APPENDIX N
AERIAL SPRAY GUIDELINES AND DRIFT MODEL RESULTS

AERIAL SPRAY GUIDELINES[1]

The following guidelines were taken from Aerial Herbicide Application for Noxious Weed Control in Northern Region (Kulla, A. 2003), Appendix F of the Lolo National Forest Big Game Winter Range and Burned Area Weed Management Final EIS (USFS. 2001b) and Appendix G of the Gallatin National Forest Noxious and Invasive Weed Control EIS. These guidelines are intended as a practical field guide for weed managers who may be considering use of aerial herbicide application as part of an integrated pest management program. Some of the terminology and work force, fiscal year, planning references are specific to Forest Service project planning. The information and observations in this guide are specific to large droplet liquid herbicide applications and does not address pellet, insecticide or other fine droplet aerial application projects.

Why Aerial Spray?

Scale: The impacts of weeds on native vegetation, wildlife, soils, fisheries, aesthetics, wilderness and a host of other resources are widely recognized by both the public and land managers. At the same time, the invasive plant problem in the northern Rockies has grown beyond the scale of ground based weed control.

While ground based and biological weed management practices still are important elements in an IWM program, they have site and species limitations. Ground based application methods such as truck, ATV, horseback, backpack or atomizer applications are generally most effective on:

- New or small infestations or
- Infestations on flat and/or open ground and
- Near a road or trail

Biological control alone, while effective and applicable in certain situations, is:

- Often cyclic,
- Not available for many weed species,
- Not as effective on weed infestations with several weed species and
- Not effective for small or pioneering infestations scattered over a large landscape.
- Not effective on complex terrain with a wide range of slope, aspect, soil and canopy combinations.

Aerial application is an efficient and useful method land mangers can add to their IWM toolboxes for weed infestations involving:

- Multiple weed species,
- At landscape scale, and
- On steep and remote areas

Cost: Aerial application reduces costs in at least two ways. Helicopter aerial application in the Northern Region costs around $10 to $15 / acre. Ground based applications can range from $25 / acre for truck based broadcast spraying to as high as $300 or more / acre for backpack applications. The lower application cost combined with the growing scale of the problem puts aerial application in a useful position when we consider that weed infestations are growing faster than any anticipated increases in weed budgets.

Access: Many wildland infestations are occurring in remote and/or very steep topography. Aerial application can quickly (in terms of application time), safely (in regards to applicator and public exposure) and efficiently (in terms of infested area coverage) treat infestations far from roads and trails and in steep or otherwise undrivable terrain.

Safety / Exposure: Aerial application improves safety and reduces worker and public exposure to herbicides.

Worker exposure and risk are influenced by the:

- Time a worker is exposed to a product,
- Physical proximity and exposure to a product,
- Personal protective equipment and safe handling practices,
- Toxicity of the product,
- Terrain, hazards, and weather in the treatment area.

Aerial application reduces application time and the time a worker is exposed to a product. It also reduces the number of applicators needed to accomplish a project and the chance of slips, falls and spills associated with ground based treatments in steep, remote or hazardous terrain.

[1] Aerial applications require an additional air safety plan, FHS 6709.11 (22.11b), 2109-14.

Public impacts are influenced by:

- The time it takes to treat an area and the resulting limitations on public use / access,
- Individual physical or philosophical sensitivity to a product, and
- Toxicity of the product.

Aerial application reduces the time that a treatment area is unavailable to the public. It also provides an aerial platform from which an applicator can see people who may have unknowingly entered a treatment area.

Weather and wind patterns also affect worker and public exposure. Aerial application reduces the potential for both worker and public exposure from weather related factors because you can accomplish more acres in less time and thereby capitalize on favorable weather conditions. Worker and public exposure are reduced when it takes less time to treat a larger area.

Efficacy: Aerial application allows a manager to quickly complete projects when the target weed(s) is at the most susceptible phenological stage and weather conditions are most favorable for efficacy. This maximization of efficacy factors can reduce the number and scale of follow up treatments.

Overgrazing and Grazing Animal Distribution: Lower application costs allow for more ecologically compatible weed management. With lower application costs, a manager can afford to treat a larger project area at once. Higher treatment costs may necessitate treatment of only a portion of a project area each year. This can inadvertently attract big game or livestock to the treated area and result in overgrazing. Overgrazing in turn can reduce the retreatment interval. By treating larger areas at one time, big game and livestock will be better distributed over a larger area as they express preference for the improved forage resulting from the treatment.

Reduced Wildlife Disturbance: The short operational time needed for aerial treatment minimizes wildlife disturbance and use of an area. Aerial applications may typically take only one operational day compared to a week to a month for ground-based treatments.

Visual Quality: Lower application costs that allow treatment of larger areas with a single entry reduce the visual impacts that result from annual treatment of only a portion of the project area. The color and texture of a landscape scale treatment is homogeneous rather than broken up by color, texture and straight lines.

Relation with Fire

The conditions that result from prescribed fire and wildfires are conditions that favor weeds. Open canopies, more direct sunlight to the ground, reduction of other competitive vegetation, soil damage from high heat, soil disturbance from fireline construction, and the potential introduction of weed seed from firefighters and firefighting equipment all favor the establishment of new weed species and the spread of weeds already found in an area.

Species-specific research to describe quantitative effects of fire on five weed species (spotted knapweed, sulfur cinquefoil, leafy spurge, Dalmatian toadflax and St. Johnswort) is being conducted on the Lolo NF in cooperation with the National Bison Range and the City of Missoula. Research is also underway to determine whether managers should burn and spray or spray and burn.

Aerial Spray Control Strategies

Weed management objective: Weed managers should develop realistic and obtainable weed management objectives before beginning a direct weed control program. Even selective herbicides will affect non-target forbs. The *effect of invasive weeds* on native or desirable vegetation needs to be recognized and considered in relation to the *effect of herbicides* on non-target vegetation. Aerial application is a general treatment and it can be difficult to avoid small or isolated non-target vegetation. Non-target vegetation can be flagged and smaller sites can be tarped to avoid treatment, but the effect of weed control on *individual* non-target plant species should be carefully weighed in relation to the effect of unchecked weed spread on the *overall population viability* of non-target species both on and off the treatment site.

The herbicides and rates used for weed control in the Northern Region are selective (depending on rate) and many do not generally kill woody vegetation or grasses. While woody vegetation may show short-term effects, widespread mortality or damage is uncommon. Forbs are the non-target plants most at risk from the use of wildland weed herbicides. Whether native forb impacts are long term or short term depends on the rate and frequency of treatment, which is influenced by size of the infestation and whether you have rhizomatous or non-rhizomatous weeds.

While an objective to *"Restore native plant communities"* may be desirable, it may be unrealistic or unobtainable on widespread or rhizomatous weed infestations. More realistic and obtainable objectives may include:

- Improving or protect existing or adjacent native plant communities,

- Improving wildlife forage areas,
- Preventing new weed species from establishing in an area,
- Containing or reducing the acreage of difficult to control weeds (such as rhizomatous species) and/or
- Controlling areas of weeds growing in large difficult terrain to access by ground.
- Controlling widespread weeds on areas with high resource value (such as concentrated public recreation areas, big game winter ranges, or adjacent to neighboring landowners with active weed control programs).

Spring vs. Fall Treatments

Both spring and fall treatments have advantages and disadvantages. Fall treatments have less effect on non-target forbs. Climatologically, the weather is more consistent in the fall, but may be consistently too cold, especially in the morning. A drawback is that there is greater annual variability in the fall treatment window. It is difficult to know (and plan) when the fall treatment window will arrive. On some years there may be no fall treatment window due to warm weather and no rainfall. If it does arrive, it may last only a week or as long as several weeks. The end of the fall window can arrive abruptly with the snowfall and cold windy weather.

The spring treatment window is relatively long and dependable in terms of start and end date and falls at a time when you know and can plan for budget and staff. The days are longer in the spring, which allows more application time (and acres) each day. Late sunset gives application operations the option of shutting down midday if the wind comes up and resuming in the evening when the wind dies down.

Both seasons can conflict with aircraft availability as a result of prescribed burning or wildfires.

Re-treatment Considerations

Before beginning an aerial treatment program, re-treatment needs, funding and scheduling should be considered. Keep in mind that the objective is not to simply kill the existing standing weed crop, but to:

- Restore and/or encourage desirable and competitive vegetation and
- Deplete the weed seed soil bank.

With these objectives in mind, a single treatment may be insufficient. As with all weed control methods, initial herbicide treatments should include planning for follow up treatments. Follow up treatment frequency should be influenced by the soil seed life of the most abundant and longest-lived weed on the site and the residual control provided by the herbicide selected. Spotted knapweed for example, has a soil seed life of about eight to 10 years. Once a treatment program begins, managers should plan for follow up treatments based on the soil seed life of the weeds present and the residual control of the herbicide selected.

For example, if spotted knapweed is being treated with picloram, a manager may consider follow up treatments every three growing seasons (the approximately residual control period for picloram) for three to four cycles (3 growing seasons x 3 to 4 cycles = 9 to 12 years – the approximately soil seed life for knapweed). Commitment to this program is important because if a cycle is missed and a weed seed crop is allowed to develop, the treatment cycle may have to be extended.

Pre-field Project Preparation

It is helpful to develop a checklist of the protection measures (Appendix C) and management requirements. This checklist should clearly identify tasks and provide a place to date and sign off as each task is completed. This checklist should be filed in the project file.

Some of the items that can go on the checklist include:

- Herbicide prescription, including site specific water quality risk assessment will need to be conducted (see Protection measures, Appendix C). Once the exact treatment areas are delineated in preparation for the contract, treatment acres can be determined for 6th hydrologic unit code (HUC) watersheds potentially affected by aerial application. These delineated areas can be incorporated into the risk assessment to estimate probable herbicide concentrations and allowable treatment acres. If concentrations exceed the recommended safe threshold, treatment acres would need to be reduced to the allowable amount.
- Pesticide Use Proposal
- Protection Measures from NEPA decision.
- Notification of neighbors (Note: neighboring landowners may want to treat their lands when they learn a project is scheduled next to them)
- Pretreatment monitoring plots (these plots should be established during the growing season prior to the treatment)
- Designation of Aerial Equipment Manager (helicopter manager)

- Recon and selection of a helibase (close to treatment area, good road access, away from waterways, reviewed and OK'd by pilot)
- Posting of the area to be treated
- Establish temporary closure orders, when needed.
- Identification and marking of sensitive areas to be avoided
- TES plant and animal considerations

Field Project Layout

It is difficult to pre-determine the treatment day due to weed phenology, weather, and aircraft availability. It is recommended that aerial spray projects be prepped well in advance (2 to 4 weeks) of the anticipated treatment date.

Ground Truthing: Treatment units should be carefully ground truthed prior to treatment to determine:

- Weed species and distribution
- Road system and any differences in roadside infestations in relation to off road infestations
- Herbicide prescription considering both weeds and native vegetation
- Live water, wet areas or other sensitive resources you want to avoid
- Overstory canopy closure

This information can be recorded on aerial photographs that include project boundaries and other adjacent or in holding ownerships. Two copies of these aerial photos should be made, one copy for the project manager and one set for the application pilot to have on board the aircraft. When possible, geo-reference the aerial photo information in order to be able to give the pilot GPS location information.

Buffers and No Treatment Areas: Buffer and no treatment areas should be established around any sensitive resource you want to avoid. These areas may include live water, wet areas, other land ownerships, TES plants or occupied areasAerial treatment buffer zones may vary depending on site characteristics. Treatments may also be designed to avoid any aerial treatment near sensitive resources (see Appendix C). . The width of an aerial treatment buffer zone near sensitive resources should consider:

- Slope (steeper = wider)
- Vegetation (less overstory vegetation = wider)
- Wind prescription (applications should be made only with low upslope winds)
- Overstory vegetation (which determines release height - higher release height = wider buffer)
- Use of a drift agent (no drift agent = wider buffer- drift reduction agents are recommended near buffer areas)
- Droplet size (smaller droplet size = wider buffer)
- Topographic position (narrow deep draws = wider buffer areas)
- Sensitivity of neighboring landowners (more sensitive = wider buffer)

Buffer Monitoring: Water sensitive "drift cards" can be placed as needed within the buffer zones to document herbicide placement. The number of drift card lines should be determined by the sensitivity of the resource and the size of the area. The number of card lines should be considered carefully because they are time intensive and require additional project staff. Cards should:

- Be placed equidistance within the buffer from the sensitive resource to the beginning of the treatment area.
- Have the Line # and location on the line recorded on each card at the time of placement.
- Be placed 10 feet to 10 yards apart depending on the width of the buffer area.
- Be placed on drift cardholders.
- Be placed immediately before application and picked up and stored in waterproof bags immediately after treatment.
- Not be placed the day or evening before early morning applications due to dew, fog or humidity contamination.
- Be laid out in a dry office setting in the order they were placed and interpreted as soon as practical. (Cards often come with interpretation information and sampling square templates.)
- Filed in waterproof bags in the project file.

It is critical that those placing drift cards be briefed on handling, placement, contamination, collection and storage of the cards. Those placing and picking up the cards should carefully check the card condition as they are placed and picked up and note any non-herbicide contamination. Contamination can include fog, high humidity, dew droplets off leaves, moisture on your hands, improper card handling, rodent urine or foot prints, wildlife or insect moisture and/or feeding on the cards.

If drift cards are used, card lines should also be placed in treatment areas under full spray conditions to serve as a reference for determining percentage of full spray on cards in buffer areas that have detection. The purpose of buffers

is to protect the resource that is at the end of the buffer area, so detection within the buffer areas may be acceptable as long as the sensitive area itself is protected.

In-stream water sampling has limitations in that it is expensive, should be sterile and automated to avoid contamination, only indicates whether herbicide reached a water way in detectable quantities, does not indicate how close herbicide may have come to the sensitive resource and is subject to dilution depending on stream volume and velocity.

Drift Mitigation Measures: Drift mitigation measures may include:

- Use of a drift agent
- Use of buffer areas next to sensitive resources
- On site weather monitoring
- Treatment next to sensitive areas when wind is upslope and gentle
- No treatment during inversions
- No treatment when winds in the project area are > 6 mph
- No treatment when weather forecasts predict rain in next 24 hours

Unit Marking Strategies: In agricultural or residential settings treatment area boundaries are clearly defined by fences, roads and / or buildings. Wildland project managers should identify treatment areas on the ground and be sure the application pilots know where treatment and no treatment areas are.

Wildland unit marking strategies fall into two general categories:

- Identification of specific treatment polygons and delineation of where *to treat* within a larger project area, or
- Identification of the general project area and delineation of areas *not to treat*.

Large wildland treatment areas that include many polygons and a mix of timbered and open areas may be difficult to mark and find from the air. If treatment units are large and there are only three to five in the project area it may be practical to mark each individual unit. If there are many units in a large area, it may be more efficient to mark the project area boundary and buffers and instruct the pilot *which areas not to treat* within the larger project area. The no treatment areas could include marked buffer areas (which would include waterways and wet areas), talus, rock and cliffs and areas with a closed overstory canopy.

On the Ground Unit Marking: Technology is rapidly developing that allows managers to mark treatment units digitally. On the ground block marking is the most expensive part of project layout and through the use of digital marking may be eventually eliminated. Some on the ground features and topography may require some degree of on the ground marking.

When on the ground marking is needed, uniform unit marking is recommended to ensure consistency between treatment blocks, different ranger districts and to reduce pilot workload. Unit marking can be done with high contrast, high strength flagging staked or rocked to the ground or with aerosol survey paint. Markings should be kept as simple as possible. Frequency of marking should depend on the specific site and site features. Some suggested unit markings are:

- Treatment unit boundary: The vertical line should be on the unit boundary with the perpendicular line pointing into the treatment unit. These markings can also be places were roads enter and leave the treatment units. A unit number can be added for further aerial orientation.
- A horizontal line to mark the edge of a buffer or area to be avoided. The line should be parallel to the feature inside the buffer area.

All ground marking schemes should be closely coordinated with the application pilot.

Digital Unit and Treatment Marking: GPS guided navigational devices are available that allow an aircraft to develop a digital treatment polygon file from either a recon flight or an on the ground unit layout. These digital shapes appear on a navigational screen in the aircraft and are used to guide the pilot to the units. GPS line files are collected for each spray swath and are displayed on the polygon on the screen during application. These swath lines can be printed after application to provide a digital map record of the treated area. The swath width can be loaded into the program to generate area treated based on swath length and width.

The aircraft recently used on the Lolo NF had the AgNav system. Additional information on this technology is available in *Demonstration of Aerial Spray Aircraft Navigation Systems in Deep Mountain Valleys*, A November 2001 “Tech Tip” by Dick Karsky at the Missoula Technology and Development Center (406.329.3921 or dkarsky@fs.fed.us)

Pretreatment Recon Flight: On or before treatment day, the pilot and project manager should fly the project area with aerial photos in hand to review and discuss treatment area, boundaries, other ownerships, buffer zones and on the ground marking. It is helpful for the project manager to GPS key project locations (such as unit corners or sensitive

areas) prior to the flight to allow the pilot and project manager to quickly and efficiently orient from within the aircraft. Things can look different from an aircraft than from the ground and this step can save flight time.

Equipment

Helicopter and fixed wing aircraft are available for aerial application work. Helicopters have been better suited to the steep topography and diverse vegetation. In 2002 the Lolo NF used a Bell 206 BIII, which carried 70 to 80 gallons of water and herbicide mix. Herbicide was applied in 2 gallons of water / acre. Each 70 to 80 gallon cycle treated 35 to 40 acres. Cycle times were about 15 to 30 minutes depending on the size of the treatment polygon and distance from the helibase. This equated to about 400 to 700 acres of treatment per day.

Aerial applicators typically come with a mix truck equipped with aviation fuel tanks, water tanks, a mix tank and a mix master. Water can be supplied by the Forest Service or by the applicator. Applicator mix trucks are not typically suited to travel over rough or steep forest roads so it is recommended to select a mix site / helibase with relatively easy road and water access. Forest Service rented water tenders can add expense to the project and Forest Service engines may be difficult to schedule during wildfire or prescribed burning season. Pump and hose fitting need to be compatible between Forest Service engines and mix trucks. Water should be clean or potable to avoid plugging up the spray system.

Field Staffing and Operations

Commercial aerial spray operations are typically conducted with two people: a pilot and a mix master. For safety, cost and public relations, project managers should try to minimize the number of people in the project area during spray operations. Additional people increase exposure and may have nothing to do, creating a negative public perception. Spray contractors should be allowed to conduct the operation with a minimal amount of interruption from project staff. All on the ground project staff should have radio communication with each other and the pilot. Suggested staffing is shown below.

TABLE N – 1. SUGGESTED PROJECT STAFFING AND DUTIES

Position	Duties	Location
Project Manager	Direct and oversee project; Recon flight; Answer pilot questions about the application; Ensure project is within weather prescriptions; Record loads, herbicide use and cycle times; Maintain contract diary; Monitor and document weather; Review and approve invoices; Ensure project mitigation measures are applied; Help with buffer monitoring; Maintain project file and complete the project report.	Helibase and throughout the project area
Aerial Equipment Manager	Oversee the flight operations; Develop communication plan; Review and brief pilot on Project Aviation Safety Plan; Assist Project Manager with load and weather monitoring and documentation.	Helibase
Drift Card / Buffer Monitors	Place and pick up drift cards; Monitor and record weather in buffer areas; Report on the ground weather to pilot and project manager when treating next to buffer zones.	In buffer areas
Traffic Managers / Public Information staff	Secure access to the project area; Prevent unauthorized public access to the project area during treatment; Answer questions and provide short briefings on the project objectives and operations.	Roads and/or trails leading into the project area.

All project staff should be briefed on the project objectives, operations and duties prior to treatment day. Written briefs are suggested for traffic management staff and any others likely to encounter the public. Boxes or satchels should be prepared with all the necessary equipment and forms each person will need to do their job. Project staff will typically report to the office as early as 0400 or 0500 hours to allow for travel to the project area, so it is suggested you have everything organized and ready to go the day before.

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Aerial Spray Recommendations

The treatment block should be marked with flagging to mark the block corners or clearly described and reviewed with applicator. It is be desirable to have a GPS system on board to record helicopter swaths, position, and boom on and off times and location.

In canyon areas, winds should follow the typical diurnal pattern of upslope during the day and down slope during the night. These diurnal winds result from heating and cooling of the surface. Clear skies with solar radiation reaching the surface during the day cause up canyon and upslope winds. Cooling that occurs after sunset generates upslope or drainage winds. Given that waterways/riparian areas are often located in the bottom of canyon areas, it is essential to avoid drift down canyon and downslope. Down canyon and downslope winds will likely occur on clear days following daytime hours. To prevent spray from drifting down canyon/downslope, winds should be up canyon and upslope. Also, inversion can result in spray drifting off site; winds indicate that an inversion is not present.

Avoid spray drift impacting non-target sites by taking the following steps (also see Appendix C Protection measures):

- When treating next to sensitive areas spray in the morning when up canyon and upslope winds are well established and blowing up canyon (most sensitive areas are down canyon). The specific time will need to be determined by real-time weather monitoring.
- Maintain boom pressure at less than 40psi.
- Monitor spray pressure during flight, since changes in pressure can change the application rates and may change the drop size.
- Use nozzles designed for medium to coarse droplet size (240 to 400 microns)
- Use drift agent to help maintain large droplet size.
- Check nozzles and review calibration with pilot.
- Begin the first swath 300 feet from any sensitive area.
- Mark boundaries so they are clearly understood by the pilot. Fly area with pilot prior to treatment to verify location. Use GPS to document boundaries and record treatment flight paths.
- Monitor treatment boundaries next to sensitive areas with spray deposit cards to detect any possible drift. Train people in how to handle the cards, interpret the cards (many things can contaminate the cards such as dew, moisture from hands, insects) and also document results. Card lines should also be placed in treated areas under full spray to serve as a reference.
- Monitor and record weather in the area. The weather should be monitored in real time for operational control and to help with the post-spray analysis. Strive for winds from 3 to 6 miles per hour or per label instruction. Do not treat if rain is predicted within next 24 hours.
- Consider using Forest Service Cramer-Barry-Grim (FSCBG) or AGDISP computer models to evaluate drift potential and to develop operational and drift protection measures prior to treatment.

Post Treatment Considerations and Tasks

Post treatment tasks may include:

- Monitor and document in the project file daily rainfall for up to a week after treatment
- Schedule reading of monitoring plots between 1 growing season and 1 year after treatment
- Read drift cards and complete a drift report
- Compile a treatment project file for reference for the next retreatment
- Add the project to the retreatment schedule
- Pick up ribbon and any other unit markings
- Complete contract daily diary and submitting original to the Contracting Officer
- Completing a Post Treatment Evaluation (FSH 2109.14 Ch 72.1)

FSM / FSH References

FSH 1909.15 Chapter 20 (Environmental Impacts Statements and Related Documents)
FSH 2080 Noxious Weeds
FSM 2100 Chapter 2150 Pesticide-Use Management and Coordination
R1 Supplement 2100-88-1 (some Forest may also have supplements)
FSM 2100 Chapter 2160 Hazardous Materials Management
FSH 2109-14 Pesticide Use
FSM 5711.11 Planning for Project Aviation Operations
FSH 6709.11 Health and Safety Code Handbook

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ITEMS TO BRING ON AERIAL SPRAY PROJECTS

- ❑ Drift cards
- ❑ Drift card holders
- ❑ Zip lock bags
- ❑ Sharpie pens to write on zip locks
- ❑ WR BA EIS, ROD, Maps (EIS has spill plan / labels / MSDSs)
- ❑ Project File
- ❑ Radios
- ❑ Extra Batteries
- ❑ Communication Plan
- ❑ Ribbon
- ❑ Blank Diary forms
- ❑ Aerial Photos
- ❑ Wind meters
- ❑ Camera
- ❑ Amendment 11 to Forest Plan
- ❑ Calculator

CONTENTS OF TREATMENT PROJECT FILE (Reference FSH2109.14 Chapter 72.1)

1. Name and location of the target pest

2. Treatment objectives

3. Date of treatment

4. Pesticide application
   a. Equipment malfunctions
   b. Pesticide formulation problems
   c. Overlaps and/or skips noted
   d. Weather conditions
   e. Application timing
   f. Treatment costs

5. Treatment success in terms of:
   a. Pest population reduction
   b. Foliage protection (from defoliators) or growth reduction (as a result fo herbicide use).
   c. Acres covered

6. Monitoring results

7. Recommendations for follow-up and/or future projects.

TABLE N – 2. DRIFT MONITORING SUPPLIES

Item	Specifications	Source
Deposit Paper	White Kromekote coated both sides 0.006 weight, size 16.9 x 11 cm = 1mm Detects dyed droplets	Nationwide papers (Paul) 345 Schwerin St. San Francisco, CA 94119 415.586.9160 or 800.652.1326 X215 FAX 415.239.7871
Water sensitive paper (Syngenta)	Product # 20301-1; size 3" x 1" – pack of 50 Product #20301-2; size 3" x 2" – pack of 50	Spraying Systems Co. North Ave at Schmale Road Wheaton, IL 60188 630.665.5000 or AgWest (Montana distributor) 800.452.0010
Holders for deposit papers	Kromekote card holder (white plastic) for 16.9 x 11 cm card	Rick and Carl Borbons Acrylonics Labs 666 Stockton #c San Jose, CA 95126 408.998.8339
Holders for deposit papers	Kromekote card holder (yellow or orange plastic) for 16.9 x 11 cm card ($3 + each)	E and F Plastics (Frank) 2756 Aiello Drive San Jose, CA 95111 408.226.6672

LOAD RECORD EXAMPLE

Aerial Spray Project Load Record

Contract Number: _____

Project Name: _____

Date: _____

Load #	Time Out	Time In	Unit	Prescription	Acres Trt'ed	Amt. Herbi	Cycle Time	Comments

Time	Location	Temp.	Wind / Direction	Rel. Humidity	Comments

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DRIFT MODEL RESULTS

AGDISP model predictions were conducted by Harold Thistle, Ph.D., USDA Forest Service, Morgantown, WV to assist in developing aerial spray strategies for proposed applications to control noxious weeds on the Custer National Forest. The predictions can be used to plan operational methodologies, determine size of buffer strips to prevent or minimize sensitive area contamination, and decide under which wind and other atmospheric conditions to conduct aerial spraying.

Three commonly used aircrafts in Western Montana are the: Bell 47 Soloy, Bell 206BIII, and Hiller 12E. Table N - 1 lists the AGDISP model inputs.

TABLE N - 1: SPRAY CONDITIONS— AGDISP MODEL INPUTS[2]

Spray Conditions	AGDISP Model Inputs for		
	Hiller 12E	**Bell 206BIII**	**Bell 47 Soloy**
Operating Speed	40 mph	80 mph	50 mph
Formulation	Tordon/Picloram	Tordon/Picloram	Tordon/Picloram
Application Rate	2 gal/acre	2 gal/acre	2 gal/acre
Swath Width	40 feet	45 feet	45 feet
Temperature	70 deg. F.	70 deg. F.	70 deg. F.
Relative Humidity	60%	60%	60%
Wind Speed	6mph	6mph	6mph
Nozzle Vertical Distance	-8.70 feet	-9.01 feet	-8.07 feet
Nozzle Type and Orientation	CP/0 degrees	TeeJet D4-46/0 degrees	D8 Jet/45 degrees
Number of Nozzles	29	35	16
Rotor Diameter	35.43 feet	33.37 feet	37.17 feet
Nozzles	Evenly spaced over 100% of the boom	Evenly spaced over 100% of the boom	Evenly spaced over 100% of the boom
Wind Directions Crosswind	45 degrees (where the direction of a north wind is 0 degrees)	45 degrees (where the direction of a north wind is 0 degrees).	45 degrees (where the direction of a north wind is 0 degrees)

TABLE N – 2. SUMMARY FROM FIVE SIMULATIONS SHOWING THE AMOUNT OF EXPECTED HERBICIDE (OZ/ACRES) AT 100 AND 300 FEET INTERVALS.[3]

	Spray Condition – Release Height & Projected Deposition					
Feet downwind	**O1 – 10 FT oz/ac**	**O1 - 25 FT oz/ac**	**O2 - 10 FT oz/ac**	**O2 - 25 FT oz/ac**	**O3 - 10 FT oz/ac**	**O3 - 25 FT oz/ac**
100 FT	0.176	0.510	0.643	0.552	0.552	0.913
300 FT	0.006	0.044	0.083	0.114	0.096	0.206

Modeling runs demonstrate that:

- Most of the spray is deposited in the treatment block;
- There would be essentially no deposition in the sensitive areas with a buffer of 300 feet.

[2] Release Height – 10 and 25 Feet Above Ground
[3] The application rate is 2 gallons per acre.