

Utility Arborist Association
Best Management Practices for a:

*Closed Chain of Custody for Herbicide Use in the
Utility Vegetation Management Industry*

June 21, 2010

Prepared by:
J.W.Goodfellow
BioCompliance Consulting, Inc.
Redmond, WA

Acknowledgements

This report was prepared for UAA CCC BMP Oversight Committee:

- Lynn Grayson (Chair), American Electric Power
- Nick Hoffman, EcoPak LLC
- Steve Hopkins, US Environmental Protection Agency
- Jim Orr, Asplundh Tree Expert Co.
- Dave Schoonover, Aqumix.
- Sam Quattrocchi, Dow AgroSciences.
- Fred Whitford, Purdue University

This project would not have been possible without the support of the many stakeholders that participated in process benchmarking studies, including representatives from the following organizations:

- Allegheny Power
- Duke Energy
- Duquesne Light Company
- Northeastern Rural Services
- Oklahoma Gas and Electric
- CWC Chemical
- Red River Supply
- ArborChem
- Aqumix
- Eco-Pac LLC
- Asplundh Tree Expert Co.
- Hazlet Tree Service
- Lewis Tree Service
- Nelson Tree Service
- Progressive Solutions
- Southeast Woodlands
- Superior Forestry
- Townsend Tree Service
- Townsend Chemical LLC

The Utility Arborist Association received funding from Dow AgroSciences for the purpose of supporting this project: Closed Chain of Custody for Herbicide Use in the Utility Vegetation Management Industry

Forward

Vegetation is a leading cause of interruptions to the reliable supply of electric power to consumers and businesses. Electric utilities maintain incompatible vegetation that may grow into conflict with overhead transmission and distribution lines using a variety of field-tested techniques and tools. In 2007 the Utility Arborist Association (UAA) published a Best Management Practice (BMP) that defines contemporary Integrated Vegetation Management (IVM) as practiced the electric utilities use to prevent vegetation from causing power outages.

The Utility Vegetation Management (UVM) industry makes extensive use of herbicide applications in maintaining vegetation on utility rights-of-way (ROW). Herbicides are used to maintain utility ROW free of incompatible tall growing tree species that endanger public safety, pose a threat to the reliability of the energy delivery systems, and to help with access for utility lines inspection, maintenance, and for personnel making emergency restoration and repairs. Considerable progress has been made in developing application methods and herbicide formulations that mitigate potentially adverse environmental impacts of UVM practices to the environment in which these products are applied. Advances in chemistry and application methods have significantly reduced the volume of mixed herbicide solutions applied. Applications of both water-based foliar and oil-based basal stem applications are common practices.

Traditionally the herbicides used in UVM have been supplied in concentrated forms in non-returnable containers. This requires handling open containers of concentrate on job sites, as herbicides are measured and mixed in spray tanks. Advances such as low volume application techniques and the herbicide formulations being prescribed have made it practical for the UVM industry to consider the adoption of ready-to-use and dilute concentrates in closed delivery systems, as yet another adoption of practices that further protect the applicator and the environment. Not only are these safety measures enhanced, but also businesses can save time and money by switching to these types of products.

This BMP is intended to establish an end-to-end strategy for managing the chain of custody for herbicides from Producer to Custom Blender, Distributor, and Applicator to the Utility. The concept of a “Closed Chain of Custody” as used in this project is focused on the end-to-end “Supply Chain”, and includes the logistical aspects of herbicide shipping, distribution, storage and mixing. It also addresses management of the waste stream and the return of empty containers for refilling and reuse as part of reducing plastic containers as part of the waste stream.

There are three important elements to the “Closed Chain of Custody” as defined in this Best Management Practice:

1. The use of supply containers that are returned, refilled, and reused – the container cycle.

2. The use of closed connections at the transfer points between supply container, mix tank, and application equipment- the integrity cycle.
3. The use of a container tracking system establishing an auditable record documenting movement of herbicides and containers – the documentation cycle.

Table of Contents

Glossary of Terms	6
Purpose of this Best Management Practice	8
Introduction	10
Intended Scope	10
Regulatory Compliance	10
Safety	11
Use of Returnable Reusable Supply Containers	11
Use of Reusable Service Containers.....	12
Use of Closed Connections at Transfer Points.....	13
Measuring Quantities of Custom Blends	14
Closed System Measuring.....	15
Herbicide Formulations Being Supplied.....	15
Mixing.....	17
Tracking and Record Keeping	17
Inventory Management	18
Applicator Handling of Empty R/R Closed Supply Containers.....	19
Refilling Returnable Reusable Closed Supply Containers by Custom Blender	20
Decommissioning R/R Closed Supply Containers at End of Service Life.	20
Use of Traditional One-Way Disposable, Open Containers.....	21
Commercial Considerations.....	22
Quality Compliance Audits.....	22

Glossary of Terms

The following terms are used extensively in defining the requirements of this Best Management Practice.

Adjuvant - Any additive to the herbicide formulation or mixture that is intended to enhance efficacy or application characteristics including emulsifiers, surfactants, drift control agents, and dyes.

Applicator - The person or company who is responsible for making the actual application of herbicides to utility rights-of-way (ROW). In most cases Applicators purchase herbicides from Distributors. The Applicator typically is under contract with the Utility. Alternatively, the Applicator may be an in-house organization within the Utility.

***Important note:** There is a regulatory distinction between “Applicator” and “Mixer/loader”. These terms have different meaning with respect to regulatory statute and the way the human health assessments are conducted. In the UVM industry the same personnel typically mix, load, and apply herbicides. It should be recognized that much of this BMP addresses “Mixer/Loader” practices.*

Best Management Practice (BMP) – This document establishes contemporary policies, procedures, and practices for use in the utility vegetation management industry in managing transportation logistics, herbicide transfer and applications, and the use and fate of containers.

Closed Connection – A means of connecting and transferring herbicides between containers in which there is no open access to the mixture being transferred. Closed connections typically involve use of mechanical interlocks and valves.

Closed System – An end-to-end process that eliminates the need for open access to herbicides and adjuvants through the preparation of ready to apply the mixtures.

Chain of Custody – An end-to-end process of documented ownership responsibilities for herbicides and adjuvants from production through application, and the fate of containers and waste products.

Custom Blend – A herbicide blend of registered active ingredients, adjuvants, and diluents that is created on demand for a specific Applicator and specific project. Custom Blends can be Dilute Concentrates or Ready To Apply mixes. Custom Blends are typically provided in Returnable Reusable Closed Supply Containers.

Custom Blender - The stakeholder who is responsible for creating and supplying Custom Blends to Applicators. Custom Blenders manage a fleet of Returnable Reusable Closed Supply Container used in supplying Custom Blends to Applicators. A Custom Blender providing Custom Blends to the open marketplace is a “repackager” per the regulatory definition in the Federal Insecticide Fungicide and Rodenticide Act

(FIFRA), and is recognized as a Registered Establishment. A custom blending operation owned by an Applicator that supplies Custom Blends for the exclusive use of the Applicator's own crews may not be a Registered Establishment.

Diluents – A medium such as water or oil used to dilute the concentrations of active ingredients in a herbicide mixture.

Dilute Concentrate – A Custom Blend containing a combination of registered active ingredients, adjuvants, and diluents produced for a specific Applicator and project. Dilute Concentrates are further diluted by the Applicator in preparing the required application mixture and rate in their mix or spray tank.

Distributor - The stakeholder to the process who is responsible for receiving orders for herbicides from Applicators, and sometimes directly from Utilities. Distributors may provide registered herbicide products in one-way disposable containers to Applicators or supply Custom Blends through a relationship with a Custom Blender.

Emulsifier - A substance that promotes the suspension of one liquid in another.

Mix Tank - A tank used by an Applicator to prepare the required mixture and rate for an application-ready mixture. This tank is used as an intermediary tank typically used to supply ready to apply formulations to the supply tank which is part of the application equipment.

Mixer/Loader – See note under definition of “Applicator”.

Product – A registered herbicide product delivered by the Producer. Registered herbicide Products are supported by their own product chemistry documentation, and are labelled for specific uses.

Producer - The stakeholder to the process who formulates registered active ingredients. Producers provide Distributors with registered products for sale, and also maintain bulk quantities of products with Custom Blenders for storage and use in Custom Blends.

Ready to Apply (RTA) - RTA formulations are created on demand by Custom Blenders and are intended for use by a specific Applicator on a project. They contain active ingredients, adjuvants, dilutants, and are supplied as an application-ready formulation. They are supplied as mixtures of registered products diluted to the required concentration as required by an Applicator for a project.

Ready to Use (RTU) - RTU formulations are labelled products that are registered for a specific use and are diluted, unique formulations. Their registration is supported by their own product chemistry documentation packages and thus can only come from producers. They contain active ingredients, adjuvants, dilutants, and are supplied as an application-ready formulation.

Returnable Reusable Supply Container - A durable container with open access to contents that is intended for repeated use as a Supply Container. These containers may be used by Custom Blenders to supply Custom Blends to Applicators. Regulations for reusable containers include the requirement that they be fitted with a tamper evident seal.

Returnable Reusable Closed Supply Container – A durable container fitted with a closed interlock valve that is intended for repeated use as a Supply Container. These containers are commonly used by Custom Blenders to supply Custom Blends to Applicators. Regulations for reusable containers include the requirement that they be fitted with a tamper evident seal.

Rinsate – The product of triple rinsing supply containers as part of the preparation for their disposal or recycling.

Service Container - A reusable container used by an Applicator within their operations to transport small quantities of herbicides from Supply Containers or mix tanks to remote crew locations. Service containers are not shipped by common carrier.

Spray Tank – The application equipment supply tank that contains a herbicide mixture at the rate and concentration required for applications. Mixing and dilution may be accomplished in the Spray Tank or in an intermediary Mix Tank.

Supply Container – A container in which herbicides are provided to Applicators. Custom Blends of Dilute Concentrates and Ready to Apply herbicides may be provided in Returnable Reusable (R/R) Closed Supply Containers. Registered straight goods and Ready to Use products are typically provided in one-way disposable package good containers or returnable reusable mini-bulk containers. It is also possible for a registered herbicide concentrate to be provide in Returnable Reusable (R/R) Closed Supply Containers.

Surfactant - A material that improves the emulsifying, dispersing, spreading, wetting or other properties of a liquid by modifying its surface characteristics.

Utility Owner - The stakeholder to the process who is the asset owner and in most cases the asset manager, the asset being the right-of-way corridor being maintained. The Utility typically retains the services of a commercial Applicator by written contract that establishes specific work performance standards that must be complied with.

Purpose of this Best Management Practice

The Utility Arborist Association believes that this BMP is a demonstration of proactive industry self-regulation and a clear demonstration of the UAA's commitment to environmental stewardship. The BMP aligns with the United States Environmental Protection Agency's (EPA) interest in promoting the use of closed

systems and container recycling. A number of benefits to the UVM industry, government, and utilities are realized by the adoption of this BMP as part of normal operations.

Maintaining closed connections at transfer points throughout the transportation, filling, and application system as herbicides move from Supply Containers to mix tanks and application equipment reduces mixer/handler and applicator exposure to herbicides. The use of custom blends of dilute concentrates and ready to apply formulations reduces potential exposure to concentrated herbicide products.

The use of all-inclusive custom blends of dilute concentrates reduces the likelihood of errors in measuring the proper quantity and during mixing operations. It also assures integrity of the intended formulations including active ingredients, diluents, and adjuvants by reducing the likelihood of unauthorized changes in rates and/or substitutions. When dilute concentrates are supplied in volumes that match spray tank requirements, the need for measuring can be eliminated, just as they are in the case of ready to apply formulations.

Improvements in crew productivity and the cost effectiveness of vegetation maintenance are available through the adoption of the policies, procedures, and practices in this BMP. The use of custom blends reduces the time required to prepare a ready to apply mix. The use of returnable reusable containers eliminates the need for the crew to triple rinse and dispose of empty containers. In contrast, reusable containers must be collected and returned. These practices enable the crew to spend more time making applications and reduce down time.

This BMP creates favorable environmental benefits and is a demonstration of commitment to environmental stewardship. The use of returnable reusable supply containers reduces the volume of the waste stream associated with UVM operations. There is a reduction in the number of one-way containers that must be disposed in a landfill. Secondly, there is a reduction in the volume of rinsate generated by a spray crew because returnable reusable supply containers eliminate the need for triple rinsing of empty containers before refilling. The volume of rinsate generated by the use of conventional open one-way disposable containers is significant, though it can be reused as part of the diluent in the next batch of mix being prepared.

Provisions within this BMP also are an effective means of risk mitigation. The use of closed connections at transfer points may reduce the likelihood of leaks and spills during handling, mixing and loading operations. The use of robust returnable reusable supply containers reduces the likelihood of damage resulting in a leaking container. There is also a reduction in the risk of unintended regulatory non-compliance, either due to application of off-label rates or improper disposal of rinsates and empty containers.

Introduction

This BMP is the fourth to be produced by the Utility Arborist Association. The other references that are published by UAA include:

- ❑ *“BMP Utility Pruning of Trees”, 2004*
- ❑ *“BMP Integrated Vegetation Management”, 2007*
- ❑ *“BMP Western Hazard Tree Mitigation”, 2009*

This BMP establishes an end-to-end strategy for managing the Chain of Custody for herbicides used in UVM programs from Producer to Distributor, Custom Blender, Applicator, Utility owner of transmission and distribution ROW. It also includes the return and reuse of empty containers. It is intended to provide Utility asset owners with a useful resource that can be incorporated by reference in procurement of vegetation maintenance services that involve the application of herbicides. This BMP is intended to increase the level of professionalism and environmental stewardship demonstrated by UVM programs.

Intended Scope

The BMP is intended for use in dedicated herbicide application programs and operations typically involving specialized crews. This includes herbicide application to all aspects of UVM including transmission and distribution ROW, substations, storage yards and related industrial sites. Several elements of the BMP may also apply to line clearance tree pruning crews making occasional use of herbicides such as cut stump treatment and incidental basal application.

There are three important elements to the “Closed Chain of Custody” as defined in this BMP:

1. The use of Supply Containers that are returned, refilled, and reused.
2. The use of Closed Connections at the transfer points between supply container, mix tank, and application equipment
3. The use of a container tracking system that establishes an auditable record documenting movement of herbicides and containers.

Regulatory Compliance

This BMP was developed by the UAA in an effort to establish a proactive strategy incorporating future regulatory trend in to the art and practice of UVM. The following regulatory developments were considered in developing this BMP:

- ❑ 2006 – New container regulations and guidance on custom formulations.
- ❑ 2007 – New labelling requirements including more specific references to appropriate container disposal.
- ❑ 2009 – Proposed recycling initiative, which is currently tabled.
- ❑ 2011 – New regulations related to use of reusable containers.

The provisions of this BMP are intended to be compliant with current federal and state regulatory requirements.

Applicators shall conform to all label instructions of the registered herbicides being applied. This includes, but may not be limited to transport, handling, mixing, application, and disposal.

Regulations change; if the BMP is found to be inconsistent with current regulations, the regulatory requirements supersede the BMP's stated practices.

Safety

Safety is a paramount objective of this BMP. Elements of this BMP are expected to enhance safety within the Applicator's work environment. The use of closed connections and all-inclusive custom blends reduces applicator exposure to concentrated herbicides. However, the need for the personal protective equipment required on the herbicide labels is unchanged.

The use of a closed system significantly reduces most exposure-related risk. However care should be taken when connecting and disconnecting closed connections with Supply Containers that may have become pressurized when exposed to direct sunlight or due to changing temperatures.

An Applicator's health risk related to herbicide use is a function of the toxicity, frequency, and duration of exposure. The toxicity of the herbicides commonly used in UVM is low relative to other pesticides. The use of the Closed System should further reduce risk by reducing the likelihood of applicator exposure. Lessening any exposure is always a worthwhile goal.

Increased accuracy in the rates of active ingredients in the herbicide mixtures being applied will enhance the safety of the general public and the environment from UVM applications. The use of a closed system should reduce the likelihood of leaks and spills during handling, transferring, and mixing processes. The use of Custom Blends decreases the likelihood of errors in mixing and application.

Use of Returnable Reusable Supply Containers

This BMP promotes the use of Returnable Reusable (R/R) Supply Containers that are returnable, reusable, and ultimately recyclable. There are inherent advantages associated with the use of R/R Supply Containers. R/R Supply Containers are filled by Custom Blenders and are the vessels in which custom blends are provided to the Applicator.

R/R Supply Containers meet UN/DOT Class II requirements. They have an expected service life of 5 years or 30 return cycles. They are typically made of recyclable translucent chemical resistant plastics, although some limited use of steel containers has occurred in the UVM industry. At the end of their service life they are recycled.

As required under the returnable container regulation, effective August 2011, each R/R Supply Container must have a unique identification number and a tamper-evident seal.

Each R/R Supply Container is labeled per regulatory requirements, including EPA product registration numbers and labels for all registered herbicide products contained within. Labeling also includes:

- ❑ The concentrations of all ingredients including active ingredients, diluents, and adjuvants.
- ❑ A reference to the specific lot or batch contained therein.
- ❑ Mixing/dilution instructions specific to the spray tank size in which it will be used. This may be expressed in either the graduated units on the Supply Container or as a ratio.
- ❑ The Utility and Applicator. The regulation requires designation of the "Owner". In this case the Utility is the Owner and the Applicator is an Owner's Agent.

Each R/R Supply Container is graduated with English and metric unit scales of sufficient detail to allow accurate determination of volume of liquid content. Containers should be sufficiently translucent to allow the user to determine the level (volume) of liquid contents.

When practical, the preferred R/R Supply Container should be of a size that facilitates the use of a 1:1 ratio of container contents to intended mix or spray tank volume. This can also be accomplished by use of Service Containers.

Use of Reusable Service Containers

The BMP recognizes the need for and use of Service Containers. Service Containers are intended to be reusable and refilled by the applicator, and are used to provide small quantities of herbicide solutions from larger containers to crews. Service containers are used within an Applicator's operations for intra-company transport of herbicides. If someone other than the Applicator transports these herbicides the container is not a service container, and is subject to UN/DOT class II container and hazardous waste regulations.

Service Containers may be used as an intermediary vessel facilitating the goal of a 1:1 ratio between containers containing custom blend and mix or spray tank. The intent is to eliminate the need for measuring by spray crews in the field.

Service Containers should be durable enough to survive repeated refilling and use over their intended service life.

The reuse of a one-way disposable container as a “service container” is inconsistent with federal regulations and this BMP. Any container that comes from producer as a package good container is labeled “do not reuse”, and must be disposed whenever it is emptied and tripled-rinsed.

Service Containers typically have 2.5 gallon and 5 gallon capacities.

Use of Closed Connections at Transfer Points

This BMP is intended to promote the use of closed interlock valve connections at each transfer point where herbicide is being moved from one container to another container or tank, including application equipment supply. There are advantages with the use of R/R Closed Supply Containers.

There should be a closed connection fitting or valve on each R/R Closed Supply Container. A closed connection involves a positive interlock valve or fitting. It is a mechanical, leak-proof connection.

The R/R Closed Supply Container should be filled through a closed connection at the Custom Blender. The integrity of the closed connection should be inspected at regular intervals and maintained at all times. Effective in August 2011 a tamper-evident seal must be maintained on all R/R Supply Containers, as required under the returnable container regulations. This is typically accomplished by affixing the seal to the closed connection valve.

There should be a closed connection between Supply Container and the Applicator's equipment. This includes maintaining a closed connection:

- ❑ Between Supply Container and Spray Tank associated with application equipment.
- ❑ Between Supply Container and any Mix Tank used as an intermediate tank used to supply application equipment Spray Tanks.
- ❑ Between an Mix Tank, if used, and the application equipment Spray Tank.

The preferred practice includes a closed connection between the mix tank (or in the case of Ready to Apply formulation the Supply Container) and backpack or other small spray equipment receiving an application-ready mixture.

If Service Containers are used to supply spray crews in the field, the preferred method is that they should be fitted with a closed connection valve or fitting that is used for filling. Transfers of herbicides into the Service Container should be made through a closed connection. However, transfer from the Service Container to application equipment may be done via an open pour since, at this time, there is no practical means of use of a closed container for drawing out the contents of a Service Container. The use of closed connections for filling of Service Containers used to supply line clearance tree crews making incidental use of herbicides is a preferred practice.

The addition of supplemental adjuvants such as surfactants and drift control agents may be added to the mix or spray tank on an as-needed basis through an open (non-closed) connection. It also may be necessary to increase the rate of active ingredients in a spray mixture to achieve the desired level of control on a specific site and/or hard to control target species. When this becomes necessary the supplemental active ingredient may be added to the mix or spray tank through an open connection.

Products that do not go into solution but occur as suspensions in the spray mix such as dry flowables may be added to the mix or spray tank through an open connection.

Adding supplemental additions to the mix or spray tank through an open connection should occur on the ROW job site.

Measuring Quantities of Custom Blends

The intent of this BMP is to reduce or eliminate the need for field measurement of quantities of the individual herbicides and adjuvants contained in the specific spray mix.

Custom Blends supplied in the form of Ready to Apply formulations do not require measuring and mixing prior to use.

The preferred method is to use Custom Blends in R/R Closed Supply Containers with capacities and at concentrations that result in a 1:1 ratio of a Supply Container volume to Mix Tank or Spray Tank volume. This eliminates the need to do any measuring because the entire contents of the Supply Container are added to the mix tank or spray tank. This can also be accomplished by using a Service Container.

There are two reasons why it may not be possible or practical to achieve the preferred 1:1 ratio of Service Container volume to mix or spray tank volume:

1. Supply Container Contains More: It may be necessary to use a partial quantity of the volume of Custom Blend contained in a R/R Closed Supply Container. This occurs when the custom blend is supplied at concentrations or volumes higher than that which would result in a 1:1 ratio of contents of the Supply Container to mix or spray tank. In this case, the amount of Dilute Concentrate required to make up a full tank of application-ready mixture should be measured in full units, and the units should be consistent with the graduated markings on the supply container. If the quantities required are less than full units as marked on the R/R Closed Supply Container, it may be necessary to use a Service Container or other intermediate tank with finer unit gradations.
2. Less Than Full Spray Tank Required: It may be necessary to mix in quantities smaller than that of a full mix or spray tank. This will result in

the need for less than a full R/R Closed Supply Container of Dilute Concentrate. In this case the amount of Dilute Concentrate required should be measured in whole unit volumes consistent with the graduated unit markings on the supply container. If the quantities required are less than full units as marked on the Supply Container, it may be necessary to use a Service Container or other intermediate tank with finer unit gradations. The volume of any existing spray mixture in the spray or mix tank should be determined. The volume of diluents being added to the partial tank should be determined by measurement. It is important to accurately measure not only the active ingredients, but also the quantity of diluents (water, oil) being added to the mix or spray tank.

Closed System Measuring

The intent of this BMP is to maintain closed connections between Supply Containers and Applicator equipment during the process of measuring quantities of Dilute Concentrates. This reduces applicator exposure and chance of spills.

The preferred method is to maintain a closed system during the measuring process as a Concentrate or Dilute Concentrate is transferred from R/R Closed Supply Container to mix or spray tank. This can be accomplished through the use of:

- ❑ Intermediate fixed volume transfer vessels of known volume such as cone tanks with volumetric measures of sufficient detail to allow the applicator to determine whole unit quantities.
- ❑ Graduated/calibrated flow transfer pumps or flow meters.
- ❑ Translucent graduated Supply Containers and mix/spray tanks, which allow the applicator to determine liquid levels and the volumes of herbicide, diluent, and adjuvant being transferred.

Herbicide Formulations Being Supplied

The full benefit of R/R Closed Supply Containers is more likely realized with Utilities and Applicators focusing on a few basic core mixes for their specific programs and projects. The intent of the BMP is to encourage increased standardization within individual operations. This BMP also acknowledges the need for an adaptive IVM strategy that anticipates the need to make changes in application-ready mixtures at the time of application due to changing weather and/or site conditions.

The use of Ready to Use Products and Ready to Apply Custom Blends are preferred for Low Volume Basal including cut surface applications.

The use of Dilute Concentrates is preferred for Low Volume Foliar, High Volume (Hydraulic) Foliar, and Aerial applications.

There will be a continued need for some use of concentrated forms of herbicides. These products are commonly referred to as “package goods” and are typically provided in one-way disposable containers. This may typically occur when the Applicator is treating small projects of limited scope and scale, or when the mixture in the R&R container will not effectively control an unexpected brush species.

The intent of this BMP is that the herbicide formulations being supplied are as complete and all-inclusive as possible. As such, Custom Blended Dilute Concentrates should:

- ❑ Contain all active ingredients that will remain in stable solution.
- ❑ Contain all necessary adjuvants intended to enhance stability and efficacy of the mixture.

Drift control agents may be added to the mix/spray tank at the time of use on an as-needed basis. Additional Surfactants may be added to the tank at the time of mixing to address unique efficacy concerns; i.e., late season applications or drought conditions. Additional active ingredients may be added on occasion to address site- or species-specific concerns.

Some forms of concentrates such as dry flowables that do not stay in suspension may have to be added to the tank at the time of mixing.

Paraffin-oil based foliar mix carriers (e.g. “Thinvert”) act as both a surfactant and drift control agent. These formulations require additional field agitation to assure that the carrier and active ingredients are in an optimum suspension.

The stability of the Custom Blend Dilute Concentrate formulations being supplied should be well established and/or demonstrated; uniform color and no layering visible.

Dilute Concentrates are intended for use in a timely manner, and should not be held in inventory for longer than a spray season. A dilute concentrate should generally be expected to remain stable for two years.

Closed packaging of dry flowables in small volumes that match individual spray or mix tank volume requirements is desirable.

This BMP acknowledges that some herbicide formulations used in the UVM industry are in granular or other dry forms that cannot be incorporated in to Custom Blends. A longer-term goal for the industry would be to develop a means of formulating dry flowables that would stay suspended in a Dilute Concentrate form and be able to be included in R/R Closed Supply Containers.

Mixing

The addition of Concentrates and Dilute Concentrates to the spray tank should occur on the ROW job site. Filling of spray equipment from Supply Containers containing RTU and RTA formulations should also occur only on the job site.

Mixing should not be done at any location where water being used as a diluent is acquired. Mixing should only be done on the job site, and at least 100 feet away from water crossings and wetlands.

Label instructions establish mixing requirements. In general the proper order of adding components is:

1. Half fill tank with diluents (water or basal oil)
2. Add Concentrate or Dilute Concentrate to the tank.
3. Add any supplemental adjuvants (e.g. surfactant, drift control agent, etc).
4. Add remainder of diluents to correct final fill volume.

Maintain a visible air gap between a water supply line and mix/spray tank. The use of an anti-siphon check valve is a preferred practice when acquiring water.

Tracking and Record Keeping

This BMP is intended to create an auditable record documenting the movement of herbicides and containers through the Chain of Custody from Producer, through Distributor, Custom Blender, Utility, Applicator, and return of empty containers to Custom Blender.

Tracking data should be maintained in a reasonably timely manner. The R/R Closed Supply Container should be tracked by its unique identification number. It would be preferable that the status of the contents (full, empty, partial) should also be tracked.

The following hand-off points along the supply chain may be useful in tracking the movement of R/R Closed Supply Containers and their contents, documenting the Chain of Custody for herbicides used in UVM:

- The order placed by an Applicator with a Distributor.
- Distributor refers order to Custom Blender
- Blending, filling and shipment of Supply Containers by the Custom Blender
- Tracking the status of a shipment may be available through a common carrier.
- Applicator receipt of shipment and placement in Applicator inventory.
- Allocation to a crew and/or job.
- Record of application made on job site.
- Status of empty container stored by Applicator
- Backhaul return of empty Returnable/Reusable Supply Containers to the Custom Blender.

The preferred method is that the tracking system be in the form of an electronic record that can be accessed remotely, such as an Internet-based system.

The industry's continued development of emerging information technologies such as use of bar coding, scanners, and other field-enabled technology represents emerging practices is encouraged. This would include automation of application records and the ability to tie the Supply Container and its contents to GIS coordinates of the application site. A geospatial record of application type indicating changes from general to wetland approved products for use near streams, lakes and seeps would aid in compliance with recent interpretation of Clean Water Act regulations as interpreted by the 6th Circuit Court. Ideally application data capability will include documentation related to temperature, relative humidity, wind speed and direction, and precipitation.

The Utility should have access to tracking data and documentation. Other stakeholders should have access to data, as appropriate to their needs. No open access to commercial/competitive information, nor is access by the general public to the data is intended. This BMP does not require or encourage the tracking of commercial information such as cost and pricing information.

Routine summary reports should be available. The tracking system should also have interactive lookup capability, and allow interrogation.

Inventory Management

This BMP is intended to create a system that allows an applicator to reduce the quantity of herbicide stored in inventory at any given time. This applies to herbicides in R/R Closed Supply Containers and in traditional one-way disposable containers.

The preferred practice is to adopt a "just-in-time" approach to inventory management where sufficient inventory is available on-site to provide for immediate and short-term needs. General guidelines include:

- Store no more than three weeks' supply on hand at any given time to meet anticipated demand.
- Store no more than 1/2 of the estimated job requirement on hand at any given time, unless it will be used within a few days.

Regulations related to custom blends prohibit Custom Blenders from producing Dilute Concentrates on a speculative basis. Dilute Concentrates are only produced when ordered for a specific Owner (Utility or Applicator as Owner's Agent) and purpose, and are shipped soon thereafter. Common carriers are typically able to provide reasonably accurate and reliable estimates of shipping times. The stability of some Custom Blends deteriorates over time. These factors should be considered when placing orders, and support a move to "just in time" inventory management.

It is recommended that users minimize the number of Supply Containers of Dilute Concentrates - such as foliar mixes - that are carried over dormant seasons when

foliar applications are not possible. Likewise, the user should minimize the number of Supply Containers of Ready to Apply basal mixes during periods when no basal or cut surface applications are being made. The same should be true of concentrated packaged goods in one-way disposable containers. They should not be carried in inventory for long periods of time.

Minimize the number of partially full containers. The recommendation applies to both R/R Closed Supply Containers and one-way disposable containers.

The inventory of herbicides should be held in secure storage with access restricted to authorized, qualified personnel. This applies both to a permanent storage at a central location and any inventory in transit and assigned to specific crews and projects. Herbicide inventory should not be accessible by the general public. These requirements apply equally to full, partially full, and empty containers.

R/R Closed Supply Containers should not be stored for long periods of time in direct sunlight. Intense sunlight may compromise container integrity and the chemical stability of container contents.

Adequate inventory controls including processes and maintenance of documentation should be in place.

The unique ID numbers assigned to Returnable/Reusable Supply Containers can be used to maintain inventory records and may include status of contents (e.g., full, partial, empty).

Applicator Handling of Empty R/R Closed Supply Containers

This BMP is intended to promote a reasonable standard of care for R/R Closed Supply Containers, and to facilitate their timely return to the Custom Blender for refilling and reuse.

Care should be taken to minimize container damage, wear and tear.

It is important to maintain integrity of container closure if it is to be reused. No additional openings should be made, such as puncturing or removal of the closed interlock valve.

It is important to preserve the integrity of any tamper-evident seals.

R/R Closed Supply Containers cannot be refilled by Applicators or Distributors, nor are they to be used for any other purposes.

Empty R/R Closed Supply Containers must be returned to Custom Blenders within 30 days. The goal of a timely return of empties is less than 30-day turn, with a target not to exceed 60 days. Empty containers may be held by the Applicator until a full pallet

of containers is accumulated for shipment. Empty R/R Closed Supply Containers should not be stored for long periods of time in direct sunlight.

Applicators should designate key contacts and job/drop locations for staging empty containers of all types.

Refilling Returnable Reusable Closed Supply Containers by Custom Blender

This BMP is intended to be consistent with all regulations governing the use of reusable containers.

A specific Custom Blender manages each fleet of R/R Closed Supply Containers and is responsible for all aspects of inspection and refilled.

R/R Closed Supply Containers are inspected to assure the integrity of each vessel and closure system, including tamper-evident seals, prior to refilling and reuse. They are pressure tested per UN/DOT Class II regulations prior to being put in service.

R/R Closed Supply Containers are “*product-dedicated*”. They can only be refilled with the same basic custom blended herbicide formulations that they originally contained, including the same active ingredients and similar diluents, without triple rinsing. Otherwise the Custom Blender must triple rinse and thoroughly clean tanks, valves, and other components before refilling and re-use with different products.

Regulations preclude Custom Blenders from preparing Custom blends on a speculative basis and holding them in inventory in anticipation of an order. R/R Closed Supply Containers are only refilled with custom blends when an Applicator’s order is placed with the Distributor and relayed to the Custom Blender. They are filled with formulations specified by the Applicator for a specific purpose.

Any prior labeling is removed and the refilled container receives new labeling specific to the contents of the R/R Closed Supply Container.

At the end of service life (5 years or 30 turns) the container is retired and decommissioned.

Decommissioning R/R Closed Supply Containers at End of Service Life.

This BMP is intended to promote the recycling of R/R Closed Supply Containers that have reached the end of their useful service life.

The closed connection valve is removed. When practical, it is refurbished and, if possible, returned to service on a new R/R container.

The returnable reusable vessel being retired is not to be re-purposed in any way. It should be rendered unusable and it, as well as the other plastic parts such as the sump, should be recycled.

The R/R Closed Supply Container's unique ID number should be retired. It should not be reissued to a new container. A record of the ultimate disposal of the container and number should be maintained.

The Custom Blender is responsible for decommissioning and disposal of their R/R Closed Supply Containers. Decommission tasks are completed at the Custom Blender's facilities, not in the field.

Use of Traditional One-Way Disposable, Open Containers.

Financial analysis has demonstrated that this BMP can be adopted without the industry incurring any additional cost. However, some package good products supplied in single use disposable one-way containers will continue to be used in the UVM industry. Examples of where it is appropriate to use traditional one-way disposable, open containers include:

- When the requirements of a small project result in the need to mix small quantities involving less than 60 gallons (4 -15 gallon containers) of Dilute Concentrate.
- When an Applicator expects to use less than 270 gallons (two pallets of 9 - 15 gallon containers) of dilute concentrate per year
- Short interval immediate demand, where there would be no time to order and receive a custom blend.
- When there is a need to add additional Active Ingredients to control a specific species.
- When using a dry flowable that is otherwise unstable in a custom blend.

When single use disposable one-way containers are used they should be stored, used, and disposed of properly in a manner consistent with label requirements.

Empty one-way containers require triple rinsing per regulations that require:

- Container to be filled to 25% volume for each of three rinses to achieve 99% decontamination. This means that the total volume of rinsate will be the equivalent of 75% of the volume of each one-way container.
- Rinsing be done "promptly", reducing the practice of gathering up and storing empties for rinsing later off-site in large batches.

The preferred method of disposing of rinsate generated from triple rinsing one-way disposable containers is to rinse them on the job site, pour the rinsate into the spray tank as part of the required diluent, and apply it properly on the job site.

One-way disposable containers should be rendered unusable by crushing, puncturing, or other means. The preferred method of final disposal of the one-way container is by recycling.

It may be possible to use the “jet rinse” process to prepare empty one-way containers for disposal. In this process the container is punctured and a high-pressure spray is directed to the inside of the container. It is an approved method of processing empty disposable containers in some regulatory jurisdictions.

One-way disposable containers used to supply herbicides as “package goods” are specifically precluded from reuse for any purpose and are not to be re-filled and used as a “Service Container”.

Commercial Considerations

This BMP is intended for use as a specific reference in Utility specifications for the procurement of vegetation management services under contracting with applicators. It may also be used in the establishment of standard work practices for a Utility’s in-house resources.

This BMP is intended for use by Applicators in purchase agreements for herbicides from Distributors, and flow-through orders from a Distributor to a Custom Blender.

The preferred method for acquiring herbicide concentrates, Custom Blends, and Ready to Use formulations is for them to be purchased directly by the Applicator from the Distributor. It is less common for herbicide concentrates, Custom Blends, and Ready to Use formulations to be purchased directly by a Utility and subsequently provided to the Applicator.

Quality Compliance Audits

Audits are recommended to assure consistency with the intended outcomes and this BMP. The recommended approach is to “trust but verify”.

Custom Blenders should have Quality Control processes in place and be able to provide documentation demonstrating that the Dilute Concentrates and Ready to Apply formulations being provided are of the required level of quality, contain all specific contents, and that no unauthorized substitutions were made.

Custom Blenders should have written agreements and protocols from the herbicide Producers that address specific quality control procedures that must be followed.

The Custom Blender should retain sample specimens of each batch of Dilute Concentrate produced for a specific Applicator and job. These samples should be retained through the end of the second growing season following the season of application. These samples should be available for analysis by the Producer, Distributor, Applicator or Owner upon request.

Distributors should have Quality Control processes in place and be able to provide documentation demonstrating that the Dilute Concentrates and Ready to Apply

formulations being ordered by the Applicator were accurately relayed to the Custom Blender, and that no unauthorized substitutions were made.

Applicators should have Quality Control processes in place and be able to provide documentation demonstrating that the Dilute Concentrates and Ready to Apply formulations specified by the Utility are what has been purchased and applied to the ROW, and that no unauthorized substitutions were made.

The Utility should have Quality Assurance processes in place that include the right to audit Custom Blenders' and Applicators' practices from order, through application and return of empty returnable/reusable container. The Utility and Applicator may audit the Custom Blender's facilities, or rely on audit reports from others.

Producers may audit Custom Blender facilities and assess the Dilute Concentrate and Ready to Apply formulations being produced.