DuPont Response to the EPA's "Proposed Registration of Aminocyclopyrachlor on Non-Crop Areas, Sod Farms, Turf, and Residential Lawns"
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DuPont has applied for the initial registration of the active ingredient aminocyclopyrachlor, and associated end-use products, for use in the non-crop, vegetation management (VM) market. As part of the review process for this registration action, the Agency has posted a number of documents to the public docket (EPA-HQ-OPP-2009-0789-0011) for review and comment. Presented here are DuPont's initial comments to the Agency document titled "Proposed Registration of Aminocyclopyrachlor on Non-Crop Areas, Sod Farms, Turf, and Residential Lawns". That document includes the following proposed label language for the vegetation management end-use products:

> *In order to mitigate risk to non-target plants and keep the pesticide on the intended treatment area, the following spray drift language must be placed on all aminocyclopyrachlor end-use product labels*
>
> <u>*Products Primarily Intended for Commercial Use on Non-Crop Areas*</u>
>
> *Aerial Application Restriction*
>
> *"When applying by air, <u>maintain a 50-foot buffer around non-target aquatic areas and between the point of direct application and the closest downwind edge of non-target terrestrial areas</u>. Apply only using nozzles which will deliver coarse or greater (VMD >350 microns) droplets as defined by ASABE S572 standard. Do not release spray at a height greater than 10 feet above the ground or crop canopy unless a greater height is required for aircraft safety. Do not apply when wind speed is greater than 10 mph. Do not apply during a temperature inversion."*
>
> *Ground Application Restriction*
>
> *"When applying by ground, <u>maintain a 50-foot buffer around non-target aquatic areas and between the point of direct application and the closest downwind edge of non-target terrestrial areas.</u> Apply only using nozzles which will deliver coarse or greater (VMD >350 microns) droplets as defined by ASABE S572 standard. Do not apply with a nozzle height greater than 4 feet above the ground or crop canopy. Do not apply when wind speed is greater than 10 mph. Do not apply during a temperature inversion."*

For several reasons discussed below, DuPont believes that the stated buffers to non-target aquatic areas and non-target terrestrial areas are not necessary to mitigate off-target movement of aminocyclopyrachlor end-use products used in vegetation management programs. Specifically:

1. The Agency's estimate of possible off-target movement of aminocylopyrachlor applications is based on laboratory data from the terrestrial plant studies combined with extrapolations from models including Terrplant and AgDrift. DuPont believes that the use of these laboratory data and the models results in gross overestimates of possible off-target movement, and calculated or recommended buffers.

2. Applications of aminocyclopyrachlor end-use products will be made by applicators using modern spray equipment under application conditions designed to reduce off-target movement. In addition, these applicators are typically required to undergo training that includes instructions on reducing possible off-target movement of herbicides during their application.

3. Addition of buffers to aminocyclopyrachlor end-use products will result in lessened utilization of the products, and will force land use managers to continue to use older, more problematic products to attempt to control weeds.

4. Aminocyclopyrachlor offers unprecedented control of a large number of weeds - including many invasive and noxious weed species that are currently not being optimally controlled. The addition of the buffer for aminocyclopyrachlor end-use products will consequently result in reduced control of these important weed species.

DuPont understands and supports the Agency's effort to minimize any potential off-target movement of aminocyclopyrachlor containing end-use products which, in turn, will mitigate possible effects on non-target plant species. DuPont believes that this can be accomplished through the best management practices that are currently in place in the vegetation management industry. Therefore, as an alternative to EPA's suggested buffers to non-target terrestrial and aquatic areas, DuPont is herein proposing label language, similar to that found on current vegetation management products, for the relevant Aminocyclopyrachlor end-use products. DuPont believes that this language, combined with other recommended restrictions, will provide adequate margins of safety to terrestrial and semi-aquatic plants for Aminocyclopyrachlor uses.

Current Modeling and Risk Assessment Results– Overestimation of Risk

Terrplant and AgDrift Modeling

Comments on Terrplant:

The EECs calculated from Terrplant modeling and the subsequent inputs into the AgDrift model result in a large overestimate for the need for buffers for aminocyclopyrachlor end-use products. Refined modeling using appropriate vegetation management use scenarios for aminocyclopyrachlor end-use products demonstrate a much lower likelihood of spray drift from both ground and aerial application than that demonstrated by using the AgDrift model (which is more appropriate to agricultural crop applications). Extrapolation from existing data also demonstrates that the likelihood of aminocylopyrachlor residues being found in waters that might be used for irrigation, which could result in risk to non-target plants, is low.

The EPA has assessed the potential risk from applications of aminocyclopyrachlor to non-target plants growing in semi-aquatic habitats by utilizing the risk assessment strategy developed and implemented through the model Terrplant version 1.2.2. This model assessed an application to bare soil at a rate of 0.284 lb ai/acre by ground and aerial spray equipment for non-crop use. The model assumes a runoff value of 10% of the applied product based on the solubility of aminocyclopyrachlor. The model scenario also assumes channelized flow and eventual deposition of the runoff from a 10 acre application area to a 1 acre low lying semi-aquatic area. It further assumes an additional environmental loading of 1% of the applied rate for ground application and 5% for aerial application as a result of spray drift. The resulting total estimated environmental concentrations (EEC) for aminocyclopyrachlor applied at the maximum use rate for non-crop uses (0.284 lb ai/acre) was 0.14484 lb ai/acre and 0.1562 lb ai./acre for ground and aerial applications, respectively.

The Terrplant assessment endpoints were derived from the pre-emergent terrestrial non-target plant studies (soil emergence and vegetative growth). The ER25 and NOAER for the most sensitive monocot and dicot species are the most appropriate endpoints for assessment. In semi-aquatic areas, the Terrplant risk quotients (RQs) calculated by the Agency for monocot species for non-listed and listed species are 3.7 and 3.0 respectively. The Terrplant RQs for dicot species are 273 for non-listed species, and 295 for listed species. (Table 5.2 of the EFED assessment dated January 22, 2010.) These values are derived from ground application. Aerial RQs are proportionally higher, based on the higher drift level of 5%.

We believe, however, that the Terrplant scenario used to evaluate risk to semi-aquatic plant species is not appropriate for non-crop vegetation management applications since that model is based primarily on conditions typical of crop use. Aminocyclopyrachlor at the maximum labeled rate will be used for more localized application, and for linear applications along railroad, highway, and other types of rights-of-ways, as proposed for registration. Unlike applications to cropland, vegetation management applications are characterized by narrow swath applications over considerable linear distance. For example, a linear application with a swath width 25 feet would require over three miles of linear distance to treat the equivalent of 10 acres of right-of-way. Any runoff from that 25 foot x 3 mile treated area would not be expected to flow into a single 1 acre pond or semi-aquatic area. Further, these applications are made by highly trained operators with equipment specifically designed to eliminate off-site movement through spray drift. In addition to the spatial considerations, heavily vegetated zones typically border the application areas and would serve to reduce runoff and channelized flow from the treated areas, thus further reducing the exposure to off-target semi-aquatic habitats.

For these reasons, we would propose that the runoff scenario/assessment to dry areas is more appropriate to assess the proposed vegetation management uses of aminocyclopyrachlor – recognizing that it may still overestimate actual exposure at distance due to the narrow swath width and the degree of vegetative cover found in vegetation management applications. Such an assessment resulted in RQ values for monocot species for non-listed and listed species of 0.43 and 0.36 respectively. The Terrplant RQs for dicot species are 32 for non-listed species, and 35 for listed species. These values are derived from ground application. Aerial RQs, as noted above, are proportionally higher based on the higher drift level of 5%.

Therefore, based on the above considerations, we believe that a buffer to non-target aquatic areas for VM applications of aminocyclopyrachlor is not warranted.

Comments on AgDRIFT:

The proposed label statements regarding nozzles, release height, wind speed and temperature inversions are consistent with practices that are commonly used in vegetative management applications and are generally accepted best practices for aerial applications.

The buffer requirement, however, is impractical since many of the use sites will be along rights-of-way, and the proposed 50-foot buffer would have the effect of prohibiting some key uses for this product. For example, rights-of-way may be only 50 feet wide along railroads or power lines, and applications to roadsides may be restricted to 20 feet on either side of the roadway. Rights-of-way could not be treated effectively since the non-target areas would be immediately adjacent to the site, and would require an on-site buffer that is actually greater than or equal to the width of the treated area.

Aerial Application

To minimize drift from applications to rights-of-way, many aerial applicators have adopted spray technologies that deliver ultra coarse droplet size distributions (VMD > 1000) using high volumes of spray solutions. Using slow speed helicopters in light winds, these applications would require no buffers to minimize the potential for off-target effects on terrestrial plants. The drift modeling conducted by EPA provides a useful starting point for further analysis which illustrates the low risk to non-target areas from VM applications with the low drift nozzles.

The default AgDRIFT model input parameters were designed to simulate deposition from typical <u>agricultural</u> applications and, consequently, assume a larger number of flight lines (or swaths) and droplet size distributions that are not typical of applications to rights-of-way (ROW). Modeling inputs typical of ROW are shown in Table 1 and compared to EPA model inputs. While the AgDRIFT model is not overly robust to assess VM applications, we have forced alternative inputs for typical vegetation management use scenarios with coarse droplet size using a single flight line into that model to simulate an application to a right-of-way with a swath width of 60 feet. [Note, however, that swath widths in VM applications are generally less than 60 feet.] Typical application conditions in vegetation management reduce the need for buffers, and the following assessment adjusts the modeling inputs to simulate the different vegetation management application scenario.

Table 1. Inputs for AgDRIFT - Aerial VM applications

	Original EPA inputs used by EFED	EPA proposal - requirement for coarse droplet size	ROW fixed wing VM scenario	ROW rotary wing VM scenario
AgDRIFT Tier	II or III	III	III	III
Aircraft	Slow fixed wing	Slow fixed wing	Slow fixed wing	Slow rotary
Droplet size distribution	Very fine to fine	Coarse	Coarse	Coarse
Application rate (lb ai/acre):	0.284	0.284	0.284	0.284
Non-volatile application rate (lb ai/acre):	0.568	0.568	0.568	0.568
Application volume (gals/acre):	10	10	10	10
Swath displacement fraction	0.6505	0.2489	0.2489	0.2489
Flight lines (number of application swaths)	20	20	1	1
Wind speed (mph)	10	10	10	10

The buffers calculated by AgDRIFT using the EPA inputs for very fine to fine droplet size ranged from about 108 feet (monocot seedling emergence endpoint) to >2640 feet (dicot vegetative vigor endpoint). However, as shown in Table 2 below, using the proposed requirement for a coarse droplet size distribution and simulating a ROW application with a single flight line (or swath), the calculated buffers are significantly reduced as compared to the results from the EPA modeling (ranging from 13 feet for monocot seedling emergence to 846 feet for dicot vegetative vigor).

Table 2. Comparison of Calculated Buffer Distances to Attain a Risk Quotient at the EPA LOC

Endpoint	Fraction of applied	EPA Modeling (very fine to fine droplets)	EPA proposal – requirement for coarse droplet size	ROW Fixed wing, 1 swath, coarse droplet	ROW Rotary wing, 1 swath, coarse droplet
Seedling emergence, monocots	0.169	108 ft.	23 ft.	16.4 ft.	13 ft.
Seedling emergence, dicots	0.00187	>2640 ft.	1644 ft.	305 ft.	262 ft.
Vegetative vigor, monocots	0.0204	1749 ft.	180 ft.	108 ft.	95 ft.
Vegetative vigor, dicots	0.000264	>2640 ft.	>2600 ft.	846 ft.	807 ft.

Further modeling to simulate low drift alternatives typically used in aerial application for vegetation management, i.e., using extremely coarse droplet size distributions, shows dramatic reductions in modeled drift compared to coarse droplet size distributions. For example, the droplet size distribution for the Accuflo 028 nozzle is representative of similar extremely coarse droplet technologies, and was obtained from the SDTF library. For this modeling scenario the swath displacement fraction was set to 0, which forces a higher deposition fraction at 0 feet than for simulations using the swath displacement fractions in AgDRIFT. The modeling inputs and resultant calculated buffers are shown in Tables 3 and 4, respectively.

Table 3. Alternative Low Drift Modeling Inputs for ROW applications

	ROW fixed wing – extremely coarse droplet scenario	ROW rotary wing - extremely coarse droplet scenario	ROW rotary wing, low wind speed - extremely coarse droplet scenario
AgDRIFT Tier	III	III	III
Aircraft	Slow fixed wing	Slow rotary	Slow rotary
Nozzle	Accuflo 028 (VMD 1212 µm, relative span 0.6915)	Accuflo 028 (VMD 1212 µm, relative span 0.6915)	Accuflo 028 (VMD 1212 µm, relative span 0.6915)
Droplet size distribution	Extremely coarse	Extremely coarse	Extremely coarse
Application rate:	0.284 lb ai/ac	0.284 lb ai/ac	0.284 lb ai/ac
Non-volatile application rate:	0.568 lb ai/ac	0.568 lb ai/ac	0.568 lb ai/ac
Application volume:	10 gals/acre	10 gals/acre	10 gals/acre
Swath displacement fraction	0.0	0.0	0.0
Flight lines (number of application swaths)	1	1	1
Wind speed (mph)	10	10	5

Table 4. Comparison of Calculated Buffer Distances to Attain a Risk Quotient at the EPA LOC

Endpoint	Fraction of applied	ROW fixed wing – extremely coarse droplet	ROW rotary wing - extremely coarse droplet	ROW rotary wing, low wind speed - extremely coarse droplet
Seedling emergence, monocots	0.169	13 ft.	6.6 ft.	0 ft.
Seedling emergence, dicots	0.00187	56 ft.	29.5 ft.	26 ft.
Vegetative vigor, monocots	0.0204	33 ft.	13 ft.	6.6 ft.
Vegetative vigor, dicots	0.000264	135 ft.	111 ft.	82 ft.

As noted above, the buffers calculated by AgDRIFT using the EPA inputs for very fine to fine droplet size ranged from about 108 feet (monocot seedling emergence endpoint) to >2640 feet (dicot vegetative vigor endpoint). However, as shown in Table 4, modeling the typical extremely coarse droplet size distribution and simulating a ROW application with a single flight line (or swath), results in calculated buffers that are significantly reduced (ranging from 0 feet for monocot seedling emergence to 135 feet for dicot vegetative vigor) as compared to the results from the EPA modeling.

Based on modeling for aerial applications using more realistic inputs simulating typical vegetation management use scenarios, there are significant reductions in the calculation of buffers, which demonstrate that buffers should not be required for applications of aminocyclopyrachlor end-use products - especially when using low drift equipment and best management practices as proposed on the label.

Ground Application

Drift modeling for ground applications using AgDRIFT is limited by the data for the empirical relationships that the model is based on. Of particular concern is that the deposition data only allow separation into two drop size categories and two application heights - which precludes the simulation of the coarse to extremely coarse drop size distributions that are common in ground ROW applications. However, within the framework of the AgDRIFT model, two forced changes to the EPA modeling scenario are possible to simulate ROW applications: 1) reduce swaths from 20 to 1, and 2) select fine to medium/coarse drop size category. Table 5 summarizes the base modeling scenarios and the ROW application alternative scenarios.

Table 5. Inputs for AgDRIFT ground applications.

	EPA inputs	EPA proposal for use of coarse droplets	ROW Scenario I	ROW Scenario II
AgDRIFT Tier	I	I	I	I
Application height	high	high	high	high
Droplet size distribution	Very fine to fine	Fine to medium/coarse	Fine to medium/coarse	Fine to medium/coarse
Percentile	90th	90th	90th	50th
Application rate:	0.284 lb ai/ac	0.284 lb ai/ac	0.284 lb ai/ac	0.284 lb ai/ac
Number of Swaths	20	20	1	1

As shown in Table 6 below, utilizing the modeling changes noted above in Table 5 significantly reduces the calculated buffers as compared to the results from the EPA modeling. Specifically, calculated buffers are reduced from 16.4 feet to 3.3 feet for monocot seedling emergence, and from >1000 feet to 282 feet for dicot vegetative vigor.

Table 6. Comparison of Buffer Distances to Attain a Risk Quotient at the EPA LOC (Ground Applications)

Endpoint	Fraction of applied	EPA Modeling, very fine to fine droplets, 90th percentile curve	EPA proposal - Requirement for coarse droplets	ROW 1 swath, 90th percentile curve	ROW 1 swath, 50th percentile curve
Seedling emergence, monocots	0.169	16.4 ft.	3.3 ft.	3.3 ft.	3.3 ft.
Seedling emergence, dicots	0.00187	833 ft.	453 ft.	102 ft.	79 ft.
Vegetative vigor, monocots	0.0204	121 ft.	26 ft.	16 ft.	16 ft.
Vegetative vigor, dicots	0.000264	>1000 ft.	>1000 ft.	394 ft.	282 ft.

Although not specifically appropriate for assessing ROW applications, AgDRIFT modeling for ground applications using more realistic inputs simulating typical vegetation management use scenarios still results in significant reductions in the calculated buffers, and demonstrates that buffers should not be required for applications of aminocyclopyrachlor end-use products - especially when using low drift equipment and best management practices as proposed on the label.

Logistics of Vegetation Management Applications and Impracticality of Buffers

The requirement of buffers for aminocylopyrachlor end-use products for use in vegetation management would severely limit, or even prohibit, the use of the products in these markets. Feedback received from the Railroad industry, various state Departments of Transportation (DOTs), and commercial applicators indicates that buffers are impractical for utility rights-of-way, roadsides and other vegetation management use sites, and are inconsistent with the goals of weed control programs. Current practices, combined with advances in application technology and stewardship training in these market segments, address the concern for reducing off-target movement of pesticide applications. Reducing off-target movement is important to vegetation managers for a number of reasons, including the reduction of pesticide exposure to workers, residents and animals, and limiting any damage to susceptible crops or other desirable plants. In addition, applicators are keenly aware of the added cost to their business if off-target movement occurs. Applicators have many options available to them to reduce off-target movement of their applications including selection of the proper application equipment, nozzle type, application height and operating pressure. In addition, they also have a strong awareness of the effects of wind direction and other weather effects (temperature, humidity) on possible off-target movement of pesticide applications. Further, drift retardants are also commonly used in these applications.

Feedback from the VM industry indicated that specifying buffers on aminocyclopyrachlor end-use products would be problematic in this market. Howard

Peavey, Alabama DOT Senior Agronomist, indicated that "buffers would likely reduce efficiencies by requiring return trips to certain routes or result in areas that did not receive treatment.[1] Lines of sight may not be cleared as effectively and appurtenance protection may not be as efficient - possibly resulting in increased cost to tax payers". Rand Swanigan, Roadside Management Specialist for the Missouri DOT, noted that the "majority of roadside right of way is very narrow and buffer areas would result in most areas being untreated - resulting in increased populations of noxious, invasive and problematic weeds."[2] Richard M. Loughery the Director of Environmental Activities for Edison Electric Institute (EEI) provided the following comments regarding the possible requirement of buffers and the subsequent impact on electric utilities:

> "The application of buffer zones would be likely to severely diminish the ability of electric utilities to fully utilize integrated vegetation management (IVM). The environmental benefits of IVM are documented by over 60 years of research (Bramble & Byrnes in particular). EEI and member companies have participated in US EPA's Pesticide Environmental Stewardship Program (PESP). The PESP program has highlighted the electric utility industry's IVM practices. The no-spray buffer zone proposal seems to run counter to the PESP program. Utility rights-of-way can be part of the solution for providing wildlife migration corridors and habitat for pollinators. However, an IVM approach including the spraying of herbicides is necessary to provide necessary habitat within the rights-of-way. Mechanical clearing can be the most appropriate utility vegetation management in some cases, but not all. The proposed no-spray buffer zones would likely push utilities to use mechanical clearing more often to meet the NERC reliability standards for rights-of-way vegetation management."[3]

Note that, in a public docket comment in response to proposed buffers for sulfometuron methyl, Robert E. Fronczack, Assistant Vice President Environment & Haz Mat, for the Association of American Railroads stated that "In order to safely and efficiently operate, effective control of unwanted vegetation along the nation's railroad rights-of-way is vitally important. Unwanted weeds and brush create safety and operational problems including; reduced visibility at grade crossings and signals, fire hazards, difficulties with inspections, rail wheel slippage, as well as compliance problems with state and local weed abatement regulations." Feedback from the Railroad industry indicates that the assignment of buffers to non-target terrestrial and aquatic areas would be impractical, and that the use of buffers in railroad applications "are unrealistic and will make products virtually unusable in our industry."[4]

[1] Email from Howard Peavey, Sr. Agronomist Alabama DOT, to Doug Wood, DuPont, dated June 28, 2010.
[2] Email from Rand Swanigan, Roadside Management Specialist Missouri DOT, to Doug Wood, DuPont, dated June 24, 2010.
[3] Email from Richard Loughery, Director, Environmental Activities, Edison Electric Institute to Mark Rice, DuPont, dated June 28, 2010.
[4] Comment to the public docket (EPA-HQ-OPP-2008-0129-0167) by Robert E. Fronczack, dated February 3, 2009

Gary Nyberg, Manager Vegetation Control, BNSF Railway, provided the following comments:

> "Requiring buffer zones for aerial application would eliminate helicopter spraying on railroads. Helicopter application is an effective tool to achieve the goals and objectives of railroad weed control. Many areas of the railroad are not accessible with conventional ground equipment and the use of helicopters is necessary to help comply with Federal and State vegetation and noxious weed laws that affect railroads."[5]

Canadian PMRA – Decisions Regarding Vegetation Management Use Pattern

It is of significance to note that in a number of Re-evaluation Decision Documents, Canada's Pest Management Regulatory Authority (PMRA) has concluded that vegetation management uses are generally exempt from terrestrial buffers. In the re-evaluation decision document for 2,4-D (dated May 16, 2008)[6], PMRA explained "The PMRA has exempted rights-of-way uses from requiring buffer zones to protect terrestrial habitat because complete plant/weed control is required right up to edge of the application areas on these sites to ensure user safety." Some additional examples of this exemption are listed below:

> Re-evaluation Decision: Metsulfuron Methyl, November 10, 2008[7]
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> For application to rights-of-way, buffer zones for protection of sensitive terrestrial habitats are not required; however, the best available application strategies which minimize off-site drift, including meteorological conditions (e.g. wind direction, low wind speed) and spray equipment (e.g. coarse droplet sizes, minimizing the height above canopy), should be used.
>
> Buffer zones for the protection of terrestrial habitats are not required for use on rights-of-way including railroad ballast, rail and hydro rights-of-way, utility easements, roads, and training grounds and firing ranges on military bases.

[5] Email from Gary Nyberg, Manager Vegetation Control, BNSF Railway, to Dan Mixon, DuPont, dated July 1, 2010.
[6] Re-evaluation Decision: (2,4-Dichlorophenoxy) acetic Acid [2,4-D]; http://www.hc-sc.gc.ca/cps-spc/pubs/pest/_decisions/rvd2008-11/index-eng.php
[7] Re-evaluation Decision: Metsulfuron Methyl; http://www.hc-sc.gc.ca/cps-spc/pubs/pest/_decisions/ rvd2008-35/ index-eng.php

Re-evaluation Decision: Dicamba, 5 August 2008[8]

For application to rights-of-way, buffer zones for protection of sensitive terrestrial habitats are not required; however, the best available application strategies to minimize off-site drift, including meteorological conditions (e.g. wind direction, low wind speed) and spray equipment (e.g. coarse droplet sizes, minimizing height above canopy), should be used.

Buffer zones for the protection of terrestrial habitats are not required for use on rights-of-way, including railroad ballast, rail and hydro rights-of-way, utility easements, roads, and training grounds and firing ranges on military bases.

Re-evaluation Decision: Picloram, January 14, 2009[9]

Buffer zones for the protection of terrestrial habitats are not required for use on rights-of-way including railroad ballast, rail and hydro rights-of-way, utility easements and roads.

For application to rights-of-way, buffer zones for protection of sensitive terrestrial habitats are not required; however, the best available application strategies that minimize off-site drift, including meteorological conditions (e.g. wind direction, low wind speed) and spray equipment (e.g. coarse droplet sizes, minimizing height above canopy), should be used.

Industry Training

The Railroad industry, state Departments of Transportation, commercial applicators and other entities responsible for applying vegetation management herbicides typically receive in-depth and frequent training regarding herbicide applications - including information on reducing any possible off-target movement of applied herbicide. As an example, Progress Solutions, LLC, a leading applicator in vegetation management servicing many electric companies, requires training for new hires and annual training for all applicators.[10] Included in the training (attachment 1), is a module entitled "Drift Management" that includes instructions on choosing appropriate nozzle size, height of release spray, sprayer pressure and use of drift retardants to limit any possible off-target movement. Similar training is also conducted by Departments of Transportation. According to Charles Flowers of the Arkansas State Highway and Transportation Department (AHTD), all certification, recertification and training of applicator personnel

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[8] Re-evaluation Decision Document: Dicamba; http://www.hc-sc.gc.ca/cps-spc/pubs/pest/_decisions/rvd2008-28/index-eng.php

[9] Re-evaluation Decision: Picloram; http://www.hc-sc.gc.ca/cps-spc/pubs/pest/_decisions/rvd2009-02/index-eng.php

[10] Email from Lee Atkins, Progressive Solutions, to Doug Wood, DuPont, dated June 24, 2010.

is conducted by the Pesticide Coordinator for the University of Arkansas Cooperative Extension Service.[11] In house training is also conducted periodically, utilizing expertise and training materials provided by basic manufacturers and suppliers of vegetation management products. Drift reduction and application technology relative to off-target movement of pesticides is addressed in each training session. Although general use pesticides are used by the Department, all AHTD applicators are **required** to be certified in the Rights-of-Way category. The Department utilizes weather instruments for documentation of environmental conditions, and uses drift control agents in all broadcast applications. Similarly, Alabama's Department of Transportation conducts annual training which addresses off-target movement - including drift, volatility, runoff and ground water considerations. In addition, the Alabama DOT has issued "A Manual For Roadside Vegetation Management" (see attachment 2). According to Howard Peavey of the Alabama DOT, applicators are required to use a drift retardant in all applications and the DOT has set restrictions relative to wind speed and applications to sensitive areas. The members of the National Railroad Contractors Association (NRCA), who represents applicators of herbicides to the US Railroads, attend annual training conducted by Purdue University's Department of Forestry and Natural Resources, which includes certification and offers continuing education topics. Spray drift and off-target movement of herbicides are an integral part of the certification and training.

Application Technology

Typical application scenarios for aminocyclopyrachlor end-use products include railroad application, utility rights-of-ways and roadsides. Control of unwanted vegetation in these areas is extremely important to provide safety to workers and the public, and to properly and efficiently maintain electrical, railroad and highway systems throughout the United States. Application technology used in these types of applications has been designed to reduce the possibility of off-target movement. (Refer to Attachment 3 for photographs of typical spray equipment)

Railroad applications:

The majority of railroad applications are made using "hi-rail" truck sprayers that actually have railroad wheels and ride on the tracks. These range from 500 - 3,000 gallon capacity and can spray from 24 - 100 foot wide patterns (12 - 50 feet from center of rail on both sides of the track). Routine railbed is sprayed 24 feet wide, while the 100 foot width is typical for railroad crossings where public safety is most crucial.

Railroad contractors are generally equipped with <u>low drift, large capacity</u> spray systems, utilizing 25 - 40 gallons/acre spray volumes and nozzles which deliver 1 - 10 gallons of spray per minute. This configuration equates to <u>droplet sizes in the range of >500 micron VMD, and in many cases > 1,000 micron VMD.</u>

[11] Email from Charles Flowers, AHTD Facilities Management, Arkansas State Highway and Transportation Department, to Doug Wood, DuPont, dated June 30, 2010

Railroad contractors also tend to use drift control agents as part of the spray mixture, which can result in a dramatic increase in droplet size depending on the specific product utilized. Specific nozzles used in railroad applications are "boomless" types such as boom busters, OC's (off center nozzles), XP boomjet, wobblers, solid streams, and radi-arc's. Fixed nozzles used include floodjets, flat fans, 1/4 MEG low-angle flat fans, and OC's.

Electric Utilities applications:

Applications made to Electric Utilities facilities and rights-of-way are primarily for brush control for general vegetation management. The range of application equipment includes backpack sprayers for applicators on foot in electric utility right-of-ways, ATV mounted sprayers using boomless configurations with either XP boomjets or boom buster nozzles, skidders (rugged vehicle for clearing forest) using configurations similar to ATVs, and helicopter spray systems utilizing some of the most innovative spray booms on the market to apply sprays exactly where they are required (for example, Thru-valve booms with a >800 micron VMD).

These applications will be of lower spray volume in some cases for efficiency (backpack 5 - 20 gallons/acre) or higher in other cases - for example with helicopters (5 - 30 gallons/acre). Backpack sprays can utilize "Constant Flow Valves" to maintain a steady droplet size at a low pressure, minimizing spray drift potential. In all scenarios, the spray nozzles will be large orifice/low pressure - producing coarse spray droplets, at a minimum, which allows the spray to be placed where intended. Placement is made easier with larger droplets since they are affected far less by any wind or vehicle movement.

Roadside applications:

Roadside applications are typically made using medium sized trucks, with tank sizes of 500 - 2,000 gallons spray, from the shoulder of roads utilizing low-drift nozzle technology. Spray systems include Norstar nutating heads that use solid stream nozzles and oscillation to break up the streams into very large droplets, or boomless nozzles such as the boom-buster or XP boomjets, which again result in large droplet size spectrums.

In summary, the vegetation management industry has pioneered the development of low to no drift nozzle technology over the last three decades to enable applications in close proximity to the public. The use of this technology, in combination with electronic controls and GPS, allows for rapid and consistent placement of herbicide applications - thereby reducing the risk of off-target movement.

Adoption of Newer Chemistry

Requiring buffers for aminocyclopyrachlor end-use products will result in some land use managers continuing to use older, less efficacious, more problematic products that do not currently have specified buffers - thereby limiting the adoption of the new aminocyclopyrachlor technology. Other active ingredients currently used in vegetation management products that either have less stringent buffer requirements, or no buffer requirements at all, include aminopyralid, picloram, triclopyr and clopyralid. These active ingredients are not scheduled for registration review until 2014, which means that any proposed buffer language resulting from these reviews would likely not appear on relevant end-use product labels until 2016 or later. This would seriously impact the adoption of aminocyclopyrachlor end-use products if the current buffer proposals were retained for this new active ingredient.

According to Tom Evans, a retired DuPont vegetation management manager with extensive experience in railroad and highway applications, assigning buffers to aminocyclopyrachlor end-use products would encourage applicators to continue to use products that otherwise require DOT HAZMAT placarding (such as Diuron), products designated as known carcinogens, products that are highly volatile (such as dicamba), products with known groundwater issues (such as picloram), and products containing 2,4-D (which is considered highly toxic if absorbed through skin). In addition, Mr. Evans notes that the continued use of these products would greatly increase the pesticide load in the environment versus the adoption of lower use rate aminocyclopyrachlor end-use products.[12]

Control of Economically Important Weed Species

As BEAD concluded in its review of the Public Interest Finding statement for aminocyclopyrachlor, this new active ingredient demonstrates better long term control of Leafy Spurge *(Euphorbia esula)* than any currently registered herbicide product. In addition to Leafy Spurge, aminocyclopyrachlor is effective on a number of other invasive and noxious weed species that are not being optimally controlled by currently registered products. Attachment 4 illustrates the broad spectrum of control of aminocyclopyrachlor versus currently registered competitive products.

Of particular note is recent efficacy work conducted with aminocyclopyrachlor on Cogongrass (*Imperata cylindrica*), an important new invasive weed of concern in southern and southeastern states. Over $8 million in federal monies was appropriated for the states of Alabama and Mississippi to aid in the control/eradication of cogongrass in 2009. Of the currently registered products, glyphosate and imazapyr are very effective at controlling cogongrass - when applied at the correct rates and timing. However, these products also kill the desirable grasses that grow in the same locations as the cogongrass, resulting in erosion problems and the further burden to re-establish the desirable grasses. During this bareground roadside period following application of non-selective herbicides, many other unwanted weeds and grasses often invade the area causing secondary problems in the planting and establishment of desirable perennial grasses. An important attribute of aminocyclopyrachlor is the control of cogongrass without severely harming the desirable grasses. Data from Auburn University demonstrates that aminocyclopyrachlor controls cogongrass in bahiagrass roadsides in southern Alabama – with acceptable levels of phytotoxicity to established grasses as compared to glyphosate

[12] Email from Thomas Evans, consultant, to Dominic Watson, DuPont, dated July 9, 2010

or imazapyr. Aminocyclopyrachlor offers an important new tool to help eradicate cogongrass in the southern and southeastern United States without causing permanent injury to desirable grasses. The ability to use aminocyclopyrachlor end-use products to control this, and other increasingly problematic weeds, would be severely limited if the currently proposed buffers are included on the product labels.

Proposed Label Language

DuPont understands and supports the Agency's effort to minimize any potential off-target movement of aminocyclopyrachlor containing end-use products which, in turn, will mitigate possible effects on non-target plant species. As an alternative to EPA's suggested buffers to non-target terrestrial and aquatic areas, DuPont is proposing label language, similar to that found on current vegetation management products, for the relevant Aminocyclopyrachlor end-use products. DuPont believes that this language, combined with other recommended restrictions, will provide adequate margins of safety to terrestrial and semi-aquatic plants for Aminocyclopyrachlor uses.

Use Restrictions:

Do not make applications when circumstances favor movement from treatment site.

Do not apply or otherwise permit DuPont™ (product name), or sprays containing (product name), to come into contact with any broadleaf crop or other desirable broadleaf plants.

Do not contaminate water intended for irrigation. To avoid injury to crops and other desirable plants, do not treat or allow spray drift or run-off to fall onto banks or bottoms of irrigation ditches, either dry or containing water, or other channels that carry water that may be used for irrigation purposes. Do not apply to snow covered or frozen ground.

Avoid Injurious Spray Drift

Applications should be made only when there is little or no hazard from spray drift. Very small quantities of spray, which may not be visible, may seriously injury susceptible plants. Do not spray when wind is blowing toward susceptible crops, or other desirable plants, near enough to the application site to be injured.

Aerial Application

Current Agency Proposal:
"When applying by air, maintain a 50-foot buffer around non-target aquatic areas and between the point of direct application and the closest downwind edge of non-target terrestrial areas. Apply only using nozzles which will deliver coarse or greater (VMD >350 microns) droplets as defined by ASABE S572 standard. Do not release spray at a height greater than 10 feet above the ground or crop canopy unless a greater height is required for aircraft safety. Do not apply when

wind speed is greater than 10 mph. Do not apply during a temperature inversion."

DuPont Proposal:
"When applying by air, apply only using nozzles which will deliver coarse or greater (VMD >350 microns) droplets as defined by ASABE S572 standard. Do not release spray at a height greater than 10 feet above the ground or canopy unless a greater height is required for aircraft safety. Do not apply when wind speed is greater than 10 mph. Do not apply during a temperature inversion."

For aerial applications near susceptible crops or other desirable plants, use a drift control additive as recommended by the manufacturer**,** or apply through a Micro-Foil or Thru-Valve boom**,** or use an equivalent drift control system. Thickened sprays prepared by using high viscosity invert systems or other drift control systems may be utilized if drift control is comparable to that obtained with drift control additives or the Thru-Valve boom. If a spray thickening agent is used, follow all recommendations and precautions on the product label. Do not use a thickening agent with the Micro-foil boom or other systems that cannot accommodate thick sprays.

Ground Application Restriction

Current Agency Proposal:
"When applying by ground, <u>maintain a 50-foot buffer around non-target aquatic areas and between the point of direct application and the closest downwind edge of non-target terrestrial areas.</u> Apply only using nozzles which will deliver coarse or greater (VMD >350 microns) droplets as defined by ASABE S572 standard. Do not apply with a nozzle height greater than 4 feet above the ground or crop canopy. Do not apply when wind speed is greater than 10 mph. Do not apply during a temperature inversion."

DuPont Proposal:
"When applying by ground, apply only using nozzles which will deliver coarse or greater (VMD >350 microns) droplets as defined by ASABE S572 standard. Do not apply with a nozzle height greater than 4 feet above the ground or canopy unless necessitated by the application equipment. Apply with the spray boom or nozzle height as low as possible. Do not apply when wind speed is greater than 10 mph. Do not apply during a temperature inversion."

For ground applications, spray drift can be reduced by keeping the spray boom as low as possible by applying 20 gallons or more of spray per acre; by using spray pressures no greater than are required to obtain adequate plant coverage; by using large-droplet producing nozzle tips; by using drift control additives; by using shielded-sprayers or other drift control systems; and/or by spraying when wind velocity is low.

Conclusion

DuPont believes that the Agency proposed buffers to non-target aquatic areas and non-target terrestrial areas are not necessary to mitigate off-target movement of aminocyclopyrachlor end-use products used in vegetation management programs. Requiring such buffers will likely result in drastically reduced adoption of this new technology in Vegetation Management programs.

At the same time, DuPont understands and supports the Agency's effort to minimize any potential off-target movement of aminocyclopyrachlor containing end-use products which, in turn, will mitigate possible effects on non-target plant species. DuPont believes that this can be accomplished through the best management practices that are currently in place in the vegetation management industry. Therefore, as an alternative to EPA's suggested buffers to non-target terrestrial and aquatic areas, DuPont is proposing label language, similar to that found on current vegetation management products, for the relevant Aminocyclopyrachlor end-use products. DuPont believes that this language, combined with other recommended restrictions, will provide adequate margins of safety to terrestrial and semi-aquatic plants for Aminocyclopyrachlor uses.

Attachments

1) Drift Management training module for Progressive Solutions, LLC.
2) Excerpt on Spray Drift Management from “A Manual For Roadside Vegetation Management” (Alabama Department of Transportation).
3) Examples of typical Herbicide Application Equipment for Vegetation Management
4) Efficacy comparison of Aminocyclopyrachlor and Competitive Products on Noxious and Invasive Weed Species

Attachment 1

Drift Management training module for Progressive Solutions, LLC

DRIFT MANAGEMENT

Progressive Solutions

Drift is a big problem.

- According to the Environmental Protection Agency (EPA), 500 million pounds of pesticides are applied annually in the United States. It is estimated that 3% of this total will drift.

That's equal to 3000 tractor trailers full of chemical in the wrong place!

What is drift?

- Drift is defined as the off-target movement of pesticides through the air at the time of application.

Why is Drift a bad thing?

- Pesticide drift can cause several problems from pesticide exposure to nearby workers, residents and animals, to damage to susceptible crops.

Waste of herbicide – waste of money

- Drift will also reduce the amount of chemical that is available to control the intended pest and may render an application inadequate. Since the chemical and the application cost money, drift not only is environmentally wrong, but it is also a costly and inefficient way of doing business.

Reduce Drift

- Drift cannot be totally eliminated during pesticide application because of technology constraints, but there are ways to minimize drift to levels approaching zero

When does drift occur?

- Drift can occur in all forms of pesticide application:
- High Volume
- Low Volume backpack
- Roadside truck

What affects Drift?

- In general, drift can be influenced by factors in one of these four categories:
- Spray characteristics
- Weather
- Application equipment and setup
- Operator skill

Droplet Size

- The overwhelming factor influencing drift is droplet size. As a general rule of thumb, small droplets do not have enough mass to drop fast, so they remain airborne and exposed to air movement longer than larger droplets.

Height at which spray is released

- The height of release of spray will influence how much droplets will travel downwind. This may not be as critical for ground sprayers, but it is very important for high volume application.

- No “shooting from the hip” with backpack sprayers

Stay close to the ground

- High Volume Applicators should not spray too far from the ground, generally no higher 8-12 feet during the application. Any additional distance will give droplets an opportunity to be influenced by wind and be deposited off target.

Decrease pressure

- When using hydraulic nozzles, higher pressures will produce more fine droplets and increase the drift potential of an application. Pressure has been demonstrated to not be an effective way to increase coverage and canopy penetration.

Drift retardants

- Drift retardants are usually added to the spray mixture in order to increase the viscosity of the spray solution. Increasing the viscosity of the spray will reduce the number of small droplets. Although drift retardants are a tool to be used to decrease drift potential, their contribution is limited. You should manage nozzle type, height and operating pressure correctly to minimize drift potential. Do not rely solely on drift retardants.

Wind Speed

- Wind speed is the most important factor influencing drift. High wind speeds will move droplets downwind and deposit them off target. Generally, pesticide application should be avoided if wind speed is greater than 10 mph. The most effective way to check wind speed is to use a wind meter.

Wind Direction

- Wind direction will influence where off-target spray droplets will be deposited. A careful operator will try to apply pesticides whenever the wind is blowing away from sensitive areas.

Temperature and Humidity

- High air temperature and low relative humidity go hand-in-hand in creating a worst-case scenario for pesticide drift. Under these conditions, spray droplets can evaporate very fast and become more susceptible to wind forces. Air temperature can also influence atmospheric stability and off-target movement of spray droplets.

Evaporation

Evaporation will reduce the size of the droplets released in the spray. For typical applications with ground applicators, droplets of 50 microns and less will completely evaporate to a residual core of pesticide before reaching the target. Droplets greater than 200 microns will have no significant reduction in size before deposition on the target. Evaporation of droplets between 50 and 200 μm is significantly affected by temperature, humidity and other weather conditions. Some pesticide formulations are more volatile than others. For example, 2,4 D or MCPA esters are susceptible to vapor drift, while 2,4-D or MCPA amines are practically non-volatile.

Operator skill and care

- Under a given spray situation, any one of the previously mentioned factors may be the most critical in reducing drift hazards. Ultimately, it is the applicator's job to determine the critical factor and to take precautions against it. By exercising good judgment regarding both equipment and weather factors relative to each application, applicators can minimize drift potential in nearly every case.

In Summary

- Drift is undesirable for economic, environmental and safety reasons. Efficient applicators don't spend money for pesticides to watch them drift away from their target fields. Chemicals are potent and require precise application. Unsatisfactory coverage could result if a significant portion of the chemical is lost in drift. This could require re-spraying the same area. We could be sued in court if spray drift damages sensitive crops in a farmer’s field.

Protect our Water

- The environmental effects of spray drift are equally costly and unacceptable. By reducing drift to a minimum, we can reduce the potential for pollution of streams, lakes and other water supplies that could endanger fish and wildlife.

Use Good Judgement

- Regardless of how accurately an application is made, the possibility of drift is always present. You can minimize this possibility by selecting the right equipment and using sound judgment when applying pesticides. Your judgment can mean the difference between an efficient, economical application or one that results in drift, damaging non-target crops and creating environmental pollution.

Attachment 2

Excerpt on Spray Drift Management from "A Manual For Roadside Vegetation Management" (Alabama Department of Transportation)

SPRAY DRIFT CONTROL

Physical drift can be defined as the movement of spray particles or droplets away from the spray site before they reach the target plant. Ground inversion can prevent the settling of very small droplets and allow their movement away from the spray site during calm conditions. The amount of drift depends upon (1) the size of the droplets, (2) weather conditions and wind speed, (3) target location/distance and (4) the height above the ground that the spray is released.

Droplet size is determined by the design of the nozzle, orifice or opening size and pump pressure. In general, low pressures and large orifice sizes tend to produce large droplets, whereas high pressures and smaller orifice sizes will produce small droplets. Target setback and height above ground that the spray is released become important since they determine the time required for droplets to reach the ground.

Weather factors include wind speed, temperature and humidity. Wind speed and direction principally determine the direction and movement of the spray droplet after release from the nozzle. Temperature and humidity can affect the rate of droplet evaporation. As the diameter of a drop decreases, the ratio of surface area (many smaller droplets) to volume increases and evaporation occurs at a faster rate. The time of exposure to evaporation conditions also increases with smaller droplet size. The potential amount of physical drift varies with the method of application. There is a large difference of risk between hand tank, ground and aerial spraying. The hazards from off-target drift depend on (1) nature of the hazard, such as water, plant species, growth state, etc.; (2) legal pesticide tolerances in crops; (3) distance from the application site, (4) wind direction and air stability; (5) type, form and rate of the herbicide; and (6) the mix carrier (water, fertilizer or oil). Herbicides require certain coverage or drops per unit area of leaf surface for effective control.

Spray droplets evaporate more slowly in (wetter) 70% relative humidity and faster in lower (drier) relative humidity. Droplets falling through dry air decrease in size and are subject to drift and possible chemical trespass.

To reduce the possibility of chemical trespass, a drift control agent is frequently added to a spray tank in an attempt to minimize spray drift to adjacent sensitive areas.

Drift control products, such as Nalcotrol®, Ground Zero®, Control®, Valid®, Sta-Put®, and numerous others, usually contain some percentage of polyvinyl polymers or acrylic copolymers. When added to a spray tank, a drift control agent hydrates in the spray solution resulting in larger spray droplets and fewer fine droplets.

There are several inherent problems associated with the use of these products. Some of these products can only be used with water soluble or emulsifiable pesticides. This means they shouldn't be used with wettable powders, dry flowables, water dispersible granules, flowables, aqueous suspensions, or liquid suspensions. Operators must read the drift control agent label carefully to determine if there is such a prohibition.

The use rate varies with the particular product used, the spray pressure and the type of spray tips used. Usually the rate is given in a range of fluid ounces per 100 gallons of spray mix. An operator should, initially add the lowest rate recommended. Increase the rate as needed. A thickened or "stringy" spray mix indicates that too much drift control agent was added. Only the manufacturer of the agent knows if it is possible to "unthicken" a spray mix. This mistake can cause loss of time, equipment, possibly pesticides, and money. Operators must read the label and use the lowest labeled rate.

There is no standard mixing order among the different drift control agents. The proper mixing order discussed earlier is still correct for mixing different products of different formulations together. However, operators will have to read the label and determine the proper time to add the drift control agent in relation to the other formulated products. In general, products that require agitation to remain in suspension are added to the tank first and agitated well before the addition of any other product. If an operator mixes his pesticides in the wrong order or adds the drift control agent at the wrong time, he may end up with a "mayonnaise-like" mixture that can't be sprayed.

Wind conditions are obvious to the applicator and strict procedures must be followed. Spraying must stop anytime the spray solution cannot be maintained within the target area. ALDOT policy is to stop when wind velocity reaches 8 - 10 mph. Often times the crew can treat the downwind side of highways and return later to treat the opposite side when wind conditions are more favorable. Following are a number of field observations that spray operators may use to alert them to wind speed changes. Hand-held wind gauges can verify observations.

Field Observations	Wind Speed (mph)
Chimney smoke rises up, air motionless	0
Chimney smoke drifts slowly, air rises	1 - 3
Leaves quietly rustle, flags stir	4 - 7
Leaves and twigs move	8 - 12
Branches move and flags flap	13 - 18
Small trees sway and flags ripple	19 - 24
Large branches move and flags beat	25 - 30
Whole trees move and flags extend	31 - 38
Twigs break and walking is difficult	39 - 46

PERSONAL SAFETY

Toxicity is not the only factor that determines how dangerous a chemical is to humans or animals. Anyone who handles pesticides should also be concerned with the hazard of the chemical. The terms toxicity and hazard do not mean the same things. Toxicity is the capacity of a substance to produce injury or death. Hazard includes two factors: toxicity and exposure. It is defined as the possibility that injury will result from the use of a substance in a given formulation, quantity, or manner.

Some hazards do not include toxicity to humans or other animals. For example, sulfur, oils, and many other chemicals are considered safe or relatively safe to animals, but may pose considerable hazards to some plants (phytotoxicity).

A pesticide may be extremely toxic but present little hazard to the applicator or others when used:

- In a very dilute formulation.
- In a formulation that is not readily absorbed through the skin or readily inhaled.
- Only occasionally and under conditions to which humans are not exposed.
- Only by experienced applicators that are properly equipped to handle the chemical safely

Attachment 3

Examples of typical Herbicide Application Equipment for Vegetation Management

Vegetation Management

Sprayer & Nozzle Types

2010

WALDRUM SPECIALTIES, INC.
PO Box 1146
Southampton, PA 18966
Phone: (215) 348-5535
Fax: (215) 348-5541

DROPLET SIZE (HELICOPTER)

Helicopter applications for forest and right-of-way vegetation management with the TVB® System are usually made with TVB® "wedge" nozzles. These nozzles are available in commercial orifice sizes of .030" and .045" and an experimental orifice size of .019". Droplet sizes and volumes produced by these nozzles in static tests are given below:

Nozzle Orifice (inches)	Droplet Size (micrometers)	Gal/Minute (30 psi) (no restrictions)
.019	900	21.2
.030	1500	42.8
.045	2200	105.5*
*39.5 Gal/Min with .080" Control Orifice		

Applying a 70' swath at 45 mph, the .019" nozzle will apply approximately 3 Gal/Acre, the .030" nozzle 7 Gal/Acre, and the .045" nozzle with control orifices 6 Gal/Acre (16 Gal/Acre without Control Orifices.)

Thru-Valve Boom (TVB)

Waldrum Specialties is a company formed by "Tex" Waldrum over 30 years ago, and has been a steady supplier of innovative low-drift technology for sprayers in the Vegetation Management market.

Helicopter Applications

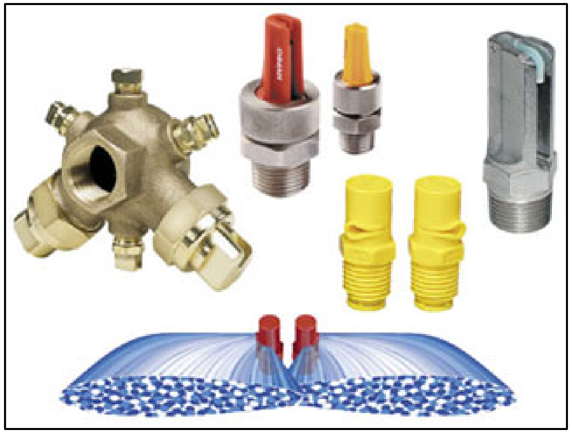
Close-up of uniform droplets forming in the smooth air behind the TVB®.

Droplet formation from TVB® on a helicopter showing straight streams which break up into uniform-sized spherical droplets.

Right-of-Way Applications

Examples of spray equipment used in right-of-way spraying include ATV's, and handguns using rollover valves and CFV's. ATV's use "boomless" nozzles due to the heavy brush, while the handguns operate from backpack sprayers targeting specific species of brush. Helicopters are also used in this market.

Railroad Applications



Railroad applications use train-powered sprayers for mainline treatments, but extensively use spray trucks, like the one shown, to spray rail yards and all other rail lines. Highly sophisticated application systems.

Roadside Applications

Roadside spraying is done almost exclusively with “Boomless” sprayers, like the ones shown below, which allow for projection from the road out to the target. The boomless spray nozzles or systems use very coarse droplet sizes to enable precise placement of spray where required. Nozzles like those shown inherently produce larger droplets due to their sheer size, dictated by the spray width and forward speed.

Attachment 4

Efficacy comparison of Aminocyclopyrachlor and Competitive Products on Noxious and Invasive Weed Species

MAT28 Comparison on Noxious weeds

- Comparison of data from labels, Noxious weed list from Western States, Data from summary charts of replicated field trials were used for Aminocyclopyrachlor,
  - Picloram comparison was 8 oz ai/A
  - Aminopyralid comparison was 1.75 oz ai/A
  - Data on perennial weeds was taken at 200 to 365 days after application
- Labeled claims of suppression or control at seedling or early stages were rated yellow
- Aminocyclopyrachlor (MAT28)

Noxious Weeds Control Comparison

	MAT28	Amino pyralid	Dicamba	Piclor am	2,4-D	Glyphosate
Yellow Starthistle	🟢	🟢	🔴	🟡	🔴	🟡
Diffuse Knapweed	🟢	🟢	🟡	🟢	🔴	🟡
Russian Knapweed	🟢	🟢	🔴	🟢	🟡	🟡
Spotted Knapweed	🟢	🟢	🟡	🟢	🔴	🟡
Kochia	🟢	🔴	🟢	🟡	🔴	🟡
Leafy Spurge	🟢	🔴	🟡	🟢	🟡	🟡
Canada Thistle	🟢	🟢	🟡	🟢	🟡	🟡
Musk Thistle	🟢	🟢	🟡	🟢	🔴	🟡
Field Bindweed	🟢	🔴	🟡	🟢	🟡	🟡
Poison Hemlock	🟢	🔴	🔴	🟢	🔴	🟡

🟢 80 to 100%　　🟡 50 to 70%　　🔴 >50 or not labeled

Competitive Products – Noxious species

	MAT28	Aminopyralid	Dicamba	Picloram	2,4-D	glyphosate
Mesquite	🟢	🔴	🔴	🟡	🔴	🔴
Newer weed species to be added to label						
Kudzu	🟢	🟢	🔴	🟡	🔴	🟡
Cogongrass	🟢	🔴	🔴	🔴	🔴	🟡
Gorse	🟢	🔴	🔴	🟢	🔴	🔴
Scotch broom	🟢	🔴	🔴	🟢	🔴	🔴
Rush skeletonweed	🟢	🟢	🔴	🔴	🔴	🔴
Wild carrot	🟢	🔴	🔴	🟡	🟡	🔴

🟢 80-100% control 🟡 51-70% 🔴 < 50% or not labeled