HIP III HERBICIDE HANDBOOK

CONSERVATION MEASURES FOR INVASIVE PLANT CONTROL

Version 1.07

TABLE OF CONTENTS

Introduction

This handbook describes conservation measures (CMs) to minimize and/or avoid the exposure of both aquatic and terrestrial endangered, threatened, and proposed species managed by National Marine Fisheries Service (NMFS) and the United States Fish and Wildlife Service (USFWS) to the effects of the Invasive Plant Control activity category under the Bonneville Power Administration's (BPA) Habitat Improvement Program (HIP III).

This guidance includes tables of allowable herbicides, treatment methodologies, buffer distances, and general conservation measure related to invasive plant control. Herbicides will be applied in liquid or granular form using wand or boom sprayers mounted on or towed by trucks, backpack equipment containing a pressurized container with an agitation device, injection, hand wicking cut surfaces, and ground application of granular formulas. Herbicides will be mixed with water as a carrier (no petroleum-based carriers will be used) and may also contain a variety of additives (see adjuvant paragraph below) to promote saturation and adherence, to stabilize, or to enhance chemical reactions.

Aerial treatment is not proposed to be covered under this consultation, nor is treatment of aquatic weeds except for knotweed (*Polygonum cuspidatum*). Aerial applications of herbicides will require individual Section 7 consultation with the Services.

A process flow chart has been included to help project sponsors and EC_leads navigate their way through this handbook and to insure that HIPIII coverage is attained. Tables 1 though 4 apply in riparian and upland corridors adjacent to surface waters containing ESA-listed anadromous salmon, steelhead and Bull Trout and their habitat. Table 5 applies predominately in upland areas when USFWS ESA-listed terrestrial species are located within 1-mile of proposed application.

This handbook also provides guidance to where the project sponsor and Environmental Compliance Lead (EC lead) could determine whether or not the project may affect USFWS ESA-listed terrestrial and plant species. For USFWS species, species specific conservation measures may apply. Please refer to the USFWS BO for additional requirements.

A reference guide for determining equivalents and proper measurements is included at the end of this handbook.

Links to both BOs and This document:

http://efw.bpa.gov/environmental_services/endangeredspecies.aspx

Variances for Herbicides

Because of the wide range of proposed activities and the natural variability within and between stream systems, BPA (on behalf of the applicant) may require variances from criteria specified herein. The Services will consider granting variances, especially when there is a clear conservation benefit or there are no additional adverse effects (especially incidental take) beyond that analyzed in the BOs. Contact your EC lead for more information.

Variance requests shall be made on the Project Notification Form, which shall then be submitted to and approved by the Services via email correspondence.

The Services will consider granting variances, especially when there is a clear conservation benefit or there are no additional adverse effects (especially incidental take) beyond that considered in the Services BOs. Variance requests can be made on the PNC form, which can then be submitted and approved by the Services via email correspondence.

Variance requests may be submitted and approved by email correspondence and will include:

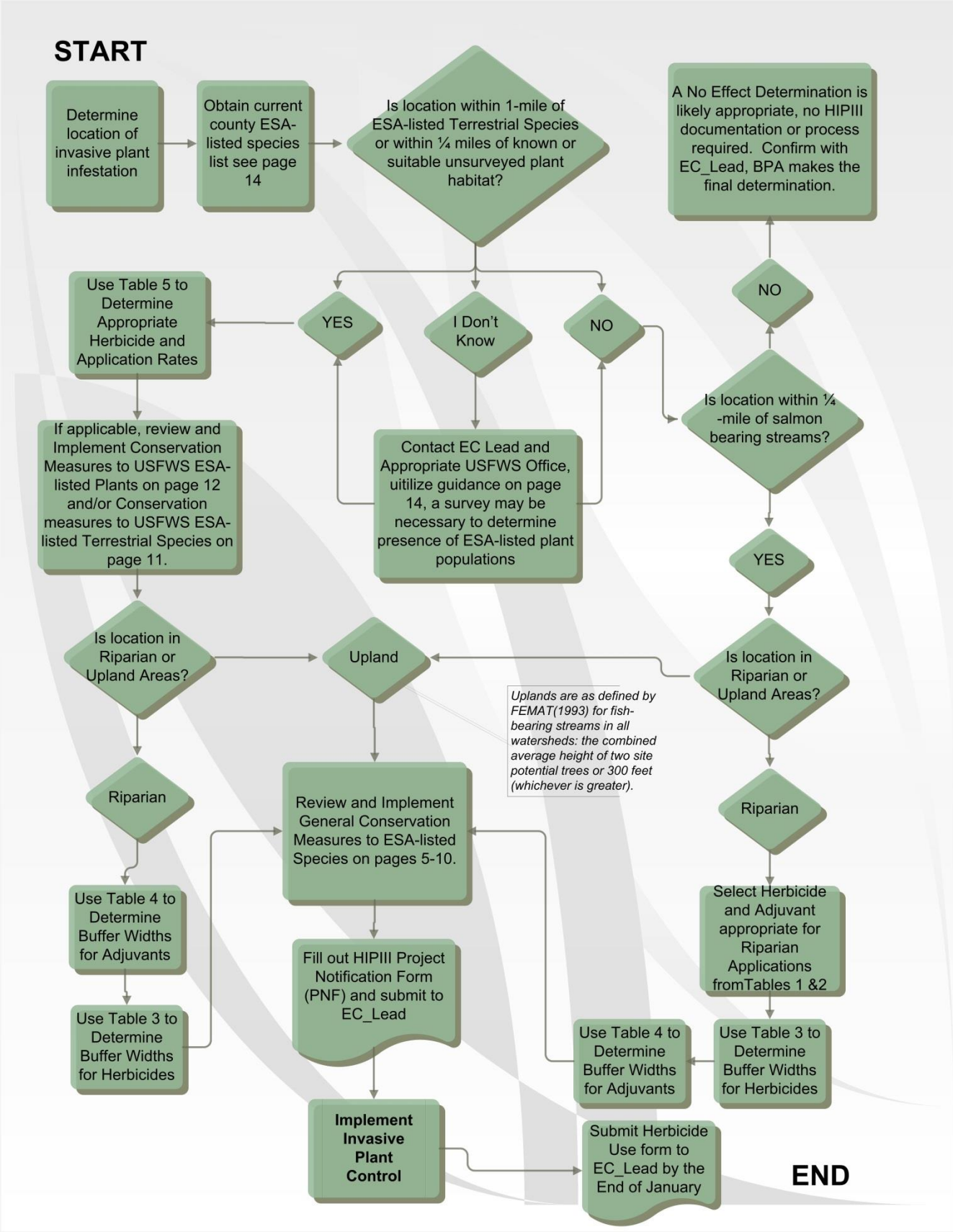
1) Define the requested variance and the relevant criterion by page number.
2) Current environmental conditions (current flow and weather conditions). If the variance is for an herbicide application provide a general description of topography and current vegetative cover.
3) Information regarding the herbicide's environmental toxicity (salmonid end points) and environmental fate and transport and evidence to support that there are less adverse effects than listed herbicide's in the HIPIII (see below for an example).
4) Include as attachments any supporting information (MSDS, Toxic profiles, fact sheets etc.)

Variances must be authorized by both the NMFS Branch Chief and USFWS Field Office Supervisor. If the Services do not approve a request for variance, the project sponsor and BPA will initiate individual Section 7 consultation with USFWS and/or NMFS on the identified action.

An example of a approved variance request and the information needed:

BPA requests a variance to use the drift-retardant Compadre in lieu of Valid, for herbicide applications on the Shillapoo Wildlife Area to control invasive weeds in the uplands of this site (lat 45.677852, long. 122.748205). The adjuvant Valid was a covered product considered in our HIP III biological opinion with the BPA, however, it is no longer commercially available. Based on review of the MSDS information for the proposed replacement, Compadre is a mixture of lecithin, alcohol ethoxylate and methyl esters of fatty acids, with low aquatic toxicity (LC50 > 10 mg/L in rainbow trout). Given the upland application envisioned, the environmental fate of the ingredients in the Compadre mixture, the low inherent toxicity of the mixture, and the lack of conditions that could lead to aquatic exposure from the proposed application, the use of Compadre does not raise additional effects to ESA-listed species or their critical habitat that were not already addressed under the HIP III programmatic opinion (NMFS NWR-2013/9724).

Process Flowchart for HIPIII Compliance



Manage Vegetation Using Physical Control

Description. BPA proposes to use two mechanisms for vegetation management by physical control: (a) Manual control includes hand pulling and grubbing with hand tools; bagging plant residue for burning or other proper disposal; mulching with organic materials; shading or covering unwanted vegetation; controlling brush and pruning using hand and power tools such as chain saws and machetes; using grazing goats. When possible, manual control (e.g., hand pulling, grubbing, cutting) will be used in sensitive areas to avoid adverse effects to ESA-listed species or water quality. (b) Mechanical control includes techniques such as mowing, tilling, disking, or plowing. Mechanical control may be carried out over large areas or be confined to smaller areas (known as scalping).

Conservation Measures:

1) For mechanical control that will disturb the soil, an untreated area will be maintained within the immediate riparian buffer area to prevent any potential adverse effects to stream channel or water quality conditions. The width of the untreated riparian buffer area will vary depending on site-specific conditions and type of treatment.

2) Ground-disturbing mechanical activity will be restricted in established buffer zones adjacent to streams, lakes, ponds, wetlands and other identified sensitive habitats based on percent slope. For slopes less than 20%, a buffer width of 35 feet will be used. For slopes over 20%, no ground-disturbing mechanical equipment will be used.

3) When possible, manual control (*e.g.*, hand pulling, grubbing, cutting) will be used in sensitive areas to avoid adverse effects to ESA- listed species or water quality.

4) All noxious weed material will be disposed of in a manner that will prevent its spread. Noxious weeds that have developed seeds will be bagged and burned.

General Conservation Measures for Herbicide Application.

1) **Maximum herbicide treatment area.** The area treated with herbicides above bankfull elevation, within riparian areas, will not exceed 10 acres above bankfull elevation and 2 acres below bankfull elevation, per 1.6-mile reach of a stream, per year.

2) **Herbicide applicator qualifications.** Herbicides will be applied only by an appropriately licensed applicator using an herbicide specifically targeted for a particular plant species that will cause the least impact to non-target species. The applicator will be responsible for preparing and carrying out the herbicide transportation and safety plan, as follows.

3) **Herbicide transportation and safety plan.** The applicator will prepare and carry out an herbicide safety/spill response plan to reduce the likelihood of spills or misapplication, to take remedial actions in the event of spills, and to fully report the event. At a minimum, the plan will:
   a) Address spill prevention and containment.
   b) Estimate and limit the daily quantity of herbicides to be transported to treatment sites.
   c) Require that impervious material be placed beneath mixing areas in such a manner as to contain small spills associated with mixing/refilling.
   d) Require a spill cleanup kit be readily available for herbicide transportation, storage and application.
   e) Outline reporting procedures, including reporting spills to the appropriate regulatory agency.
   f) Require that equipment used in herbicide storage, transportation and handling are maintained in a leak proof condition.
   g) Address transportation routes so that hazardous conditions are avoided to the extent possible.
   h) Specify mixing and loading locations away from waterbodies so that accidental spills do not contaminate surface waters
   i) Require that spray tanks be mixed or washed further than 150 feet of surface water.
   j) Ensure safe disposal of herbicide containers.
   k) Identify sites that may only be reached by water travel and limit the amount of herbicide that may be transported by watercraft.
   l) All individuals involved, including any contracted applicators, will be instructed on the plan.

4) **Herbicides.** BPA proposes the use of the following herbicides in the typical application rates (see Tables 1 and 2) for invasive plant control. These products were previously evaluated in risk assessments by the US Forest Service http://www.fs.fed.us/foresthealth/pesticide/risk).

Table 1. Herbicides Proposed for Use by BPA.

Active Ingredient	Trade Name	Typical Application Rates (ai/ac)	Maximum Label Application Rate (ai/ac)	General Geographic Application Areas
2,4-D (amine)	Many	0.5 - 1.5 lbs.	4.0 lbs	Upland[1] & Riparian
Aminopyralid	Milestone®	0.11 - 0.22 lbs	0.375 lb	Upland & Riparian
Chlorsulfuron	Telar®	0.25 - 1.33 oz	3.0 oz	Upland
Clethodim	Select®	0.125 – 0.5 lbs	0.50 lb	Upland
Clopyralid	Transline®	0.1 - 0.375 lbs	0.5 lb	Upland & Riparian
Dicamba	Banvel® only	0.25 - 7.0 lbs	8.0 lbs	Upland & Riparian
Glyphosate 1 Glyphosate 2	Many Many	0.5 - 2.0 lbs 0.5 - 2.0 lbs	3.75 lbs 3.75 lbs	Upland & Riparian Upland
Imazapic	Plateau®	0.063 – 0.189 lbs	0.189 lb	Upland & Riparian
Imazapyr	Arsenal® Habitat®	0.5 – 1.5 lbs.	1.5 lbs	Upland & Riparian
Metsulfuron methyl	Escort®	0.33 - 2.0 oz	4.0 oz	Upland
Picloram	Tordon®	0.125 - 0.50 lb	1 lb	Upland
Sethoxydim	Poast®	0.1875 – 0.375 lb	0.375 lb	Upland
Sulfometuron methyl	Oust®	0.023 - 0.38 oz	2.25 oz	Upland
Triclopyr (TEA)	Garlon 3A®	1.0 - 2.5 lbs	9.0 lbs	Upland & Riparian

5) **2,4-D.** As a result of the National Consultation[2], this herbicide shall comply with all relevant reasonable and prudent alternatives from the 2011 Biological Opinion (NMFS 2011a):
   a) Do not apply when wind speeds are below 2 mph or exceed 10 mph, except when winds in excess of 10 mph will carry drift away from salmonid-bearing waters.
   b) Do not apply when a precipitation event, likely to produce direct runoff to salmonid bearing waters from the treated area, is forecasted by NOAA/NWS (National Weather Service) or other similar forecasting service within 48 h following application.

6) Control of invasive plants within the riparian habitat shall be by individual plant treatments for woody species, and spot treatment of less than 1/10 acre for herbaceous species per project per year.

[1] Uplands are as defined by FEMAT(1993) for fish-bearing streams in all watersheds: the combined average height of two site potential trees or 300 feet (whichever is greater).

[2] On June 30, 2011, NMFS issued a final biological opinion addressing the effects of this herbicide on ESA-listed Pacfic salmonids. The opinion has concluded that EPA's proposed registration of certain uses of 2,4-D, including aquatic uses of 2,4-D BEE are likely to jeopardize the continued existence of the 28 endangered and threatened Pacific salmonids. http://www.nmfs.noaa.gov/pr/consultation/pesticides.htm

7) **Adjuvants.** The following adjuvants are proposed for use (Table 2). Polyethoxylated tallow amine (POEA) surfactant and herbicides that contain POEA (e.g., Roundup) have been removed from the proposed action.

8) **Herbicide carriers.** Herbicide carriers (solvents) are limited to water or specifically labeled vegetable oil.

9) **Herbicide mixing.** Herbicides will be mixed more than 150 feet from any natural waterbody to minimize the risk of an accidental discharge and no more than three different herbicides may be mixed for any one application.

10) **Herbicide application rates.** Herbicides will be applied at the lowest effective label rates, including the typical and maximum rates given (Table 1). For broadcast spraying, application of herbicide or surfactant will not exceed the typical label rates.

Table 2. Adjuvants Proposed for Use by BPA.

Adjuvant Type	Trade Name	Labeled Mixing Rates per Gallon of Application Mix	General Geographic Application Areas
Colorants	Dynamark™ U.V. (red)	0.1 fl oz	Riparian
	Aquamark™ Blue	0.1 fl oz	Riparian
	Dynamark™ U.V. (blu)	0.5 fl oz	Upland
	Hi-Light® (blu)	0.5 fl oz	Upland
Surfactants	Activator 90®	0.16 – 0.64 fl oz	Upland
	Agri-Dex®	0.16 – 0.48 fl oz	Riparian
	Entry II®	0.16 – 0.64 fl oz	Upland
	Hasten®	0.16 – 0.48 fl oz	Riparian
	LI 700®	0.16 – 0.48 fl oz	Riparian
	R-11®	0.16 – 1.28 fl oz	Riparian
	Super Spread MSO®	0.16 – 0.32 fl oz	Riparian
	Syl-Tac®	0.16 – 0.48 fl oz	Upland
Drift Retardants	41-A®	0.03 – 0.06 fl oz	Riparian
	Valid®	0.16 fl oz	Upland

11) **Herbicide application methods.** Liquid or granular forms of herbicides to be applied by a licensed applicator as follows:
   a) Broadcast spraying – hand held nozzles attached to back pack tanks or vehicles, or by using vehicle mounted booms;
   b) Spot spraying – hand held nozzles attached to back pack tanks or vehicles, hand-pumped spray, or squirt bottles to spray herbicide directly onto small patches or individual plants using;
   c) Hand/selective – wicking and wiping, basal bark, fill ("hack and squirt"), stem injection, cut-stump;
   d) Triclopyr – will not be applied by broadcast spraying.

12) **Emergent Knotweed Application._** No aquatic application of chemicals is covered by this consultation except for treating emergent knotweed. Only aquatic labeled glyphosate formulations will be used. The only application methods for emergent knotweed are stem injection (formulation up to 100% for emergent stems greater than 0.75 inches in diameter), wicking or wiping (diluted to 50% formulation), and hand-held spray bottle application of glyphosate (up to the percentage allowed by label instructions when applied to foliage using low pressure hand-held spot spray applicators).

13) **Water Transportation.** Most knotweed patches are expected to have overland access. However, some sites may be reached only by water travel, either by wading or inflatable raft (or kayak). The following measures will be used to reduce the risk of a spill during water transport:
   a) No more than 2.5 gallons of glyphosate will be transported per person or raft, and typically it will be one gallon or less.
   b) Glyphosate will be carried in 1 gallon or smaller plastic containers. The containers will be wrapped in plastic bags and then sealed in a dry-bag. If transported by raft, the dry-bag will be secured to the watercraft.

14) **Minimization of herbicide drift and leaching.** Herbicide drift and leaching will be minimized as follows:
   a) Do not spray when wind speeds exceed 10 miles per hour, or are less than 2 miles per hour;
   b) Be aware of wind directions and potential for herbicides to affect aquatic habitat area downwind;
   c) Keep boom or spray as low as possible to reduce wind effects;
   d) Increase spray droplet size whenever possible by decreasing spray pressure, using high flow rate nozzles, using water diluents instead of oil, and adding thickening agents;
   e) Do not apply herbicides during temperature inversions, or when ground temperatures exceed 80 degrees Fahrenheit;
   f) Do not spray when rain, fog, or other precipitation is falling or is imminent. Wind and other weather data will be monitored and reported for all broadcast applications. Table 3 identifies BPA's proposed minimum weather and wind speed restrictions (to be used in the absence of more stringent label instructions and restrictions). During application, applicators will monitor weather conditions hourly at sites where spray methods are being used.

Table 3. Herbicide Buffer Widths (from Bankfull Width)

Active Ingredient	Broadcast Application[3]		Backpack Sprayer/Bottle[4] Spot Spray Foliar/Basal		Hand Application[5] Wicking/Wiping/Injection
	Min buffer from bankfull width (ft)	Max/ Min wind speed (mph)	Min buffer from bankfull width (ft)	Max/ Min wind speed (mph)	Min buffer from bank full width
2,4-D (amine)	100	10/2	50	5/2	15
Aminopyralid	100	10/2	15	5/2	0
Chlorsulfuron	100	10/2	15	5/2	0
Clethodim	**NA**	**NA**	50	5/2	50
Clopyralid	100	10/2	15	5/2	0
Dicamba (Banvel only)	100	10/2	15	5/2	0
Glyphosate 1	100	10/2	15	5/2	0
Glyphosate 2	100	10/2	100	5/2	100
Imazapic	100	10/2	15	5/2	0
Imazapyr	100	10/2	15	5/2	0
Metsulfuron	100	10/2	15	5/2	0
Picloram	100	8/2	100	5/2	100
Sethoxydim	100	10/2	50	5/2	50
Sulfometuron	100	10/2	15	5/2	0
Triclopyr (TEA)	**NA**	**NA**	50	5/2	0 for cut-stump application of aquatic labeled formulations; 15 feet for other applications.
Herbicide Mixtures	100	Most conservative of listed herbicides	15	Most conservative of listed herbicides	Most conservative of listed herbicides.

[3] Ground-based only broadcast application methods via truck/ATV with motorized low-pressure, high-volume sprayers using spray guns, broadcast nozzles, or booms.
[4] Spot and localized foliar and basal/stump applications using a hand-pump backpack sprayer or field-mixed or pre-mixed hand-operated spray bottle.
[5] Hand applications to a specific portion of the target plant using wicking, wiping or injection techniques. This technique implies that herbicides do not touch the soil during the application process.

Table 4. Adjuvant Buffer Widths(from Bankfull Width).

Adjuvant	Broadcast Application[6]	Backpack Sprayer/Bottle[7] Spot Spray Foliar/Basal	Hand Application[8] Wicking/Wiping/Injection
	Min buffer from bankfull width (ft)	Min buffer from bankfull width (ft))	Min buffer from bankfull width (ft)
Dynamark (red)	100	15	0
Dynamark (yel)	100	15	0
Dynamark (blu)	100	50	50
Hi-Light (blu)	100	50	50
Activator 90®	100	15	0
Agri-Dex	100	15	0
Entry II	100	100	100
Hasten	100	15	0
LI 700	100	15	0
R-11	100	50	50
Super Spread MSO	100	15	0
Syl-Tac	100	50	50
41-A	100	15	0.
Valid	100	50	50

[6] Ground-based only broadcast application methods via truck/ATV with motorized low-pressure, high-volume sprayers using spray guns, broadcast nozzles, or booms.
[7] Spot and localized foliar and basal/stump applications using a hand-pump backpack sprayer or field-mixed or pre-mixed hand-operated spray bottle.
[8] Hand applications to a specific portion of the target plant using wicking, wiping or injection techniques. This technique implies that herbicides do not touch the soil during the application process.

Conservation Measures for USFWS ESA-Listed Terrestrial Species

If it is determined that ESA-listed species, critical habitat, or unsurveyed suitable habitat for ESA-listed species are located within the vicinity (generally within 1 mile) of the proposed project, the action agency will implement the following project design standards for each species. Additional species-specific conservation measures may apply (Your EC lead shall provide you with those).

1) **Project Access.** Existing roads or travel paths will be used to access project sites whenever possible; vehicular access ways to project sites will be planned ahead of time and will provide for minimizing impacts on riparian corridors and areas where listed species or their critical habitats may occur.

2) **Vehicle use and human activities.** Including walking in areas occupied byESA- listed species, will be minimized to reduce damage or mortality to listed species.

3) **Flight patterns.** Helicopter flight patterns will be established in advance and located to avoid seasonally important wildlife habitat

4) **Herbicide Use.** On sites where ESA-listed **terrestrial wildlife** may occur, herbicide applications will be avoided or minimized to the extent practicable while still achieving project goals. Staff will avoid any potential for direct spraying of wildlife or immediate habitat in use by wildlife for breeding, feeding, or sheltering. Herbicide use in or within 1 mile of habitat where ESA-listed terrestrial wildlife occur will be limited to the chemicals and application rates as shown in **Table 5**.

5) There may be additional species-specific herbicide limitations are defined in each species section in the USFWS Biological Opinion, see your EC lead for more information.

Table 5: Maximum Application Rates within 1 Mile of Habitat where ESA-listed Terrestrial Species Occur.

	2,4-D	Aminopyralid	Chlorsulfuron	Clethodim	Clopyralid	Dicamba	Glyphosate 1	Glyphosate 2	Imazapic	Imazapyr	Metsulfuron	Picloram	Sethoxydim	Sulfometuron	Triclopyr (TEA)
Listed Species	Maximum Rate of Herbicide Appliction (lb/ac)														
Mammals	NA	0.22	0.083	NA	0.375	NA	2.0	2.0	0.189	1.0	0.125	NA	0.3	NA	NA
Birds*	NA	0.11	0.083	NA	0.375	NA	2.0	2.0	0.189	1.0	0.125	NA	0.3	NA	NA
Invertebrates*	NA	NA	NA	NA	0.375	NA	2.0	2.0	NA	1.0	NA	NA	0.3	NA	NA

NA = Not Authorized for use
** See required buffers and methods restrictions within each species-specific PDS*

Conservation Measures for USFWS ESA-Listed Plants

Within the Columbia River Basin, BPA funded activities may occur in areas that are near or occupied by the following ESA-listed plant species; Bradshaw's lomatium (*Lomatium bradshawii*), Cook's lomatium (*Lomatium cookie*) and their critical habitat, Gentner's fritillary (*Fritillaria gentneri*), Golden paintbrush (*Castilleja levisecta*), Howell's spectacular thelypody (*Thelypodium howellii spectabilis*), Kincaid's lupine (*Lupinus sulphureus ssp.* Kincaidii) and their critical habitat, Large-flowered wooly meadowfoam (*Limnanthes floccosa*) and their critical habitat, Malheur wire-lettuce (*Stephanomeria malheurensis*) and their critical habitat, McFarlane's four o'clock (*Mirabilis macfarlanei*), Nelson's checkermallow (*Sidalcea nelsoniana*), Rough popcorn flower (*Plagiobothrys hirtus*), Showy stickseed (*Hackelia hispida*), Slickspot peppergrass (*Lepidium papilliferum*) and their proposed critical habitat, Spalding's catchfly (*Silene spaldingii*), Umtanum Desert buckwheat (*Eriogonum codium*) and their critical habitat, Ute ladies' tresses (*Spiranthes diluvialis*), Water howellia (*Howellia aquatilis*), Wenatchee Mountain checkermallow (*Sidalcea oregana var. calva*) and their critical habitat, Western lily (*Lilium* occidentale), Willamette daisy (*Erigeron decumbens*) and their critical habitat, and White Bluffs bladderpod (*Physaria douglasii*) and their critical habitat.

Conservation Measures:

1) Listed plants must be clearly flagged or fenced prior to restoration activities to avoid inadvertently affecting listed plants.

2) When using manual methods at project sites occupied by a federally listed plant species, a buffer of 3 m (10 ft) will be required around green growing plants until after senescence. Manual control and removal activities may occur year round in occupied habitat or critical habitat for listed plants except at sites occupied by listed butterflies (see above for information on Fender's blue butterfly). Chips, sawdust, brush accumulations, and other plant waste materials will be removed from project site to the extent possible.

3) Mowing, tilling, disking, plowing, excavation, raking or sod rolling (*i.e.*, larger scale sub-surface ground disturbances) will not occur within 10 m (33 ft) of known federally listed plant species or critical habitat for listed plants at any time. Listed plants must be clearly flagged or fenced prior to restoration activities to avoid inadvertently affecting listed plants. Additional requirements for mechanical treatments include the following.
   a) Use of low ground impact (*e.g.*, rubber tired or tracked) and appropriately sized equipment to prevent soil compaction.
   b) Mower deck heights must be set to prevent soil gouging.
   c) Chips, sawdust, brush accumulations, and other plant waste materials must be removed from project site to the extent possible.
   d) Mechanical treatments must not alter the existing hydrology at a project site.
   e) All equipment must be cleaned of invasive and non-native plant materials before entering a project site occupied by a listed plant species to prevent the dispersal of seeds or other reproductive plant parts.
   f) Ground-disturbance activities (*e.g.* tilling, disking, and plowing) must be followed with native seed or plant introductions to minimize or eliminate the establishment of invasive and non-native vegetation.

4) Herbicides will not be applied at locations where nearby listed plants may be in the path of surface runoff from the project.

5) Hand applications of herbicide will maintain a minimum distance of 5 m (16 ft) from listed plants or critical habitat. Spraying will only take place during calm periods (wind velocities less than 3 mph). ESA-listed plants will be physically shielded (e.g., covered with buckets or some other barrier that will not harm the plants) as needed to protect them from spray or drift, unless they are dormant; plants will be uncovered immediately after spraying has been completed.

6) Broadcast applications of herbicide will not occur within 275 m (900 ft) of occupied habitat or critical habitat for listed plants.

7) Herbicide treatments must be followed with native seed or plant introductions to minimize or eliminate the establishment of invasive and non-native vegetation.

8) The following conservation measures are specific for the type of herbicide application to be used at project sites when listed plant species are nearby.
   a) Wick and wipe applications
      i) The appropriate type and size of equipment will be used to apply herbicides onto the target foliage and stems.
      ii) Herbicide applications will be made in a manner that prevents herbicide runoff onto the ground.
   b) Basal bark applications
      i) Applicators will avoid unnecessary run-off when applying herbicide to stems of target vegetation.
      ii) Herbicide applications will be applied using the lowest nozzle pressure that will allow adequate coverage.
      iii) Applicator will apply herbicides while facing away from listed plants.
   c) Spot and patch applications
      i) Herbicides applications may be used with hand applicators.
      ii) Herbicide will be applied in a manner where the spray is directed towards the application area and away from listed plants.
      iii) The spray nozzle will be kept within three feet of the ground when herbicide is being applied within 50 feet of listed plants. Beyond 50 feet, the nozzle may be held up to six feet above ground if needed to treat taller clumps of competing vegetation.
   d) Cut surface and hack and squirt/injection applications. Herbicide applications will be made in a manner that prevents herbicide runoff onto the ground.
   e) Spot applications of dry granules, pellets, and dust. A 5 m (16 ft) buffer will be maintained between listed plants and application areas to prevent exposure to listed plants.

Guidance on identifying Locations of USFWS ESA-listed Terrestrial Species

When proposed project locations have been identified, the action agency or project proponent will obtain the current species list for the county in which the proposed project is located. The species lists can be accessed at the following websites:

- **Idaho**: http://www.fws.gov/idaho/species/IdahoSpeciesList.pdf
- **Oregon**: http://www.fws.gov/oregonfwo/Species/Lists/default.asp
- **Montana**: http://www.fws.gov/montanafieldoffice/Endangered_Species/Listed_Species/countylist.pdf
- **Washington, Western**: http://www.fws.gov/wafwo/speciesmap.html
- **Washington, Eastern**: http://www.fws.gov/wafwo/species_EW.html

If species are located within the county where the proposed project is located, refer to the habitat descriptions for each species below for each species or critical habitat to determine whether that listed species may occur in the vicinity of the proposed project. Maps for some species have also been provided at the end of this Appendix to assist in identifying suitable habitat that may be occupied by listed species. For additional assistance, contact the appropriate state FWS office for more information:

- **Idaho Fish and Wildlife Office:** (208) 378-5243
- **Oregon Fish and Wildlife Office:** (503) 231-6179
- **Montana Ecological Services:** (406) 459-5225
- **Washington Fish and Wildlife Office**: (360) 753-9440
- **Eastern Washington Field Office:** (509) 891-6839
- **Central Washington Field Office:** (509) 665-3508

Site-specific information of listed species occurrences in Washington State may be obtained from the Washington Department of Fish and Wildlife Priority Habitat and Species Program http://www.wdfw.wa.gov/hab/phspage.htm and from the Washington Department of Natural Resources Natural Heritage Program at http://wdfw.wa.gov/mapping/phs/.

Site-specific information of listed species occurrences in Oregon may also be available from the Oregon Biodiversity Information Center at http://orbic.pdx.edu/index.html.

Guidance on Identifying Locations of USFWS ESA-listed Plants

If an ESA- listed plant is located within the county where a project is proposed (based on a review of the most recent USFWS county species list), contact the appropriate USFWS field office to determine whether there are known ESA-listed plants or suitable unsurveyed habitat for ESA-listed plants in the project area. If a known site of an ESA-listed plant is within 0.4 km (0.25 mi) of the project action area, or suitable or potential habitat may be affected by project activities, then a BPA contract botanist will conduct a site visit/vegetation survey to determine whether ESA-listed plants are within the project area. This visit and survey will be conducted at the appropriate time of year to identify the species and determine whether individual listed plants or potential habitat are present and may be adversely affected by project activities (**Table 6**). If listed plants are present and likely to be adversely affected by the project, then an individual consultation with the USFWS under Section 7 of the ESA must be initiated.

Table 6. Optimal Survey Times for Flowering Periods of ESA-Listed Plants

Species	Optimal Survey Time Period
Bradshaw's Lomatium (*Lomatium bradshawii*)	April to mid-May
Cook's Lomatium (*Lomatium cookii*)	Mid-March through May (varies with spring moisture)
Gentner's Fritillary (*Fritillaria gentneri*)	April to June
Golden Paintbrush (*Castilleja levisecta*)	April to September
Howell's Spectacular Thelypody (*Thelypodium howellii* ssp. *spectabilis*)	June through July
Kincaid's Lupine (*Lupinus sulphureus* ssp. *kincaidii*)	May through July
Large-flowered Wooly Meadowfoam (*Limnanthes floccose*)	Mid-March to May (varies with spring moisture)
Malheur Wire-Lettuce (*Stephanomeria malheurensis*)	July through August
MacFarlane's four o'clock (*Mirabilis macfarlanei*)	May through June
Nelson's Checkermallow (*Sidalcea nelsoniana*)	Late May to Mid-July
Rough Popcornflower (*Plagiobothrys hirtus*)	Mid-June to early July
Showy Stickseed (*Hackelia venusta*)	May to July
Slickspot peppergrass (*Lepidium papilliferum*)	Mid-May to Mid-July
Spalding's Catchfly (*Silene spaldingii*)	June to September
Umtanum Desert Buckwheat (*Eriogonum codium*)	June through July
Ute Ladies'-Tresses (*Spiranthes diluvialis*)	July to late August
Water Howellia (*Howellia aquatilis*)	May through August
Wenatchee Mountains Checker-Mallow (*Sidalcea oregano* var. *calva*)	June to Mid-August
Western Lily (*Lilium occidentale*)	May to July
Willamette Daisy (*Erigeron decumbens* var. *decumbens*)	Mid-June to early July
White Bluffs Bladderpod (*Physaria douglasii* ssp. *tuplashensis*)	Mid-May to Mid-June

Measurements for Herbicide Application

The following is a compilation of equivalent, conversion and other data that will help in the mixing and application of pesticides in small amounts. Always follow the label directions and precautions of the material being used.

TABLE 1 – EQUIVALENTS

1 teaspoon	1/3 tablespoon
3 teaspoons	1 tablespoon
1 tablespoon	3 teaspoons
2 tablespoons	1 fluid ounce
4 tablespoons	1/4 cup or 2 fluid ounces
6 tablespoons	1 dry ounce
8 tablespoons	1/2 cup or 4 fluid ounces
16 tablespoons	1 cup or 8 fluid ounces
96 tablespoons	1 dry pound or 16 dry ounces
¼ cup	4 tablespoons
1 cup	1/2 pint or 8 fluid ounces
2 cups	1 pint or 16 fluid ounces
1 pint, liquid	16 fluid ounces
1 quart, liquid	2 pints or 4 cups
1 gallon, liquid	4 quarts

TABLE II – When recommendations are made on a per volume basis:

LIQUID PESTICIDES		WETTABLE POWDERS	
Rate Per 100 Gals. Water	Per Gal.	Rate Per 100 Gals. Water	Per Gal.
1 pint	1 teaspoon	1 pound	1 tablespoon
1 quart	2 teaspoons	2 pounds	2 tablespoons
1 gallon	1 ½ fluid ounces or 8 teaspoons	3 pounds	3 tablespoons
		4 pounds	4 tablespoons
10 gallons	12 ½ fluid ounces or 4/5 pint		

TABLE III – When recommendations are made on a per area basis:

LIQUID PESTICIDES		WETTABLE POWDERS	
Rate Per Acre	Per 1000 sq.ft	Rate Per Acre	Per 1000 sq. ft.
1 pint	¾ tablespoon	1 pound	5 teaspoons
1 quart	1 ½ tablespoons	2 pounds	3 tablespoons
2 quarts	3 tablespoons	3 pounds	5 tablespoons
1 gallon	6 tablespoons	10 pounds	1 cup

OTHER

Dry Measure:	Wettable powders	1 ounce	=	6 level tablespoons
	Complete fertilizer, pelletized limestone	1 ounce	=	2.25 tablespoons
	Limestone	1 cup	=	approximately 1 lb.