
• The pesticide industry is one of the most highly regulated industries in the U.S.
• Regulation is similar to that performed by the FDA for pharmaceuticals
Regulation of Pesticides

- Unlike pharmaceuticals which are regulated based on their activity in humans, pesticides are regulated based on no effect levels in humans and the environment.
Before registering a new pesticide or new use for a registered pesticide, EPA must first ensure that the pesticide, when used according to label directions, can be used

- with a reasonable certainty of no harm to human health
- and without posing unreasonable risks to the environment.
Food Quality Protection Act of 1996

• EPA must be able to conclude with "reasonable certainty" that "no harm" will come to infants, children, or other sensitive individuals exposed to pesticides.
• All non-occupational pesticide exposures - from food, drinking water, and home and garden use - must be considered in determining allowable levels of pesticides in food.
• The Agency also must consider the cumulative effects of pesticides and other compounds with common mechanisms of toxicity.
Safety Determinations

To make such determinations, EPA requires more than 100 different scientific studies and tests from applicants.
Product Development and Registration

• 3-5 years for product development
  – Conduct and reporting of EPA required studies
  – $25-50 million dollars

• 21-24 month EPA review
  – $400 to 600 thousand dollar registration fee
Required Studies

• Acute Mammalian Toxicity
  – Oral, dermal, eye, skin irritation, skin sensitization and inhalation

• Subchronic and Chronic Mammalian Toxicity
  – Terratology, mutagenicity, carcinogenicity
  – 2-year feeding study
  – Reproduction study
Required Studies

• Ecotoxicology
  – Acute toxicity to bees, fish, birds and aquatic invertebrates
  – Avian dietary
  – Avian reproduction, fish and aquatic invertebrate full life cycle.
Required Studies

• Environmental Fate
  – What happens to the product once it is released into the environment?
  – Soil, surface water, ground water, air
  – How does it breakdown, how fast and what does it breakdown to?
Required Studies

- Fate in animals and plants
  - Animal metabolism
    - Breakdown products
    - Bioaccumulation
  - Plant metabolism
    - Residues in/on plants
    - Major metabolites
  - Non-target plant affects
EPA Risk Assessments

- Adverse human health affects
- Adverse environmental affects
- Adverse affects on wildlife and non-target organisms
What is a Label

• A label is the primary means of communication between the manufacturer and the end-user.

• A label contains all the necessary information that is required to use the product in a safe and efficacious manner.

• The label is the law
Different Types of Labels

- Container label

- Additional labeling not attached to container:
  - Supplemental label
  - Special local needs, 24(c) label
  - Emergency Use, Section 18 label
  - Technical Information Bulletin, 2ee label
  - Specimen label
Container label vs. Specimen Label

• The container label is the legal language by which the product must be used, even if a newer label is commercially available.
• A specimen label is an accurate reproduction of the container label language, but it is not a legal label.
• A specimen label can not be used to update an older container label.
Specimen Labels

- Specimen labels are considered to be forms of advertising.
- Available from manufacturer’s web sites and sales reps.
- Many specimen labels are available from CDMS.net
Products

The pressure grows ever greater: economic globalization, energy demand, climate change, urbanization and an ever-growing population. In 2050, more than nine billion people will live on our planet. The world population and its demands will keep growing, while the planet’s resources are finite. If nothing changes, we will need the resources of almost three of our planets to meet the demands of the population. This will pose huge global challenges. Getting more from every acre is an urgent priority.

BASF is responding to this challenge with an ongoing push for supplying innovative products. We’re committing $415 million to increasing our production capacity for key crop protection products that meet rigorous standards for effectiveness and crop safety.

BASF is committed to investment in research and development, new chemistry and resources and tools to help growers, retailers and distributors, consultants, industry partners and students find the solutions they need.

The future demands new solutions. Be assured, BASF will be right there with you.

As a leading producer of agricultural products, BASF strives to support growers and exporters by offering practical information as they navigate the complexities of Maximum Residue Levels (MRL). Given today’s global economy, we recognize the importance of having harmonized MRLs and convenient access to global information impacting business decisions. Key facts along with global MRL databases can be accessed here.
Container Label Requirements

- EPA requires the label to contain all the necessary information that is needed to use the product in a safe and effective manner.

- Label language is determined/supported by studies conducted and submitted by registrant
  - Toxicology
  - Ecotoxicology
  - Environmental Fate

- EPA may require additional language.
What information is on a label and what does it mean?

- Language concerning Product Identity, Warning Statements, Worker Protection, First Aid, Environmental Hazards and Use Restrictions are dictated by EPA.

- Use directions and Product Performance claims are proposed by the registrant for review and approval by EPA.
Label Approval Process

- Registrant develops a proposed label or label changes.
  - Reference EPA labeling handbook
- Registrant submits proposed label to EPA for review.
- EPA approves label, approves with conditions or denies label as proposed.
Tradename: ARSENAL®

Common Name: herbicide

Chemical Name: isopropylamine salt of imazapyr: (2-[4,5-dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1H-imidazol-2-yl]-3-pyridinecarboxylic acid)*

Active Ingredient: 27.8%

Other Ingredients: 72.2%

Total: 100.0%

*Equivalent to 22.6% 2-[4,5-dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1H-imidazol-2-yl]-3-pyridinecarboxylic acid or 2 pounds acid per gallon

EPA Reg. No. 241-346

KEEP OUT OF REACH OF CHILDREN
CAUTION/PRECAUCIÓN

Si usted no entiende la etiqueta, busque a alguien para que se la explique a usted en detalle.
(if you do not understand the label, find someone to explain it to you in detail.)

See inside for complete First Aid, Precautionary Statements, Directions For Use, Conditions of Sale and Warranty, and state-specific crop and/or use site restrictions.

In case of an emergency endangering life or property involving this product, call day or night 1-800-832-HELP (4357).

Product of U.S.A.

Produced and Packaged* by:
BASF Corporation, 26 Davis Drive
Research Triangle Park, NC 27709

*Packaged for BASF if EPA Est. No. does not begin with 241
FIRST AID

If swallowed
- Call a poison control center or doctor immediately for treatment advice.
- Have person sip a glass of water if able to swallow.
- **DO NOT** induce vomiting unless told to by a poison control center or doctor.
- **DO NOT** give anything by mouth to an unconscious person.

If in eyes
- Hold eyes open and rinse slowly and gently with water for 15 to 20 minutes.
- Remove contact lenses, if present, after first 5 minutes; then continue rinsing eyes.
- Call a poison control center or doctor for treatment advice.

If on skin or clothing
- Take off contaminated clothing.
- Rinse skin immediately with plenty of water for 15 to 20 minutes.
- Call a poison control center or doctor for treatment advice.

If inhaled
- Move person to fresh air.
- If person is not breathing, call 911 or an ambulance; then give artificial respiration, preferably by mouth to mouth, if possible.
- Call a poison control center or doctor for further treatment advice.

HOTLINE NUMBER

Have the product container or label with you when calling a poison control center or doctor or going for treatment. You may also contact BASF Corporation for emergency medical treatment information: 1-800-832-HELP (4357).

Precautionary Statements

**Hazards to Humans and Domestic Animals**

*CAUTION.* Harmful if swallowed. Avoid contact with eyes or clothing.

**Personal Protective Equipment (PPE)**

Some materials that are chemically resistant to this product are listed below. If you want more options, follow the instructions for *Category A* on an EPA chemical-resistance category selection chart.

- Makers, loaders, applicators, and other handlers must wear:
  - Long-sleeved shirt and long pants
  - Chemical-resistant gloves made of any waterproof material
  - Shoes plus socks

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

**Engineering Controls**

Pilots must use an enclosed cockpit that meets the requirements listed in the Worker Protection Standard (WPS) for agricultural pesticides [40 CFR 170.240(d)(6)].

**USER SAFETY RECOMMENDATIONS**

Users should:
- Wash hands with plenty of soap and water before eating, drinking, chewing gum, using tobacco, or using the toilet.
- Remove clothing/PPE immediately if pesticide gets inside. Then wash thoroughly and put on clean clothing.
- Remove PPE immediately after handling this product. Wash the outside of gloves before removing. As soon as possible, wash thoroughly and change into clean clothing.

**Physical and Chemical Hazards**

Spray solutions of *Arsenal* herbicide must be mixed, stored, and applied only in stainless steel, fiberglass, plastic, and plastic-lined steel containers. Thoroughly clean application equipment, including landing gear, immediately after use of this product. Prolonged exposure of this product to uncoated steel (except stainless steel) surfaces may result in corrosion and failure of the exposed part. The maintenance of an organic coating (paint) may prevent corrosion.
Environmental Hazards

This product is toxic to plants. Drift and runoff may be hazardous to plants in water adjacent to treated areas. DO NOT apply to water except as specified in this label. Treatment of aquatic weeds may result in oxygen depletion or loss because of decomposition of dead plants. This oxygen loss may cause suffocation of some aquatic organisms. DO NOT treat more than 1/2 of the surface area of the water in a single operation and wait at least 10 to 14 days between treatments. Begin treatment along the shore and proceed outward in bands to allow aquatic organisms to move into untreated areas. DO NOT contaminate water when disposing of equipment washwater or rinsates.

This pesticide is toxic to vascular plants and must be used strictly in accordance with the drift precautions on the label.

Directions For Use

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

Arsenal® herbicide must be used only in accordance with the instructions on the label attached to the container. Keep containers closed to avoid spills and contamination.

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.

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 intervals. 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 48 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
- Shoes plus socks
- Chemical-resistant gloves made of any waterproof material
- Protective eyewear

Nonagricultural Use Requirements

The requirements in this box apply to uses of this product that are NOT within the scope of the Worker Protection Standard (WPS) for agricultural pesticides (40 CFR Part 170). The WPS applies when this product is used to produce agricultural plants on farms, forests, nurseries, or greenhouses. DO NOT enter or allow others to enter treated areas until sprays have dried.

Storage and Disposal

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

Pesticide Storage

DO NOT store below 10° F.

Pesticide Disposal

Wastes resulting from the use of this product must be disposed of on-site or at an approved waste disposal facility.

Container Handling

Nonrefillable Container. DO NOT reuse or refill this container. Triple rinse or pressure rinse container (or equivalent) promptly after emptying; then offer for recycling, if available, or reconditioning, if appropriate, or puncture and dispose of in a sanitary landfill, or by incineration, or by other procedures approved by state and local authorities.

Triple rinse containers small enough to shake (capacity < 5 gallons) as follows: Empty the remaining contents into application equipment or a mix tank and drain for 10 seconds after the flow begins to drip. Fill the container 1/4 full with water and recap. Shake for 10 seconds. Pour rinseate into application equipment or mix tank, or store rinseate for later use or disposal. Drain for 10 seconds after the flow begins to drip. Repeat this procedure two more times.

Triple rinse containers too large to shake (capacity > 5 gallons) as follows: Empty the remaining contents into application equipment or a mix tank. Fill the container 1/4 full with water. Replace and tighten closure. Tip container on its side and roll it back and forth, ensuring at least one complete revolution, for 30 seconds. Stand the container on its end and tip it back and forth several times. Turn the container over onto its other end and tip it back and forth several times. Empty the rinseate into application equipment or a mix tank, or store rinseate for later use or disposal. Repeat this procedure two more times.

(continued)
Storage and Disposal (continued)

Container Handling (continued)

Pressure rinse as follows: Empty the remaining contents into application equipment or mix tank and continue to drain for 10 seconds after the tow begins to drip. Hold container upside down over application equipment or mix tank, or collect rinse for later use or disposal. Insert pressure rinsing nozzle in the side of the container and rinse at about 40 PSI for at least 30 seconds. Drain for 10 seconds after the flow begins to drip.

Refrillable Container. Refill this container with pesticide only. DO NOT reuse this container for any other purpose. Triple rinse the container before final disposal. It is the responsibility of the person disposing of the container. Cleaning before refilling is the responsibility of the refiller.

Triple rinse as follows: To clean the container before final disposal, empty the remaining contents from this container into application equipment or mix tank. Fill the container about 10% full with water. Agitate vigorously or recirculate water with the pump for 2 minutes. Pour or pump rinse into application equipment or rinse collection system. Repeat this rinsing procedure two more times.

When this container is empty, replace the cap and seal all openings that have been opened during use; return the container to the point of purchase or to a designated location. This container must only be refilled with a pesticide product. Prior to refilling, inspect carefully for damage such as cracks, punctures, abrasions, worn-out threads and closure devices. Check for leaks after refilling and before transport. DO NOT transport if this container is damaged or leaking. If the container is damaged, damaged, or obsolete and not returned to the point of purchase or to a designated location, triple rinse emptied container and offer for recycling if available, or dispose of container in compliance with state and local regulations.

In Case of Emergency

In case of large-scale spillage regarding this product, call:

- CHEMTREC 1-800-424-9300
- BASF Corporation 1-800-832-HELP (4357)

In case of medical emergency regarding this product, call:

- Your local doctor for immediate treatment
- Your local poison control center (hospital)
- BASF Corporation 1-800-832-HELP (4357)

Steps to be taken in case material is released or spilled:

- Dike and contain the spill with inert material (sand, earth, etc.) and transfer liquid and solid diking material to separate containers for disposal.
- Remove contaminated clothing and wash affected skin areas with soap and water.
- Wash clothing before reuse.
- Keep the spill out of all sewers and open bodies of water.

Product Information

Arsenal® herbicide is an aqueous solution to be mixed with water and a surfactant and applied as a spray solution to control undesirable vegetation growing within specified aquatic sites, forestry sites, pasture/rangeland and nonagricultural lands. Aquatic sites consist of standing and flowing water, estuaries/marines, wetland, and riparian areas. Nonagricultural lands include private, public and military lands as follows: uncultivated nonagricultural areas (including airports, highways, railroad and utility rights-of-way, and sewage disposal areas); uncultivated agricultural areas - noncrop producing (including farmlands, fuel storage areas, fence rows, nonirrigation ditchbanks, and barrier strips); industrial sites - outdoor (including lumberyards, pipeline and transmission); and natural areas (including wildlife management areas, wildlife openings, wildlife habitats, recreation areas, campgrounds, trails, and trails). Arsenal® may also be used for the release of unimproved Bermudagrass and Bahiagrass, for bareground weed control, and for use under certain paved surfaces.

Herbicidal Activity

Arsenal® will control most annual and perennial grass and broadleaf weeds. In addition to many brush and vine species with some residual control of undesirable species that germinate above the waterline. Arsenal® is readily absorbed through emergent leaves and stems and is translocated rapidly throughout the plant with accumulation in the mesotrophic regions. For maximum activity, weeds should be growing vigorously at the time of application, and the spray solution should include a surfactant (see Adjuvants section for specific use directions). Treated plants stop growing soon after spray application. Chlorosis appears first in the newest leaves, and necrosis spreads from this point. In perennials, the herbicide is translocated into and kills underground or submerged storage organs, which prevents regrowth. Chlorosis and tissue necrosis may not be apparent in some plant species until 2 or more weeks after application. Complete kill of plants may not occur for several weeks. Arsenal® applications are rainfast 1 hour after treatment.

Product Use and Restrictions

Applications may be made for control of undesirable vegetation growing within specified aquatic sites, forestry sites, pasture/rangeland and nonagricultural lands. Aquatic sites consist of standing and flowing water; estuaries/marines, wetland, and riparian areas; for control of most annual and perennial grass weeds, broadleaf weeds, vines and brambles, and hardwood brush and trees for forestry sites preparation and release of conifers from woody and herbaceous competition. Arsenal® may also be used for selective woody and herbaceous weed control in natural regeneration of certain conifers (see Conifer Release Treatment). Nonagricultural lands include private, public and military lands as follows: uncultivated nonagricultural areas (including airports, highways, railroad and utility rights-of-way, and sewage disposal areas); uncultivated agricultural...
areas - noncrop producing (including farmyards, fuel storage areas, fence rows, nonirrigation ditches, banks, and barrier strips); industrial sites - outdoor (including lumberyards, pipeline and tank farms); and natural areas (including wildlife management areas, wildlife openings, wildlife habitats, recreation areas, campgrounds, trailheads, and trails).

Restrictions and Limitations

- **DO NOT** use on food crops.
- **DO NOT** apply this product within 1/2 mile upstream of an active potable water intake in flowing water (i.e., river, stream, etc.) or within 1/2 mile of an active potable water intake in a standing body of water, such as a lake, pond, or reservoir.
- **DO NOT** apply to water used for irrigation except as described in Product Use and Restrictions section of this label.
- Keep from contact with fertilizers, insecticides, fungicides, and seeds.
- **DO NOT** spray or flush equipment on or near desirable trees or other plants, or on areas where their roots may extend, in or locations where the treated soil may be washed or moved into contact with their roots.
- **DO NOT** use on lawns, walks, driveways, tennis courts, or similar areas.
- **DO NOT** allow trim desirable vegetation with this product unless severe injury and plant death can be tolerated. Prevent drift of spray to desirable plants.
- Clean application equipment after using this product by thoroughly flushing with water.

Nonagricultural Lands and Forestry Sites

- **DO NOT** apply more than 1.5 lbs ac equivalent (ae) imazapyr (equivalent to 96 fl ozs of *Arsenal* herbicide) per acre per year.

Pasture/Rangeland Sites

- For spot treatment only.
- **DO NOT** treat more than 1/10 of the available area to be grazed or cut for hay.
- **DO NOT** apply more than 0.75 lb ae imazapyr (equivalent to 43 fl ozs of *Arsenal*) per acre per year.

Aquatic Sites

- **DO NOT** apply more than 1.5 lbs ae imazapyr (equivalent to 96 fl ozs of *Arsenal*) per acre per year.
- **Public waters** - Application of *Arsenal* to water can only be made by federal or state agencies, such as Water Management District personnel, municipal officials, and the U.S. Army Corps of Engineers, or those applicators who are licensed or certified as aquatic pest control applicators and are authorized by the state or local government. Treatment to other than non-native invasive species is limited to only those plants that have been determined to be a nuisance by a federal or state government entity.
- **Permitting** - Consult local state fish and game agency and water control authorities before applying this product to public water. Permits may be required to treat such water.
- **Private waters** - Applications may be made to private waters that are still, such as ponds, lakes, and drainage ditches where there is minimal or no outflow to public waters.
- **Aerial application** - Aerial application to aquatic sites is restricted to helicopter only.
- **Irrigation water** - Application to water used for irrigation that results in *Arsenal* residue greater than 1.0 ppb **MUST NOT** be used for irrigation purposes for 120 days after application or until *Arsenal* residue levels are determined by laboratory analysis or other appropriate means of analysis to be 1.0 ppb or less. When applications are made within 500 feet of an active irrigation intake, **DO NOT** irrigate for at least 24 hours following application to allow for dissipation.

Recreational Use of Water in Treatment Area

There are no restrictions on the use of water in the treatment area for recreational purposes, including swimming and fishing.

Livestock Use of Water In/from Treatment Area

There are no restrictions on livestock consumption of water from the treatment area.

Restrictions for Potable Water Intakes

**DO NOT** apply *Arsenal* directly to water within 1/2 mile upstream of an active potable water intake in flowing water (i.e., river, stream, etc.) or within 1/2 mile of an active potable water intake in a standing body of water such as a lake, pond, or reservoir. To make aquatic applications around and within 1/2 mile of active potable water intakes, the water intake must be turned off during application and for a minimum of 48 hours after application. These aquatic applications may be made only in cases where there are alternative water sources or holding ponds that would permit turning off an active potable water intake for a minimum period of 48 hours after applications.

**NOTE:** Existing potable water intakes that are no longer in use, such as those replaced by connections to wells or a municipal water system, are not considered to be active potable water intakes. This restriction does not apply to intermittent, inadvertent overspray of water in terrestrial use sites.

Quiescent or Slow-moving Waters

In lakes and reservoirs, **DO NOT** apply *Arsenal* within 1 mile of an active irrigation water intake during the irrigation season. Applications less than 1 mile from an active irrigation water intake may be made during the off-season if the irrigation intake will remain inactive for a minimum of 120 days after application or until *Arsenal* residue levels are determined by laboratory analysis or other appropriate means of analysis to be 1.0 ppb or less.
Precautions for Avoiding Injury to Nontarget Plants

Untreated desirable plants can be affected by root uptake of *Arsenal* herbicide from treated soil. Injury or loss of desirable plants may result if *Arsenal* is applied on or near desirable plants, on areas where their roots extend, or in locations where the treated soil may be washed or moved into contact with their roots. When making application along shorelines where desirable plants may be present, use caution to avoid spray contact with their foliage or spray application to the soil in which they are rooted. Shoreline plants that have roots which extend into the water in an area where *Arsenal* has been applied generally will not be adversely affected by uptake of the herbicide from the water.

If treated vegetation is to be removed from the application site, **DO NOT** use the vegetative matter as mulch or compost on or around desirable species.

Managing Off-target Movement

**Aerial Application**

- Applicators are required to use a coarse or coarser droplet size (ASABE S572) or, if specifically using a spinning atomizer nozzle, applicators are required to use a volume mean diameter (VMD) of 385 microns or greater for release heights below 10 feet. Applicators are required to use a very coarse or coarser droplet size, or, if specifically using a spinning atomizer nozzle, applicators are required to use a VMD of 475 microns or greater for release heights above 10 feet. Applicators must consider the effects of nozzle orientation and flight speed when determining droplet size.

- Applicators are required to use upward swath displacement.

- The boom length must not exceed 60% of the wingspan or 90% of the rotor-blade diameter to reduce spray drift.

- **Applications with wind speeds less than 3 mph and with wind speeds greater than 10 mph are prohibited.**

- Applications into temperature inversions are prohibited.

**Ground Boom Application**

- Applicators are required to use a nozzle height below 4 feet above the ground or plant canopy and coarse or coarser droplet size (ASABE S572) or, if specifically using a spinning atomizer nozzle, applicators are required to use a volume mean diameter (VMD) of 385 microns or greater.

- Applications with wind speeds greater than 10 mph are prohibited.

- Applications into temperature inversions are prohibited.

**Wind Erosion**

Avoid treating powdery, dry, or light sandy soils when conditions are favorable for wind erosion. Under these conditions, the soil surface should first be settled by rainfall or irrigation.

Adjuvants

Postemergence applications of *Arsenal* require the addition of a spray adjuvant. When making aquatic applications, only spray adjuvants approved or appropriate for aquatic use must be used.

**Nonionic Surfactant**

Use a nonionic surfactant (NIS) at the rate of 0.25% volume/volume (v/v) or higher (see manufacturer’s label) of the spray solution (0.25% v/v is equivalent to 1 quart in 100 gallons). For best results, select a nonionic surfactant with a hydrophobic-to-lipophobic balance (HLB) ratio between 12 and 17 with at least 70% surfactant in the formulated product. Alcohol, fatty acid, oil, ethylene glycol, or diethylene glycol should not be considered as surfactants to meet the above requirements.

**Methylated Seed Oil or Vegetable Oil Concentrate**

Instead of a surfactant, a methylated seed oil (MSO) or vegetable-based seed oil concentrate may be used at the rate of 1.5 to 2 pints per acre. When using spray volumes greater than 30 gallons per acre, mix MSO or vegetable-based seed oil concentrates at a rate of 1% of total spray volume, or alternatively use a nonionic surfactant as described above. Research indicates that these oils may aid in *Arsenal* deposition and uptake by plants under moisture or temperature stress.

**Silicone-based Surfactant**

See manufacturer’s label for specific rates. Silicone-based surfactants may reduce the surface tension of the spray droplet allowing greater spreading on the leaf surface as compared to conventional nonionic surfactants. However, some silicone-based surfactants may dry too quickly, limiting herbicide uptake.

**Invert Emulsions**

*Arsenal* can be applied as an invert emulsion. The spray solution results in an invert (water-in-oil) spray emulsion designed to minimize spray drift and spray runoff, resulting in more herbicide on the target foliage. The spray emulsion may be formed in a single tank (batch mixing) or injected (in-line mixing). Consult the Invert chemical label for proper mixing directions.

**Other**

An antifoaming agent, spray pattern indicator, or drift-reducing agent may be applied at the product labeled rate if necessary or desired.

**Tank Mixes**

*Arsenal* may be tank mixed with other herbicides. Consult manufacturer’s labels for specific rate restrictions and weeds controlled. Always follow the more restrictive label restrictions and precautions for all products used when making an application involving tank mixes.
**Weeds Controlled**

**Aquatic Weeds Controlled**

*Arsenal* herbicide will control the following target species as specified in the Use Rates and Application Directions column of the table. Rates are expressed in terms of product volume for broadcast applications and as a % solution for directed applications including spot treatments. For % solution applications, DO NOT apply more than the equivalent of 3 quarts of Arsenal per acre.

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
<th>Use Rates and Application Directions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Floating Weeds</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Floating heart</em></td>
<td><em>Nymphoides</em> spp.</td>
<td>2 to 4 pints/A (0.5 to 1.0% solution) applied in 100 GPA water mix. Ensure 100% coverage of actively growing emergent foliage.</td>
</tr>
<tr>
<td><em>Frogbit</em></td>
<td><em>Limnium spongia</em></td>
<td>1 to 2 pints/A (0.5% solution) applied in 100 GPA water mix. Ensure 100% coverage of actively growing emergent foliage.</td>
</tr>
<tr>
<td><em>Spatterdock</em></td>
<td><em>Nuphar luteum</em></td>
<td>Apply a tank mix of: 2 to 4 pints/A <em>Arsenal</em> + 4 to 6 pints/A glyphosate (0.5% <em>Arsenal</em> + 1.5% glyphosate) in 100 GPA water for best control. Ensure 100% coverage of actively growing emergent foliage.</td>
</tr>
<tr>
<td><em>Water hyacinth</em></td>
<td><em>Eichhornia crassipes</em></td>
<td>1 to 2 pints/A (0.5% solution) applied in 100 GPA water to actively growing foliage.</td>
</tr>
<tr>
<td><em>Water lettuce</em></td>
<td><em>Pistia stratiotes</em></td>
<td>1 to 2 pints/A (0.5% solution) applied in 100 GPA water mix. Ensure 100% coverage of actively growing emergent foliage.</td>
</tr>
<tr>
<td><strong>Emerged Weeds</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Alligatorweed</em></td>
<td><em>Alternanthera philoxeroides</em></td>
<td>1 to 4 pints/A (0.5% solution) applied in 100 GPA water mix. Ensure 100% coverage of actively growing emergent foliage.</td>
</tr>
<tr>
<td><em>Arrowhead, duck-potato</em></td>
<td><em>Sagittaria</em> spp.</td>
<td>1 to 2 pints/A (0.5% solution) applied in 100 GPA water mix. Ensure 100% coverage of actively growing emergent foliage.</td>
</tr>
<tr>
<td><em>Bacopa, lemon</em></td>
<td><em>Bacopa</em> spp.</td>
<td>1 to 2 pints/A (0.5% solution) applied in 100 GPA water mix. Ensure 100% coverage of actively growing emergent foliage.</td>
</tr>
<tr>
<td><em>Parrot feather</em></td>
<td><em>Myriophyllum aquaticum</em></td>
<td>Foliage must be above water for sufficient <em>Arsenal</em> uptake. Apply 2 to 4 pints/A <em>Arsenal</em> to actively growing emergent foliage.</td>
</tr>
<tr>
<td><em>Pennywort</em></td>
<td><em>Hydrocotyle</em> spp.</td>
<td>1 to 2 pints/A (0.5% solution) applied in 100 GPA water mix. Ensure 100% coverage of actively growing emergent foliage.</td>
</tr>
<tr>
<td><em>Pickerelweed</em></td>
<td><em>Pontederia cordata</em></td>
<td>2 to 3 pints/A (1% solution) applied in 100 GPA water mix. Ensure 100% coverage of actively growing emergent foliage.</td>
</tr>
</tbody>
</table>

* Use not permitted in California unless otherwise directed by supplemental labeling.
Conditions of Sale and Warranty

The Directions For Use of this product reflect the opinion of experts based on field use and tests. The directions are believed to be reliable and must be followed carefully. However, it is impossible to eliminate all risks inherently associated with the use of this product. Crop injury, ineffectiveness or other unintended consequences may result because of such factors as weather conditions, presence of other materials, or use of the product in a manner inconsistent with its labeling, all of which are beyond the control of BASF CORPORATION ("BASF") or the Seller. To the extent consistent with applicable law, all such risks shall be assumed by the Buyer.

BASF warrants that this product conforms to the chemical description on the label and is reasonably fit for the purposes referred to in the Directions For Use, subject to the inherent risks, referred to above.

TO THE EXTENT CONSISTENT WITH APPLICABLE LAW, BASF MAKES NO OTHER EXPRESS OR IMPLIED WARRANTY OF FITNESS OR MERCHANTABILITY OR ANY OTHER EXPRESS OR IMPLIED WARRANTY.

TO THE EXTENT CONSISTENT WITH APPLICABLE LAW, BUYER’S EXCLUSIVE REMEDY AND BASF’S EXCLUSIVE LIABILITY, WHETHER IN CONTRACT, TORT, NEGLIGENCE, STRICT LIABILITY, OR OTHERWISE, SHALL BE LIMITED TO REPAYMENT OF THE PURCHASE PRICE OF THE PRODUCT.

TO THE EXTENT CONSISTENT WITH APPLICABLE LAW, BASF AND THE SELLER DISCLAIM ANY LIABILITY FOR CONSEQUENTIAL, EXEMPLARY, SPECIAL OR INDIRECT DAMAGES RESULTING FROM THE USE OR HANDLING OF THIS PRODUCT.

BASF and the Seller offer this product, and the Buyer and User accept it, subject to the foregoing Conditions of Sale and Warranty which may be varied only by agreement in writing signed by a duly authorized representative of BASF.
Stay Behind Label
or
Base Label
“Always Read and Follow Label Directions”

Thank you