CLALLAM COUNTY ROAD DEPARTMENT

INTEGRATED WEED MANAGEMENT PLAN 2018

2018

Table of Contents

CLALLAM COUNTY INTEGRATED WEED MANAGEMENT PLAN 5
Introduction 5
Why Control Noxious and Invasive Weeds? 6
Integrated Weed Management 7
Choosing Control Methods 7
The IWM Decision-Making Process 8
BIOLOGICAL WEED CONTROL 9
Roadside Application 9
PHYSICAL WEED CONTROL 11
Roadside Application 12
CHEMICAL WEED CONTROL 14
Roadside Application 15
Record Keeping 16
CULTURAL WEED CONTROL 21
Roadside application 21
PREVENTATIVE WEED CONTROL 23
Roadside Application 23
2018 WORK PLAN 25
Focus Area Maps of Selected Roads 43
APPENDICES 53
Appendix A Ordinance 923- Integrated Weed Management 54
Appendix B Non-Target Impacts and Risk Assessment, Herbicide Selection Process, Product List, and Application Methods 57
Appendix C Sample Record Keeping Forms 82
Appendix D Sample Press Release and Public Notice 86
Appendix E Sample Herbicide Notice 87
Appendix F Owner Will Control Packet 88
Appendix G Adopt-a-Patch Permit 92
Appendix H Roadside Weed Life Cycle, Growth Form, Category and Status 95
Appendix I Historical Survey Data For Known Roadside Weed Locations 97
Appendix J References 104

The Cover: photos, from top knapweed weevil (biological control agent) on meadow knapweed flower head photo credit Laura Parsons, University of Idaho; weed board staff digging tansy rosettes from county roadside; selective herbicide treatment for elk habitat restoration; distributing native blue wildrye grass seed post treatments; Forest Service sign indicating weed free forage requirements, native bear grass flower – one of the native species to be available for natural, pollinator-friendly, roadside revegetation projects.

List of Tables

Page

Table 1. Insect biocontrol agents in Clallam County. 11
Table 2. Known roadside weeds in Clallam County. 26
Table 3. Recommended control treatments for Clallam County roadside noxious weeds. 30
Table 4. East Clallam County roads selected for herbicide treatment in 2018. 34
Table 5. Central Clallam County roads selected for herbicide treatment in 2018. 35
Table 6. West Clallam County roads selected for herbicide treatment in 2018. 40
Table 7. County Pit Sites for treatment in 2018. 41
Table 8. Additional Road's Department managed locations selected for treatment in 2018. 42
Table 9. Species in Clallam County with potential for special management consideration. 60
Table 10. Half-Maximum Application Rates Used in Risk Charts. 62
Table 11. Toxicity reference values used to estimate risk. 73
Table 12. Selected herbicide characteristics. 79
Table 13. Adjuvants used to enhance herbicide effectiveness. 81
Table 14. All roadside weed locations in approximately 250 miles of roads surveyed in 2015. 97

List of Figures

Figure 1 A. The herb Robert monoculture shown here, dies back to bare ground, does not filter pollutants, is susceptible to erosion, and exudes chemicals to inhibit the germination of native species. 6
Figure 1 B. A low growing, naturally sustainable plant community is compatible with right-of-way goals while providing environmental services and quality habitat. 6
Figure 2. Factors influencing IWM program. 7
Figure 3. The continuing flow of monitoring, evaluation, and adapting treatment occurring in an IWM program. 8
Figure 4. Soil half-lives of herbicides in aerobic environments…… 76
Figure 5. Predicted concentrations from first flush runoff at half-maximum application rate. 77

This Page Left Blank

CLALLAM COUNTY INTEGRATED WEED MANAGEMENT PLAN

INTRODUCTION

Clallam County is a major landholder subject to Washington State weed laws RCW 17.10 and WAC 16-750 which mandate the control of specific non-native, invasive “noxious” weeds. An integrated weed management plan is needed to help the County efficiently comply with its noxious weed control obligation on county roadsides.

The primary responsibility of the Clallam County road system is safety in the transport of people, goods, and services. Roadside weed management is a unique element within a general road maintenance program. Effective weed management requires identifying the best mix of all control techniques as well as an understanding of how plant communities are part of a dynamic process. Healthy, self-sustaining plant communities better compete with weed pressure. The explicit goal of this plan is to shift roadside vegetation to natural, site appropriate plant communities. This includes using best management practices that support that shift, minimizing the need for all types of interventions, including the use of herbicide.

The IWM plan must be consistent with Clallam County’s long term goals for its road system including environmental and public safety considerations. The IWM plan will strive for a balance of multiple, but compatible goals, such as reducing maintenance costs for weed control over time, while increasing environmental services. Other considerations will include protection and preservation of the natural environment, preserving and enhancing the scenic and habitat quality of the roadside, and being a good neighbor to adjoining property owners.

This document serves as the strategic plan for managing non-native invasive plants that infest county rights-of-way. It contains information on priority weed locations, and guidelines and procedures for best management practices in weed control. This plan is developed in compliance with Washington State Noxious Weed Law, Chapter 17.10 of the Revised Code of Washington, and modeled on the State of Washington’s Integrated Pest Management program as codified in Chapter 17.15 of the Revised Code of Washington. Specific County legislative direction upon which this plan is based is codified in Clallam County Code Ordinance 923 (Appendix A).

Roadside weed management is an evolving process, and it is intended that this plan be annually evaluated and adapted over time based on input and technical updates from federal and state agencies, tribes, universities and local partners and stakeholders. It is essential that the results of control activities are monitored, evaluated and adjusted as necessary to maximize efficiency and effectiveness. Best Management Practices (BMPs) for each weed program element with continued research and education will provide important information for ongoing Integrated Weed Management (IWM) treatments.

This plan encourages public involvement. “Landowner Will Control” agreements, Adopt-A-Patch, and revegetation projects represent volunteer opportunities. Annual plans, treatment progress updates and year-end reports will be available to the public online at http:www.clallam.net/weed.

Please contact the County at the numbers listed below for questions or comment
Jim Knape, 360-417-2000 ext. 2703 or Ross Tyler, 360-417-2379

WHY CONTROL NOXIOUS AND INVASIVE WEEDS?

Noxious weeds impact native ecosystems by reducing biodiversity, altering hydrologic conditions, altering soil characteristics, changing fire intensity and frequency, modifying successional pathways, competing for pollinators, displacing rare plant species, serving as reservoirs of plant pathogens, and by replacing complex native communities with simple non-native ones. Noxious weeds cause economic impacts. In general, noxious and invasive weeds are expensive to control and negatively impact agricultural and forestry production, property values, water flow and availability, and recreation opportunities. It is estimated that invasive plants cause about $123 billion in damages and losses to the U.S. economy annually (Harper-Lore, Johnson, and Skinner, 2007). Non native weeds cause an estimated $34 billion in losses to crops and pastures alone (Pimentel, McNair et al., 2001).

For these reasons, Washington State law requires the control of certain weed species. The purpose of the law is to limit economic loss and adverse effects to Washington's agricultural, natural, and human resources due to the presence and spread of noxious weeds in all terrestrial and aquatic areas in the state. The processes for regulation and control are defined in the Revised Code of Washington Chapter 17.10. and the Washington Administrative Code Chapter 16-750. All landowners, public and private, are required to control noxious weeds on lands they own.

Transportation rights-of-way are high priority locations for control of noxious weed species because they cross and link so many adjacent properties and land uses, and can act as conduits for the spread of weeds. Weeds often appear first along road corridors.

Clallam County must be a responsible steward of county owned land. It supports commerce and the economic viability of the agricultural community. The County also values environmental preservation. It has taken the lead on projects to restore ecosystem function. The County promotes tourism and recreational opportunities. All can be undermined by the spread of invasive plants. To meet its responsibilities, the County must ensure noxious and invasive weeds are effectively and efficiently controlled on its rights-of-way (Figure 1, A and B).

Figure 1A. The herb Robert monoculture shown here, dies back to bare ground, does not filter pollutants, is susceptible to erosion, and exudes chemicals to inhibit the germination of native species.

Figure 1B. A low growing, naturally sustainable plant community is compatible with right-of-way goals while providing environmental services and quality habitat.

INTEGRATED WEED MANAGEMENT

INTEGRATED WEED MANAGEMENT

Integrated Weed Management (IWM) is a coordinated decision making process that uses the most appropriate weed management methods and strategies, along with a monitoring and evaluation system, to achieve roadside maintenance goals and objectives in an environmentally and economically sound manner. This includes assessing potential non-target impacts that may occur as a result, and minimizing adverse effects through best management practices. The principles of IWM dictate that each weed problem is addressed from the perspective of all control options. The selected mix of control methods is the best treatment for the long term stability of the plant community. Stable plant communities become established when the desired plants are not disturbed by the control program for the undesired plants. The physical design of the roadside environment coupled with the sporadic occurrence of noxious weeds imposes restrictions on the selection of control methods.

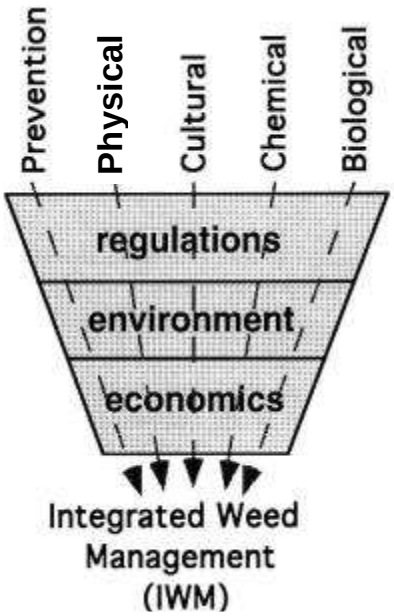


Figure 2. Factors influencing IWM program.

CHOOSING CONTROL METHODS

Weed control methods include biological, chemical, cultural, physical, and preventative. Each has its strengths and weaknesses influenced by regulations, environment and economics (Figure 2). A consideration of potential non-target impacts also plays a role. (See Appendix B for risk assessments)

Biological (such as releasing insect agents) and physical methods (such as mowing) use fewer labor resources. These are best for managing and slowing the spread of, but not controlling or reducing, widely dispersed weed infestations. Mowing is non-selective and can spread weed seeds or other viable propagules. Biological agents can be extremely selective, but require specific conditions. Both must be repeated indefinitely to suppress the weed population. Neither will eliminate populations of most weeds without using other techniques in combination.

Physical methods such as hand pulling or digging are labor intensive but can effectively control or eliminate small weed infestations of limited distribution. While highly selective, such methods are unlikely to control deeply rooted weeds or weeds with spreading root systems.

Herbicides can effectively and selectively control all sizes and types of weed infestations with a small, but knowledgeable workforce. Careful attention must be paid to minimize potential non-target effects and to follow all relevant regulations. See Appendix B for analysis of non-target impacts and risk assessment. Weather or site conditions can limit use.

Cultural and prevention practices are the most cost effective and efficient in the long term. These methods are more indirect and best used in tandem with the others. As current weed populations are eliminated, the goal is to shift control measures toward cultural practices such as use of native seed mixes and less disturbance of native shrub communities, as well as prevention practices such as weed-free material standards and cleaning equipment between job sites.

Use of the most effective method or combination of methods within an IWM decision-making framework will result in the greatest roadside service levels at the lowest life-cycle costs. Figure 3 demonstrates some of the feedback loops involved in an IWM strategy.

The IWM Decision-Making Process

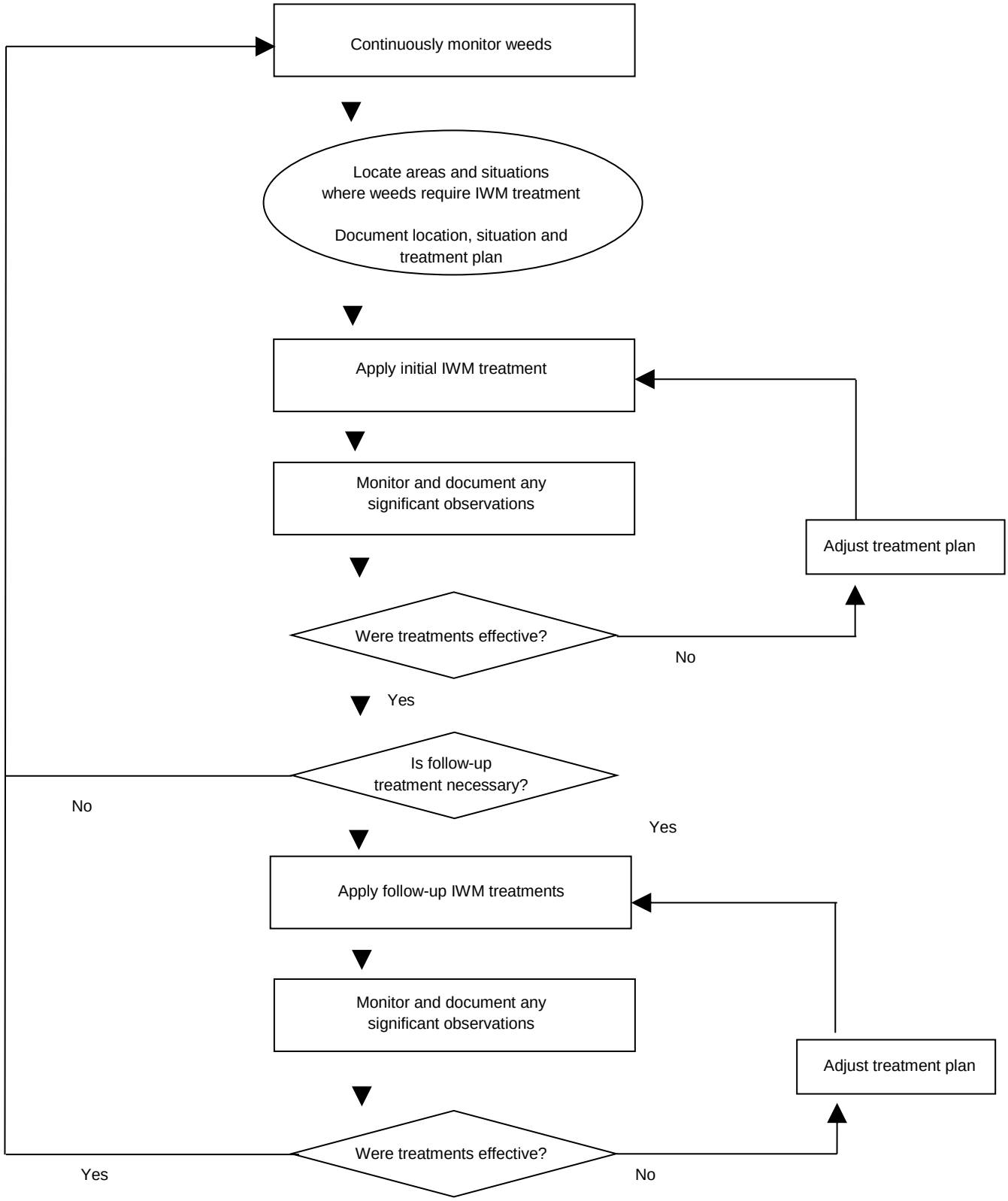


Figure 3. The continuing flow of monitoring, evaluation and adapting treatments occurring in an IWM program (adapted with permission from WSDOT area management plans).

BIOLOGICAL WEED CONTROL

DESCRIPTION

Methods which use living organisms to inhibit a host plant's ability to survive or reproduce are considered biological controls. Insects, diseases, and foraging animals, such as goats and cattle, are examples of biological control organisms. Biological methods are typically applied only when weed infestations are so well established that total eradication is not practical or possible.

GENERAL USE CONSIDERATIONS

Insect biocontrol agents are routinely inexpensive to maintain, but their populations lag behind the development of the weed population. Careful testing and screening is done before releasing insect agents to ensure they will not also attack native or other desirable plants. Insect predators are intended to be very weed-specific, though insects are not available for many weeds. They are usually part of regional programs of which the roadside right-of-way is an incidental beneficiary. Livestock grazing has the same effect as mowing; it removes the top growth without disturbing the roots so perennial plants re-grow as soon as grazing pressure is removed. Grazing animals can suppress desirable bee and butterfly forage, create bare ground or otherwise disturb the shoulder making it prone to reinfestation and erosion. Measures must be taken to ensure that animals do not destroy desirable vegetation on adjoining land. Contiguous acres are usually needed for successful biological control. Biological controls can reduce populations, but can never result in eradication. The use of disease organisms as a form of biological control, is still very limited.

ROADSIDE APPLICATION

There are several limitations and hazards associated with using grazing animals on Clallam roadsides. Most importantly, many of the noxious and invasive weeds targeted for control are sporadically dispersed along the road system and not easy to selectively target by grazing animals. Biological control is applicable where host weeds are present in dense or continuous colonies. All available insect agents have been released or are present for control of noxious weeds within Clallam County (Table 1).

LIMITATION

Grazing: *not considered for use at this time*

- Grazing animals on narrow right-of-way pose a hazard to motorists
- Insufficient grazing area
- Creates bare ground
- Targeted species are distributed in such a way that makes grazing inefficient and less selective

Insects:

- Insect agent unavailable for many weeds
- Non-contiguous infestation or insufficient host density
- Minimal disturbance is required for insect population to grow to an effective level; often conflicts with routine mowing schedule
- Will not eliminate weed populations, only suppress them

Table 1. Insect biocontrol agents in Clallam County

Biological Agent	Latin Name	Target Weed	Comments
Bindweed gall mite	*Aceria malherbae*	Bindweed sp	Generally for field bindweed, but experimental use for hedge bindweed; best for hot, dry sites; these are new releases
Bull thistle seed head gall fly	*Urophora stylata*	Bull thistle	Seed feeder; not compatible with other control methods; may be present already
Canada thistle stem gall fly	*Urophora cardui*	Canada thistle	Metabolic sink, reducing vigor; not compatible with other control methods; three additional agents had been previously released (not by us!) for thistle control, but very detrimental to native thistle species.
Banded gall fly and knapweed seed head fly Lesser knapweed flower weevil and blunt nosed flower weevil	*Urophora quadrifasciata and U. affinus* *Larinus minutus and L. obtusus*	Knapweed, meadow	Flies often destroyed by seed weevils when both agents occur together Seed feeders
Knapweed root weevil Lesser knapweed flower weevil and blunt nosed flower weevil	*Cyphocleonus achates,* *Larinus minutus, and L. obtusus*	Spotted knapweed	Root weevil can be very effective, but limited distribution Seed feeders
Sap-sucking psyllid	*Aphalaris itadori*	Knotweed sp.	Experimental releases only in WA
Defoliating hemlock moth	*Agonopterix alstroemeriana*	Poison hemlock	Not effective, no longer distributed
Black-margined loosestrife beetle	*Galerucella calmariensis*	Purple loosestrife	Highly effective even in low density infestations, some non-target effects
Tansy flea beetle Cinnabar moth	*Longitarsus jacobaeae* *Tyria jacobaeae*	Tansy ragwort	Best on rosettes and seedlings; poor survival in wet areas; a Swiss ecotype was released in the hopes of increased survival A generalist that feeds on all plants in the *Senecio* genus, **distribution not recommended** -danger to native plants
Seed-feeding bruchid Seed-feeding weevil	*Exapion fuscirostre* *Bruchidius villosus*	Scotch broom	Seed eaters
Klamath weed beetle	*Chrysolina quadrigemina*	St. Johnswort	Feeds on ornamental and native species also; present; not well adapted to our climate

APPLICATION GUIDELINES

- Grazing may be possible under specific "Owner Will Control" option
- Release additional viable insect agents should they become available.

MAINTENANCE

None required at this time.

PHYSICAL WEED CONTROL

DESCRIPTION

Physical control includes both mechanized and manual methods. Mechanical methods use equipment to mow, cut, prune, scrape or cultivate in a manner which reduces, removes or prevents undesirable plant growth. A variety of machines are used in a roadside program, such as flail, reel, sickle, and rotary mowers, which come in different sizes, and graders, which are used to pull shoulders and remove sod buildup. Brush cutting is usually done with machines that are larger and heavier versions of rotary mowers. Mechanical methods are for larger scale general vegetation maintenance activities.

Manual methods include hand-held tools such as bladed weed-eaters, string trimmers, chain saws, brush hooks, hoes, and machetes; mechanical methods on a small scale, as well as grubbing and pulling weeds. Hand pulling is generally reserved for small or difficult to access sites or where greater selectivity is required. Repeat treatments are required for many species.

GENERAL USE CONSIDERATIONS

Mechanized equipment is typically used to non-selectively suppress undesirable or excessive vegetation growth on a large scale; not specifically to control weeds. Mechanical tools such as mowers do not affect the roots of plants, and cut plants often resprout in greater numbers. This is particularly true of weedy biennial and perennial forbs or shrubs. Many weeds respond to mowing by shorter regrowth and producing seeds on stalks below the blade height. Properly timed or frequent mowing can delay or prevent seed development during a growing season, but improperly timed mowing results in spreading propagules over a broad area. Sod scalping causes erosion potential and creates sites for weed invasion.

Weed suppression by mowers is temporary and must be repeated to achieve the desired effect. Without specific guidelines, mowing is non-selective in its effect on the plant community. Many desirable native plants grow more slowly than their weedy, invasive cousins. Desired and undesired plants are continuously reduced to the same height, the same starting point, with each mowing. Some weeds are spread by the mowing operation. Stable plant communities, an expressed objective of the county's roadside program, are not retained under heavy mowing pressure. Unless carefully timed, close mowing may be disastrous for ground nesting birds, animals, and pollinator forage. Mowing also has a large carbon footprint in comparison to other control strategies and machinery can leak hydraulic fluid and shed other hazardous substances into ditches and other sensitive environments.

Special considerations for this management option are necessary due to exposure to hazards such as noise, sharp power equipment and road traffic. Extra alertness is necessary. Protection for eyes, ears, hands, legs, and feet is required when using these tools. Alternative mechanical methods such as steam or flame have been investigated. Both steam and flaming work by destroying top growth and are best used when plants are first germinating, not when well established. Both have little effect on roots. Additionally, steam and flaming pose significant hazards for the operator and the environment and are very costly. These methods are not being considered for inclusion at this time.

Manual methods are commonly used for small infestations. This technique is effective in treating areas where obstructions prohibit mechanical methods. Hand pulling can be very selective and may be reserved for sites where extreme selectivity is critical and the infestation is small. Grubbing and hand pulling rely on moist soils and can be performed during inclement weather. These methods are labor intensive, slow, disturb the soil, and are usually expensive compared to other methods. As with other physical methods using mechanized equipment, manual treatments that do not extract all the roots of perennial plants will result in resprouting.

ROADSIDE APPLICATION

Physical control methods, both mechanical and manual, have been the preferred method for roadside vegetation management in Clallam County for many years. Mowing and brushing activities are an indispensable part of maintaining road safety by preventing line-of-sight obstructions, reducing fire hazard, preventing flooding, and ensuring biofiltration of hazardous runoff. Reach mowing is the practice of clearing vegetation, primarily brush and small trees, from the right-of-way. Work is accomplished with a rotary or flail mowing head attached to an extendable boom mounted to a tractor. This practice includes ditches and intersections. Clearing undesirable brush and trees from ditches encourages the growth of desirable grasses. This helps maintain the bio-filtration function of grass, resulting in cleaner runoff water.

The road department strives to make one complete mowing pass per year; more at intersections or critical locations. Right-of-way mowing and brushing can occur from spring to early fall when shoulder vegetation is actively growing and ongoing shoulder maintenance is required. Mowing does not normally reduce weed infestations, but can provide temporary suppression. It is best used in close coordination with other weed control methods. In general, perennial weeds like Canada thistle must be mowed at least three times per season or the weeds are invigorated.

Under the IWM plan, road shop supervisors will work closely with the environmental coordinator, noxious weed control coordinator, and right-of-way weed crew lead and coordinate with the mowing crew to ensure that all work is performed in accordance with Endangered Species Act and water quality requirements and state weed laws. Critical areas have been identified ensuring that mowers will know which areas and locations require special consideration. Appropriate guidelines have been developed for these locations. Changes and updates are done as necessary.

The road department funds sheriff department-led chain gangs which provide a valuable manual workforce. Manual weed control activities will be incorporated into their assigned duties. Chain gangs will be the backbone of weed control activities that require a large labor force. They will be directed to work on large infestations of easily recognized weeds that can be effectively pulled such as flowering tansy ragwort and Scotch broom.

LIMITATION

- Mowing suppresses weed infestations; but does not control. Where control is desired, mowing is not recommended unless in combination with other control measure.
- Tough perennial weeds, especially those with extensive roots, are difficult to control using only physical means.
- Pulling or digging weeds is most effective when ground is soft.

APPLICATION GUIDELINES

- Avoid close mowing of desirable, native vegetation. Limit back slope mowing as much as possible. Avoid mowing the back slope in critical areas.
- Resurvey mowed roads to locate weed regrowth.
- Do not mow knotweed infestations; mowing encourages re-sprouting, may spread fragments capable of producing viable plants, and makes other treatments less effective. Consult crews responsible for weed control recommendations.
- Manual methods may be applied where practical and conditions favorable.
- Digging should be limited to individual plants or very small infestations.
- Limit digging of perennial weeds or those with deeply spreading roots unless they are newly established
- Pull and bag the heads of flowering plants. Dispose of appropriately.

Personnel

The mowing program is currently staffed with three employees who mow, as time allows, between other road maintenance duties. The road department funds two chain gangs that are comprised of up to five low-risk offenders overseen by a corrections officer. The chain gangs perform various tasks as directed by the road department. Weed Board staff digs minor regulated weed infestations as conditions and resources allow to help the County achieve compliance with law.

Training and Licensing

On-the-job training
Monthly safety trainings
Annual weed, native plant identification, and weed control training in conjunction with the Noxious Weed Control Program

Equipment

Various mechanical mowers and tractors with mowing attachments, weed whackers, chainsaws, weed wrenches, shovels, dandy diggers, and *hori-horis* (specialized digging tools).

Maintenance

- Regular maintenance and inspection of mowers and mower heads to minimize leaks or potential spills.
- Operators will be familiar with a spill prevention plan and carry spill kits.
- Ongoing training in critical areas issues for operators.
- Recurrent weed identification training for chain gang.
- Ongoing improvements in equipment.

PERFORMANCE MEASUREMENTS

- Number of weeds pulled
- Number of volunteer events
- Mowing – number of roadside pass miles. Pass miles count each shoulder mile mowed including those that are mowed more than once in a given year. The goal is to reduce this parameter while satisfying public, safety and regulatory responsibilities.

CHEMICAL WEED CONTROL

DESCRIPTION

Herbicide applications only target specific noxious weeds or non-native and invasive species of special concern in our area that have been identified by the Clallam County Noxious Weed Board, state or federal agencies. Applications are made with herbicides selected for their effectiveness on the weed being targeted and may be applied using backpack sprayers or other handheld equipment as determined appropriate by the site conditions and/or the target weed.

GENERAL USE CONSIDERATIONS

Herbicide applications are a less physically labor intensive means of controlling large weed infestations. Herbicides are the most effective way to control deeply rooted, persistent weeds. Properly applied herbicides can suppress weed germination and allow desirable vegetation to flourish with minimal effort. However, herbicides may not be appropriate under certain site or weather conditions, and require more complex decision making and staff training than most other control measures. In Washington all herbicides must undergo a registration process in addition to that required by the Environmental Protection Agency before they can be legally applied. Washington's pesticide laws may require an applicator be licensed.

Choosing an herbicide application requires carefully considering the level of weed infestation, economic impacts, and human and ecologic consequences. When a chemical measure is chosen, optimal effect is achieved through proper herbicide selection, timely application, proper application method, and the use of the effective rate of herbicide.

Herbicide use may differ depending on the setting. Targeted roadside application, as included in this plan, is fundamentally different than that of many other types of applications where herbicides are the mainstay of weed control. Spot applications of herbicides in a noxious weed control program are often used to control individual plants, while in agricultural settings, broadcast applications to entire fields are common. A limited number of chemicals are typically used for noxious weed management compared to those used in agriculture. In a successful weed management program, the amount of herbicide used on a particular site will decrease over time as the invasive plant population declines and sustainable, desirable plant replacement is supported. The potential for developing herbicide resistance is also significantly decreased by this approach.

An herbicide's potential risk is assessed by the Environmental Protection Agency before the product is registered for use. A clear understanding of the risk of using a particular herbicide requires knowledge of the toxicity of the herbicide as well as the likelihood of exposure. Toxicity is a measure of how harmful any chemical compound is. It can be measured in many different ways and evaluated for many different biological systems. However, a chemical cannot have any effects on an organism without an exposure. Because noxious weed management with herbicides necessarily introduces chemicals into the environment, the challenge is to estimate the amount of exposure (the dose) for humans and different types of animals, as well as non-target plants. The presence of an herbicide in the environment poses less risk if the exposure for non-target organisms is sufficiently low that it is unlikely to have a negative impact.

ROADSIDE APPLICATION

It is the explicit goal of this IWM plan to minimize the use of herbicides whenever practicable, while shifting roadside vegetation to natural, self-sustaining, site-appropriate plant communities. Activities that create bare ground in the course of controlling weeds will be avoided, or be limited in duration, to prevent reinvasion by other weed species. Revegetation of bare ground with desirable plants will be promoted wherever opportunity exists.

Each species will have a Best Management Practice (BMP) specific to that species, developed and provided by the Clallam County Noxious Weed Program. Product label guidelines for timing and rates will be observed for best results. Herbicides may be used in conjunction with other practices, including biological and physical.

Most of the herbicides used in noxious weed control are of fairly low toxicity; however, not all herbicides have equal impacts. For example, some may pose greater risks to aquatic life and are not approved for use in aquatic settings. Others have long-lasting pre-emergent herbicidal activity that may restrict plant emergence or growth for several months after treatment. In areas that are to be re-vegetated soon after treatment, these herbicides may not be the best choice if their residues remain biologically active in the soil after desirable plant species are seeded or transplanted.

Herbicide products chosen for this program are ones that maximize effectiveness, selectivity, and safety. Appendix B provides herbicide toxicity and possible exposure scenarios for wildlife. The analysis presented in the Cal-IPC document from which this information was reproduced, was based on the best available scientific data. Herbicide users are reminded of the need to keep in mind that risk analysis is a dynamic, ongoing process, as new data is generated on exposure potential and toxicity. Future studies or refined analyses may reveal risks that were previously unknown; alternatively, they may provide assurance that risks are actually lower than previously understood. With this in mind, invasive weed managers must stay informed about the latest technical developments about the chemical and non-chemical strategies they use.

The way in which herbicides are applied can enhance efficiency and safety goals. Spot, foliar treatments with backpack sprayers or even more selective hand held equipment (such as wick applicators or injectors) will be the most commonly used application method. Spot treatments can release or protect habitat for wildlife such as pollinators, song birds, and small mammals. Spot treatments reduce potential for offsite chemical drift. No broadcast treatments with mechanized equipment are being considered.

Herbicide applications to any particular site will be limited to one or two per season, depending on the weed target. The general treatment period for noxious weeds will be during the growing season when the weeds are in full leaf. Treating before bloom focuses on preventing seed production, treating after bloom focuses on herbicide translocation to the roots as the plant restores food levels in the roots. Late season treatments need to be timed so that green living leaf and stem growth is still present. Fall applications are effective for controlling germinating winter annuals, biennials in the rosette stage, and moving herbicide to the roots of established perennials.

All herbicides used by Clallam County are currently registered by the U.S. Environmental Protection Agency (EPA) and the Washington State Department of Agriculture (WSDA). Application of herbicides is in accordance with WSDA standards and chemical labels. County employees who apply the herbicides are licensed by WSDA. In addition, these employees undergo continuous training to upgrade their expertise in the selection and safe application of herbicides. Herbicide labels, Safety Data Sheets (SDS), WSDA sensitive person list, a safety plan, and this document are kept in the office and in the weed control truck.

Record Keeping

Thorough record keeping is maintained on a WSDA approved form (Appendix B), per State requirement for all herbicide applications. The record includes information about the treatment including location, chemical used, weather conditions, and applicator comments. Citizen inquiries pertaining to herbicide applications are recorded and addressed.

LIMITATION

Herbicides should not be used:

- When heavy rainfall is imminent, winds exceed 10 mph or during other inclement weather conditions, such as heavy rainfall that is expected soon after an application.
- Where landowners have a current "Landowner Will Control" agreement
- Special management areas such as adjacent certified organic farms may have specific control practices or limitations.

APPLICATION GUIDELINES/STANDARD OPERATING PROCEDURES

- Use only EPA and WSDA approved herbicides.
- All applications conducted under direct supervision of licensed applicators.
- Observe strict compliance to product labels and to State and local regulations.
- Use personal protective equipment as directed on the herbicide product label.
- Carefully select products, rates, timing of application, and equipment to be used.
- Include marker dye to aid identification of treated areas.
- Follow all applicable notification protocols.
- Follow product label for use and storage.
- Apply only aquatically approved formulations within 50 feet of water.
- Treat only the noxious weed site.
- Minimize drift injury by not spraying when wind exceeds 10 mph.
- Use drift reduction agents or techniques as appropriate.
- Don't spray when drift cannot be controlled.
- Avoid foliar application when rainfall is forecast within 24 hours. .
- Conduct mixing and loading operations in an area where a spill would not contaminate an aquatic site or well head.
- Do not rinse spray equipment near bodies of water or sources of potable water.
- Be aware and protective of people, working equipment, sensitive crops and gardens, apiaries, endangered species, water and wells.
- Avoid direct applications to pollinators.

- Secure containers during transportation.
- Contain and clean up spills and request help as needed.
- Keep copy of product labels and SDSs in truck.
- Promptly respond to any public inquiries or direct them to the supervisor.
- Post treated areas and specify the duration of exclusion, if appropriate.
- Provide public educational information on the need for weed treatments.
- Coordinate weed management activities where joint use of a right-of-way exists.

Herbicide Notification Process

Our intent is to provide notice as far in advance as possible balanced with the ability to predict weather and scheduling. General notice is provided in early spring through a Press Release (Appendix C) provided to the local news media and Public Notice posted on the County website. Both include general vicinity of areas to be treated, reference to the IWM plan and how to obtain a copy, and information for entering into an Owner Will Control Agreement with Clallam County. Additionally, up to one week prior to weed treatments along county rights-of-way, an Herbicide Notice (Appendix D) is posted at intersections and at least every mile of contiguous treatment. The Herbicide Notice includes the herbicides to be used, target weed species, approximate application date, and phone contact. Notices that are pre-posted are redated with the actual date of application. Staff is trained and available to explain applications and answer onsite questions.

Staff

The IWM program will be staffed with a licensed supervisor and two seasonal employees that will be licensed or operate under the direct supervision of the supervisor or licensed Noxious Weed Control Board staff.

Training and Licensing

Washington State Department of Agriculture Pesticide License “Public Operator”
Washington State University IPM Program Certification (Continuing Education)

Equipment

Equipment used: back pack sprayers, hand held-spray bottles and loppers, wicker wipe applicators, EZ-Ject lance and injection guns for selected noxious weeds. A backpack sprayer is a self-contained unit (tank and pump) and is carried on the back of the applicator. The capacity of these sprayers is usually less than 5 gallons. The entire tank may be pressurized or only a small chamber that draws from the main tank. This equipment is useful for selective applications and spot treatments. Backpack sprayers are very adaptable to a wide range of nozzle configurations for treating foliage. The backpack sprayer is the major application device for roadside weed control in Clallam County.

Maintenance

- Regular maintenance and calibration of all spray equipment.
- Early detection of targeted weed infestations and ongoing site evaluations.
- Ongoing training of staff including yearly recertification credits.
- Ongoing improvement and updates of equipment and handling protocols.

PERFORMANCE MEASUREMENTS

- Number of projects completed.
- Area of weeds controlled.
- Number of weed species controlled/encountered
- Public, interdepartmental, and agency weed control requests – number of requests, area of treatment, miles of road.
- Public satisfaction -- number of complaints (the lower the number, the better the performance)
- Survey goals -- area and number of miles inspected.
- Documentation, monitoring, evaluation, and reporting

OWNER WILL CONTROL AGREEMENT

Owner Will Control Agreement

Property owners will have the option to keep the road right-of-way abutting their property weed free with or without herbicides. To do so, the property owner must enter into an Owner Will Control Agreement with the County and perform weed control as outlined in the Agreement.

When entering into an Owner Will Control agreement, property owners assume the county's responsibility under state laws RCW 17.10 and WAC 16-750 to control noxious weeds, which requires timely and often repeated control efforts during the growing season. The landowner would also assume any additional weed control responsibilities resulting from county policy.

Property owners participating in control agreements may also be interested in assisting with cultural control enhancements consistent with long-term roadside weed control goals. Such opportunities will be pursued as program resources and voluntary participation allow.

A sample Owner Will Control packet is included in Appendix F.

Adopt-A-Patch

The public may "Adopt-A-Patch" consisting of weeds infestations that may be controlled manually. These types of locations will be annually identified, compiled and posted online before seasonal county treatments commence. Those who wish to adopt a patch, must enter into a Control Agreement (obtain a special use permit) with the County which will outline control responsibilities and the deadline for completion.

An Adoption Deadline will be posted along with Adopt-A-Patch locations to avoid scheduling conflicts with county control personnel. Permits granting permission to control weeds on County owned or managed lands, safety training and tips, as well as any other conditions required by county policy will be included in the Control Agreement packet.

A sample Adopt-a-Patch packet is included in Appendix G.

This Page Left Blank

CULTURAL WEED CONTROL

DESCRIPTION

Techniques that benefit the development and health of desirable, competitive plant communities are considered cultural weed control methods. Cultural methods, along with prevention, are the preferred method of weed control wherever possible. Examples include the use of mulch and soil amendments that improve soil fertility to stimulate growth of desired species or to alter soil pH to discourage undesired plants. Cultural weed control includes the planting or seeding of desirable species. Effective use of cultural methods must be conducted in close coordination with efforts to eliminate existing noxious weed sites.

GENERAL USE CONSIDERATIONS

Cultural control methods encourage natural, self-sustaining, site-appropriate plant communities to develop in the long term. Native plant materials are preferred because once established on appropriate sites they require few additional inputs to thrive and self-perpetuate. In addition to low maintenance, well established native plantings provide many environmental services, such as erosion control, biofiltration, pollinator and animal habitat. Native plantings have the potential to prevent undesirable weeds from becoming established by two mechanisms, competition and allelopathy. Competition is the interaction between plants for site resources such as space, nutrients, moisture, and light. Allelopathy occurs when one plant produces chemicals which inhibit the establishment and growth of others. The composition of plant communities on the roadside is likely to be a result of both mechanisms. Native wildflowers provide forage for pollinators and are aesthetically pleasing, while occupying the site to prevent or retard invasion by undesired noxious weeds.

ROADSIDE APPLICATION

The long term goal of this plan is to programmatically incorporate cultural practices into overall roadside management practices. Possible opportunities include: new construction, shoulders and ditches, locations under “Owner Will Control” agreements, post weed treatment, and other county land such as pits, trails, and parks.

Activities that enhance or create native or self-sustaining plant communities should be applied as broadly as possible. Cultural practices are best applied to disturbed or bare ground or after weed treatments have occurred. Controlling the noxious weeds may release native roadside plants but more active measures may be required. Clallam County has committed to the unique opportunity to partner with Olympic National Park to develop and obtain native seed mixes and plant material through the Matt Albright Native Plant Center.

Activities to improve site conditions such as mulching or adding soil to increase successful desirable plant establishment will be considered as resources and materials are available. Such activities cannot interfere or conflict with the primary use and safety of county rights-of-way.

LIMITATION

- Revegetating activities must be postponed until weed infestation is adequately controlled.

- Plant selection must not conflict with roadside safety and maintenance considerations, public or animal health, and adjacent land use or values.
- Roadsides are a harsh environment for establishing many desirable plant species; amending soil may not be a viable option in many cases.

APPLICATION GUIDELINES

- Use native species wherever possible.
- Blend with adjacent landscaping.
- Choose low growing plants for foreslope that require less mowing
- Utilize weed-free, chipped materials on site to suppress weeds. Weedy brush may only be chipped and left on site if it is in early growth stages, and has no ripe seed.

Staff

WSU Master Gardener Coordinator, volunteers, Weed Crew

Training and Licensing

No licensing required
Native plant identification, biology, and habitat needs
Planting techniques
Use of GPS equipment

Equipment

Handheld GPS, hand tools

MAINTENANCE

Maintain/evaluate sites for first five years
Monitor periodically thereafter

PERFORMANCE MEASUREMENT

- ♦ Cooperative relationships with outside entities developed and maintained
- ♦ Planning documents developed
- ♦ Volunteer participation
- ♦ Area replanted
- ♦ Maintenance costs are reduced over time

PREVENTATIVE WEED CONTROL

DESCRIPTION

Preventative weed control refers to any control method that aims to reduce or prevent weeds from being established. Examples of preventative weed control would be using certified weed free materials such as road and shoulder base rock, gravel, straw, soil, or mulch material for construction and maintenance activities, and making sure equipment is cleaned before moving from one location to another.

GENERAL USE CONSIDERATION

Prevention is, by far, the most environmentally and cost-effective control strategy. In addition to the above mentioned best management practices, prevention includes actively surveying for and eradicating new invaders or small, newly discovered infestations as they are encountered.

ROADSIDE APPLICATION

Prevention is a top priority for this plan. Using certified weed-free materials whenever possible reduces or prevents introducing new weeds, and avoiding soil disturbance helps prevent creating an environment vulnerable to invasion. Road designs that are easier to maintain and incorporate weed prevention features can be very cost effective in the long term. Weed Board staff is available to advise and provide technical assistance to Road Department engineers at all stages in road construction.

Weed Free Materials. Since prevention is the foundation of noxious weed control, prevention should start with certified weed-free seeds, mulches, soil, and gravel. The North American Invasive Species Management Association has certification standards that involve inspection of sources and sites to determine they do not contain seeds or plant parts of invasive weeds. Inspection includes, but is not limited to, surrounding ditches, top soil piles, gravel/sand piles and pits, fence rows, roads, easements, rights-of-way, working areas, storage areas, and a buffer zone surrounding the area. Washington subscribes to these certification standards and Clallam County will apply these standards as widely as possible.

Clean Equipment. An important part of prevention is to not carry noxious weed seeds or plant parts from site to site. Before moving from or to a construction or maintenance project, clean the equipment. Remove hanging debris; wash off mud. Ensure that associated vehicles and crew are similarly inspected. These actions help stop the movement of weeds along the roadside corridor. Clean hand tools, boots and clothing as well.

Avoid Bare Ground. One of the problems of mechanical tools is scalping the soil. Whether it's by a grader, a mower, a bush hog, or a string trimmer, bare ground creates openings for the establishment of invasive weeds. Historically, when roadsides were disturbed, native plants from the soil seed bank or undisturbed adjacent land provided the seed source for the new native plants. In today's world, with human disturbances and inadvertent plant introductions, aggressive invasive plants are ready to occupy the available site. Covering bare ground with weed-free materials or seeding with desirable seed mix as soon as possible will suppress weed germination.

Design Controls. Adding new engineering standards that require less maintenance, such as favorable slope gradient, extending chip-seal edge, and incorporating native plantings in construction planning all help to prevent weed invasion.

EDRR. Eradication is a very realistic objective in the early stage of noxious weed establishment. Detecting new invaders or small weed patches and eliminating them at an early stage prevents costly intervention later. This form of prevention called Early Detection, Rapid Response (EDRR), is a preferred strategy for this program.
Both county employees and the general public can be an important part of the EDRR process. The components of EDRR are: 1) detection reporting, 2) identification confirmation, 3) rapid assessment, 4) program planning, and 5) rapid response. The general public will be encouraged to report suspicious plants, or new weed locations. The Clallam County noxious weed board has the resources to confirm the identity of suspicious weeds.

LIMITATION

- Roadways are exposed to all manner of weed pressure and completely preventing transportation and introduction of invasive plants is not possible.
- Routine maintenance activities will create some amount of bare ground.
- This control measure does not deal with established weed infestations.

APPLICATION GUIDELINES

- Incorporate prevention strategies programmatically into all aspects of planning and executing weed control activities and road maintenance.
- Develop native plant materials so that native seeds of desired plants are readily available.
- Limit activities that create bare ground.
- Where disturbance is expected, plan to revegetate with site appropriate plants. Identify the most favorable conditions for establishment.
- Inspect, evaluate weed invasion risk, and treat appropriately in response to emergency disturbances such as fire and flooding.
- Adopt a monitoring schedule to detect the presence of new invaders along roadsides or weed invasion of new construction.
- Incorporate EDRR strategy

Personnel

WSU Master Gardener Coordinator, volunteers, Noxious Weed Control Board Staff

Training and Licensing

Cooperative training with WSDOT
Annual prevention and weed identification programs conducted by the Weed Board

Equipment

None determined at this time

PERFORMANCE MEASUREMENT

- A higher percentage of weed sites are small.
- Program costs are reduced over time.

2018 WORK PLAN

2018 Work Plan

The focus of this work plan is the control of state-listed noxious weeds and invasive, non-native weeds of special concern on Clallam County rights-of-way. The integral precept of this IWM plan is that all control techniques are potentially applicable to the solution of the problem. A project list will be posted online and updated as treatments occur to keep the public informed.

With more than five hundred miles of county roads there are a variety of weed problems as well as control opportunities. Biological controls will continue to operate on roadsides through releases made elsewhere in the county. Additional releases will be made if new insect controls become available and are compatible with routine maintenance activities such as mowing, which is non-specific to and independent of weed control.

Physical controls will continue to be applied across the road system where effective and as resources allow. Scheduling chain gang weed control activities to be consistent with weed growth life-stage and as part of an overall strategy will greatly increase the efficiencies of using this labor force. Volunteers will be recruited for various projects, especially where adjacent infestations threaten county assets.

Chemical control is an important tool that is needed for specific weed problems. Great care has been taken in choosing which herbicides may be applied, and additional safeguards are included by ensuring only targeted, hand applications are allowed. Herbicide use is limited to specific county roads and noxious weed locations which are listed in this plan based on past surveys and on-going treatment locations.

Most importantly, cultural and preventative controls will be applied programmatically to sustain the progress made by all of the above mentioned control methods. Combined, these management practices will move us towards achieving a low maintenance, naturally stable, plant community.

High priority weed targets are identified and control options for an array of roadside weeds are summarized in the tables below. These are followed by specific tasks necessary to implement the 2018 work plan. Tasks are itemized under separate category headings. While listed separately, the tasks represent the best mix of control options chosen to address specific weed problems. The complete set of tasks is carefully designed to be implemented in tandem, not independently.

Identifying High Priority Weed Targets

Table 2 contains known roadside weeds for Clallam County. The table is arranged to show which weeds are the highest priority for control based on potential economic or environmental impacts and feasibility for control. The list is not comprehensive and will change as conditions change.

"Plant status" indicates one of several categories: a **noxious weed** (a prioritized legal designation including Class A, Class B and Class C weeds where control may be required under state law), a **non-native, invasive** plant capable of causing economic or environmental impacts, but not listed by the state, and **weedy**, so prevalent that it is generally considered naturalized or an aesthetic

nuisance. Infestations of invasive, non-native species are more easily eliminated before they become established.

To be most efficient when deciding treatment priorities, where known, weeds are characterized as widespread or rare. The following abbreviations are used in the "status" column in Table 2:

ISSC = **I**nvasive **S**pecies of **S**pecial **C**oncern
NCR = **N**oxious, **C**ontrol **R**equired
NR = **N**oxious**, R**are
NW = **N**oxious, **W**idespread
WR = **W**eedy**, R**are
WW = **W**eedy**, W**idespread

Weeds are assigned to a "category" based on information in the "status" column. Weeds are categorized as follows:

Category 1 weeds are Class A, B designate, and selected B or C noxious weeds, additional noxious weeds and invasive species of special concern that are very limited in distribution, and newly discovered invaders that were previously unknown in the county (EDRR - early detection, rapid response). Category 1 weeds are the *highest priority* for control.

Category 2 weeds are noxious weeds that are widespread, but of particular concern to the general public or an affected public entity. Category 2 weed infestations will be added to the annual work plan in an effort to methodically reduce widespread weeds over time and to accommodate requests.
Category 3 weeds are those that are so widespread they are generally considered naturalized or a nuisance. These weeds are tolerated. Control is not considered feasible.

A list of roadside weeds, life cycle, growth form, category and status are in Appendix G.

Table 2. Known roadside weeds in Clallam County.

Common Name	Scientific Name	4-Letter Weed Code	Category	Status	Threat
alyssum, hoary	*Berteroa incana*	BEIN	1	NCR	Aggressive invader in fields of forage crops; toxic to horses
bindweed, field	*Convolvulus arvensis*	COAR	1	NR	Seriously interferes with agriculture
brome, ripgut	*Bromus diandrus*	BRDI	1	ISSC	Long seed awns cause injury to nose and eyes of grazing animals; known to occur in Clallam County, but not on roadsides; will be treated under EDRR protocol if observed.
butterfly bush	*Buddleia davidii*	BUDA	1	NR	Invades natural areas; dense stands crowd out native vegetation in riparian areas and interfere with natural succession
cheatgrass or downy brome	*Bromus tectorum*	BRTE	1	ISSC	Depletes soil moisture in early spring; fire hazard in summer; known to occur in Clallam County, but not on roadsides; will be treated under EDRR protocol if observed.
Chicory, common	*Cichorium intybus*	CIIN	1	ISSC	Only found in the Dungeness Valley where it is starting to spread

Common Name	Scientific Name	4-Letter Weed Code	Category	Status	Threat
cinquefoil, sulfur	*Potentilla recta*	PORE	1	NCR	Not readily grazed by livestock and wildlife; forms dense stands
comfrey, common	*Symphytum officinale*	SYOF	1	ISSC	Used medicinally for poultices; liver damage when ingested; can form dense stands; difficult to control once established
fennel, common	*Foeniculum vulgare*	FOVU	1	NCR	Dense stands exclude native vegetation
hawkweed, orange	*Hieracium aurantiacum*	HIAU	1	NCR	Dense stands exclude other species; bitter and unpalatable, little forage for livestock and wildlife
Hawkweed, yellow	*Hieracium caespitosum*	HICA	1	NCR	Dense stands exclude other species; bitter and unpalatable, little forage for livestock and wildlife
herb Robert	*Geranium robertianum*	GERO	1	N	Rapid spreading; displaces native herbaceous plants; allelopathic, inhibits the germination of small seeded forbs in forest understory
hogweed, giant*	*Heracleum mantegazzianum*	HEMA	1	NCR	Skin contact with sap causes severe dermatitis and blistering on people and animals
knapweed, diffuse	*Centaurea diffusa*	CEDI	1	NCR	Spreads seed by tumbling; prickly flower heads; unpalatable after early spring
knapweed, meadow	*Centaurea x moncktonii*	CEMO	1	NCR	Outcompetes pasture species; degrades wildlife habitat; interferes with agriculture
knapweed, spotted	*Centaurea stoebe*	CEST	1	NCR	Allelopathic plant that can inhibit the germination of grasses; forms dense stands that exclude desired plants and wildlife
knotweed, Bohemian	*Polygonum bohemicum*	POBO	1	NCR	Easily spreads by disturbance; dense colonies eliminate other plant species and can degrade fish habitat; causes structural damage to human structures
knotweed, giant	*Polygonum sachalinense*	POSA	1	NCR	Easily spreads by disturbance; dense colonies eliminate other plant species and can degrade fish habitat; causes structural damage to human structures
knotweed, Japanese	*Polygonum cuspidatum*	POCU	1	NCR	Easily spreads by disturbance; dense colonies eliminate other plant species and can degrade fish habitat; causes structural damage to human structures
laurel, spurge	*Daphne laureola*	DALA	1	NR	Toxic to humans and animals; contact with plants can cause dermatitis
loosestrife, purple*	*Lythrum salicaria*	LYSA	1	NCR	Dense stands eliminate other plant species; poor palatability; degrades wildlife habitat and hunting and fishing areas.
nightshade, hairy	*Solanum physalifolium*	SOPH	1	WR	Can be toxic to humans and livestock; limited distribution

Common Name	Scientific Name	4-Letter Weed Code	Category	Status	Threat
old man's beard	*Clematis vitalba*	CLVI	1	NR	Climbing growth smothers other plants, even trees
poison hemlock	*Conium maculatum*	COMA	1	NCR	Highly toxic to humans and animals; all parts of the plant are toxic; severe birth defects
ribbon grass	*Phalaris arundinacea*	PHAR	1	NR	Aggressive invader displaces other plants in wet sites; an ornamental form of reed canarygrass; may also be used as a source for psychedelic drugs
sowthistle, perennial	*Sonchus arvensis*	SOAR	1	NR	Aggressive invader, will outcompete desirable forbs and grasses in pastures; limited distribution in Clallam County
tansy ragwort	*Senecio jacobaea*	SEJA	1	NCR	Poisonous to horses, cattle, and pigs; animals grazing tansy can produce tainted milk, may result in potentially toxic residue in honey
tansy, common	*Tanacetum vulgare*	TAVU	1	NR	Dense stands degrade forage value; toxicity issues for humans and livestock
teasel, common	*Dipsacus fullonum*	DIFU	1	NR	Forms dense stands of prickly, unpalatable plants; degrades habitat and reduces accessibility
whitetop, hairy	*Lepidium appelianu*	LEAP	1	NR	Monocultures displace desirable plants; unpalatable; can be form toxic to cattle
wormwood, absinth	*Artemisia absinthi*	ARAB	1	NR	Aggressive invader, will outcompete desirable forbs and grasses in pastures, fields and native grasslands; plants have a strong bitter taste and odor, may affect milk quality
yellow archangel	*Lamiastrum galeobdolon*	LAGA	1	NCR	Aggressive invader, competes understory species, degrades wildlife habitat
birdsrape mustard	*Brassica rapa*	BRRA	2	WW	Can be toxic to livestock, can degrade agricultural seed production
blackberry, evergreen	*Rubus laciniatus*	RULA	2	NW	Dense canopies crowd out native species; impenetrable barrier
blackberry, Himalayan	*Rubus armeniacus*	RUAR	2	NW	Dense canopies crowd out native species; impenetrable barrier
broom, Scotch	*Cytisus scoparius*	CYSC	2	NW	Forms dense stands; unpalatable; interferes with forest regeneration; fire hazard; scent can exacerbate human grass allergies; seeds are toxic to horses and livestock
burdock, common	*Arctium minus*	ARMI	2	WR	Forms large rosettes; hooked spines on seeds become entangled in fur of animals
canarygrass, reed	*Phalaris arundinacea*	PHAR	2	NW	Unpalatable unless young, forms dense stands that crowd out native plants; especially difficult to control; serious wetland invader; can stop the process of succession in riparian sites, impedes tree seedling establishment

Common Name	Scientific Name	4-Letter Weed Code	Category	Status	Threat
carrot, wild	*Daucus carota*	DACA	2	NW	Damages agricultural commodity as it may cross pollinates with domestic carrot, seriously degrading the quality of commercial carrot seed production
English hawthorn	*Crataegus monogyna*	CRMO	2	NR	English hawthorn is carried by birds into forests and open fields where it can form dense, thorny thickets that outcompete native species
iris, yellow flag	*Iris pseudacorus*	IRPS	2	NR	Toxic to humans and animals; displaces vegetation at wet margins of ditches, ponds, and lakes; plant resins can cause skin irritation in humans
peavine, everlasting	*Lathyrus latifolius*	LALA	2	ISSC	Forms dense thickets; seeds can be toxic to livestock; seriously interferes with forest regeneration where it invades from edges of timber units
thistle, bull	*Cirsium vulgare*	CIVU	2	NW	Aggressive competitor, unpalatable for cattle
thistle, Canada	*Cirsium arvense*	CIAR	2	NW	Aggressive competitor, unpalatable; decreases forage; host species for several agricultural pests
bindweed, hedge	*Calystegia sepium*	CASE	3	WW	
buttercup, creeping	*Ranunculus repens*	RARE	3	WW	
catsear, common	*Hypochaeris radicata*	HYRA	3	NW	Crowds out palatable forage species
clover, various			3	WW	
common mullein	*Verbascum thapsus*	VETH	3	WW	
daisy, oxeye	*Leucanthemum vulgare*	LEVU	3	NW	Livestock avoid grazing; milk from dairy cows has unpleasant flavor
dandelion, common	*Taraxacum officinale*	TAOF	3	WW	
English holly	*Ilex aquifolium*	ILAQ	3	WW	Dense thickets can dominate shrub layer and suppress desirable vegetation
fox glove	*Digitalis purpurea*	DIPU	3	WW	Can be toxic to livestock; spreads aggressively in disturbed areas
orchard grass and other pasture grasses	*Dactylis glomerata*	DAGL	3	WW	
st johnswort, common	*Hypericum perforatum*	HYPE	3	NW	Causes photo-sensitization when grazed; toxic at all stages of growth

*No active sites, but previously documented; **Insufficient distribution information Table 3 shows general guidelines for year-round treatments of the listed noxious weeds and invasive weed species of special concern.

It is intended as a basic reference framework from which decisions are made for weed treatments from available options. Seasonal variables are considered and addressed as they become evident. Changes to the Clallam County Noxious Weed List or species that appear on county right-of-way may make adjustments necessary.

Table 3. Recommended control treatments for Clallam County roadside noxious weeds.

Noxious Weed	Fall	Winter	Spring	Summer
Category 1 Weeds				
alyssum, hoary	Foliar herbicide treatment	Manual removal/digging	Manual removal/ digging; foliar herbicide treatment	Foliar herbicide treatment; clip flower heads
bindweed, field	Foliar herbicide treatment	Plants die back - no action	Foliar herbicide treatment	Foliar herbicide treatment
brome, ripgut	Foliar herbicide treatment	Plants die back - no action	Foliar herbicide treatment	Foliar herbicide treatment
butterfly bush	Herbicide treatment - cut stump or foliar	Manual removal/ digging; mowing; cut stump treatment	Manual removal/ digging; herbicide treatment - cut stump or foliar	Manual removal/ digging; herbicide treatment - cut stump or foliar
chicory, common	Manual removal/ digging;	Plants die back - no action	Foliar herbicide (rosette stage)	Foliar herbicide treatment
cinquefoil, sulfur	Foliar herbicide treatment	Plants die back - no action	Manual removal/ digging; foliar herbicide treatment	Foliar herbicide treatment
Comfrey, common	Foliar herbicide treatment	Plants die back - no action	Foliar herbicide treatment	Foliar herbicide treatment
fennel, common	Manual removal/ digging; foliar herbicide treatment for fall regrowth	Manual removal/ digging;	Manual removal/ digging; foliar herbicide treatment	Manual removal/ digging; foliar herbicide treatment
hairy white top	Foliar herbicide treatments	Plants die back - no action	Foliar herbicide treatments	Foliar herbicide treatments
hawkweed, orange	Foliar herbicide treatment	Plants die back - no action	Foliar herbicide treatment	Foliar herbicide treatment
hawkweed, yellow	Foliar herbicide treatment	Plants die back - no action	Foliar herbicide treatment	Foliar herbicide treatment
herb Robert	Foliar herbicide treatment	Plants die back - no action	Manual removal; foliar herbicide treatment	Manual removal; foliar herbicide treatment
hogweed, giant	Manual removal/ digging;	Plants die back - no action	Manual removal/ digging; foliar herbicide treatment; clip flower heads	Manual removal/ digging; foliar herbicide treatment
knapweed species	Manual removal/ digging;	Manual removal/ digging;	Foliar herbicide treatment (rosette stage)	foliar herbicide treatment; biological control
knotweed species	Foliar herbicide treatment or injection	Plants die back - no action	Avoid disturbance; No action; mow for site distance ONLY	Foliar herbicide treatment or injection (late summer)
laurel, spurge	Foliar herbicide treatment; cut stump	Manual removal/ digging; cut stump	Foliar herbicide treatments; cut stump	Foliar herbicide treatments; cut stump
loosestrife, purple	Manual removal/digging;	Plants die back - no action	Manual removal/digging;	Manual removal/ digging; foliar herbicide treatment; clip flower heads; biological control
Nightshade, hairy	Manual removal/digging;	Plants die back - no action	Manual removal/digging; foliar herbicide treatment	Manual removal/digging;

Noxious Weed	Fall	Winter	Spring	Summer
old man's beard	Foliar herbicide treatment if prostrate; basal stem treatment	Basal stem treatment	Foliar herbicide treatment if prostrate; basal stem treatment	Foliar herbicide treatment if prostrate; basal stem treatment
poison hemlock	Manual removal/ digging; foliar herbicide treatment for fall regrowth	Manual removal/ digging;	Foliar herbicide treatment (rosette stage)	Manual removal/ digging; foliar herbicide treatment; clip flower heads; biological control
ribbon grass	Foliar herbicide treatment	Plants die back - no actions	Foliar herbicide treatment	Foliar herbicide treatment
tansy, common	Foliar herbicide treatment	Plants die back - no action	Manual removal/ digging; foliar herbicide treatment	Foliar herbicide treatment
sowthistle, perennial	Foliar herbicide treatment	Plants die back - no actions	Foliar herbicide treatment	Foliar herbicide treatment
tansy ragwort	Manual removal/ digging; foliar herbicide treatment for fall regrowth	Manual removal/digging	Manual removal/ digging; foliar herbicide treatment (rosette stage)	Manual removal/ digging; foliar herbicide treatment; clip flower heads; biological control
teasel, common	Foliar herbicide treatments	Plants die back - no action	Manual removal/ digging; foliar herbicide treatment	Foliar herbicide treatment
wormwood, absinth	Mowing for sight distance and seed prevention; herbicide treatment - cut stump, basal bark	Mowing for sight distance; herbicide treatment - cut stump, basal bark	Manual removal/ digging; mowing for sight distance; herbicide treatment - foliar, cut stump, basal bark	Mowing for sight distance; herbicide treatment - foliar, cut stump, basal bark
yellow archangel	Foliar herbicide treatments	Plants die back - no action	Foliar herbicide treatments	Foliar herbicide treatments
Category 2 Weeds				
blackberry species	Foliar herbicide treatment; mowing for sight distance issue	Mowing for sight distance issues	Foliar herbicide treatment; mowing for sight distance issue	Foliar herbicide treatment; mowing for sight distance issue
burdock, common	Foliar herbicide treatments	Plants die back - no action	Manual removal/ digging; Foliar herbicide treatments	Foliar herbicide treatments
broom, Scotch	Manual removal /digging; mowing for sight distance issues; cut stump treatment	Manual removal/ digging; mowing; cut stump treatment	Manual removal/ digging; cut stump and foliar herbicide treatment	Manual removal/ digging; cut stump and foliar herbicide treatment; clip flower heads; biological control
carrot, wild	Foliar herbicide treatment	Plants die back - no action	Manual removal/digging; foliar herbicide treatment	foliar herbicide treatment
hawthorn, english	Manual removal /digging; mowing for sight distance issues; cut stump treatment	Manual removal/ digging; mowing; cut stump treatment	Manual removal/ digging; cut stump and foliar herbicide treatment	Manual removal/ digging; cut stump and foliar herbicide treatment
iris, yellow flag	Foliar herbicide treatment	Plants die back - no action	Foliar herbicide treatment	Foliar herbicide treatment
mustard, birdsrape	Manual removal /Digging; Foliar herbicide treatment	Plants die back - no action	Manual removal/digging; foliar herbicide treatment	foliar herbicide treatment
peavine, everlasting	Foliar herbicide treatments	Plants die back - no action	Foliar herbicide treatments	Foliar herbicide treatments
canarygrass, reed	Foliar herbicide treatment	Plants die back - no actions	Foliar herbicide treatment	Foliar herbicide treatment
thistle, bull	Foliar herbicide treatment to rosettes	Plants die back - no action	Manual removal/ digging; foliar herbicide treatment	Manual removal/ digging; foliar herbicide treatment; clip flower heads
thistle, Canada	Foliar herbicide treatment	Plants die back - no action	Foliar herbicide treatment	Foliar herbicide treatment; clip flower heads

TASKS

Biological

- Identify release appropriate sites adjacent to County right-of-way.
- Coordinate with WSU Extension and the Noxious Weed Control Board for releases as they become available.
- Assist with research projects where possible.

Physical

- Update contact list to be shared between departments.
- Coordinate mowing schedule with weed treatments to avoid incompatible treatments.
- Provide mowers with map of planned weed treatment areas.
- Clearly mark areas, communicate location to field crews.
- Schedule and oversee six weeks of chain gang time for large control projects.
- Provide training and focus area maps for chain gang projects
- Support volunteer opportunities for weed pulling projects as appropriate.
- Identify "Adopt-A-Patch" locations appropriate for manual control that can be adopted by members of the public; and post online before treatment season begins.
- Review public involvement opportunities to ensure the available material meets program goals and is readily accessible online.
- Create ***Report It!*** forms so that road crews can report weed infestations.
- Discourage mowing of desirable native vegetation wherever possible.
- Collaborate with mowing personnel to update mowing practices.
- Consult on road standards that maximize mowing effectiveness in regard to weed control.

Cultural

- Identify opportunities to use native plantings in the early stages of projects in the County's transportation plan.
- Create maps to incorporate roadside environmental typing system.
- Compile list of plant material sources and needs from other government entities.
- Seek grant opportunities to implement pilot projects.
- Foster partnership with Olympic National Park Matt Albright Plant Material Center and update native plant material list and program as necessary.
- Partner with experts from local, state and federal agencies and entities including but not limited to Clallam County Noxious Weed Control Board, Clallam County Parks, Washington State University Extension, WSU Master Gardeners, local chapters of Bee Keepers, the Native Plant and Audubon Societies, The Nature Conservancy, Conservation Districts, Olympic National Park, Olympic National Forest, USFW Marine Refuge System, Makah, Quileute, Lower Elwha Klallam, and Jamestown S'Klallam Tribes, and others who have an interest in developing local native seed and plant resources for use in government projects.

- Encourage landowners with “Owner Will Control” agreements to undertake adjacent roadside enhancements consistent with developing a low maintenance, self-sustaining plant community to prevent weed invasion.
- Identify suitable county pit locations for native plant seeding and implement as material becomes available and when seasonally appropriate.

Preventative

- Update rock and gravel source weed management protocols.
- Inventory, develop and implement weed management plans for all county quarries, storage areas, and spoil disposal sites (pits); update as needed as County use requirements change.
- Create county pit reference maps to include in management plans.
- Adopt weed free material requirements for all county projects.
- Develop clean equipment standards and requirements for all county projects.
- Provide inspection services for all privately sourced material for county projects that may be weed-contaminated.
- Compile a list of sources that meet weed-free standards and publish online.
- Facilitate annual department weed and native plant identification training in cooperation with Weed Board staff. Supply field crew with identification booklets. Provide plant identification services for field crew in cooperation with Weed Board Staff.

Chemical

- Implement project list based on tables 4-8 and planned reduction of Category 2 weed sites.
- Develop and utilize regional partners to assist in weed control across the county.
- Complete treatment records.
- Enter data into Clallam County Noxious Weed Control Program (CCNWC) database.
- Identify any additional equipment needs and take steps to incorporate any available resources, including; vehicles, application equipment, water tanks, or technical equipment.
- Post annual project list and treatments online. Update list during the season as resources allow.
- Monitor at least 10% of all treatments, retreat as needed and as resources allow.
- Provide WSU Master Gardeners Roadside Weed Monitoring Team (RWMT) with safety equipment, additional training opportunities, and technical support for monitoring projects.
- Develop protocols to monitor treatments in county pits.
- Conduct a weed inventory on at least 25% of all county roads annually.
- Identify, document, and map additional species, location, size, and density.
- Update survey data of county roadsides and catalog infestations over time.
- Identify and compile a list of high priority infestations for following year. Create map.
- Identify and compile a list of sites for revegetation appropriate opportunities.
- Support, volunteer-based projects either on or adjoining county property that protect county property from weed infestations as resources allow. Compile locations and instructions for special management areas. Include and update field maps as frequently as needed.

- Promptly respond to all public inquiries. Address any public concerns regarding applications.
- Manage "Owner Will Control" agreements.
- Review “Owner Will Control” application process and forms to ensure all public involvement opportunities are readily accessible online.
- Maintain current list and map of “Owner Will Control” locations for both the office and field use.
- Review and update on-line weed control request application process and forms as necessary.
- Develop on-line, ***Report It!*** process and forms for interdepartmental communication.
- Compile annual report summarizing accomplishments, effectiveness, and recommendations for the subsequent year. Brief the Road Department and County Commissioners by December 31.
- Draft IWM plan and submit to the Clallam County Noxious Weed Control Board and Road Department Supervisor for approval prior to the Weed Board’s first meeting of the year. At its first meeting, the Weed Board holds a public hearing to approve the annual County Noxious Weed Control List. Submission of the IWM plan should occur 10 days before the meeting, and should be posted online. Provide public notice that plan will be discussed, with weed board meeting announcements. The finalized plan and a map of proposed treatment locations should be posted online and made available to the public upon request.

APPLICATION LOCATIONS

The 2018 Work Plan identifies treatment locations that may include the use of herbicides. The IWM Program priorities for roadside weed control in 2018 include:

1) Control of Category 1, regulated weeds on county roadsides in accordance with state law.
2) Control of Category 1, regulated weeds and select weeds in all county rock sources.
3) Control of Category 1 and 2 weeds at locations with most impact to local agriculture.
4) Control of Category 1 and 2 weeds at locations with most impact to local forestry.
5) Control of Category 1 and 2 weeds at locations requested by the public and local agencies.

In general, sites included in the 2018 Work Plan were chosen to complement last year's work, to account for 2017 field conditions, or to further specific public benefit and need. Roadside treatments will include the most effective mix of methods as site or species appropriate. Tables 4 through 8 only include locations where herbicides may be used, even if in combination with other treatment methods. The tables include county roads to their full extent; however, treatments will be limited to specific weed locations and in many cases only at isolated patches of Category 1 weeds.

Roads controlled in 2017 for infestations of Category 1 weeds are included in this Work Plan for retreatment; adjacent roads may have also been included as needed. This Work Plan also includes county roads with isolated patches of Category 1 weed species as identified by 2015 survey data. Isolated infestations can be controlled efficiently and require limited time and effort.

To prevent the spread of weeds, all county rock sources (pits/quarries) are included in the 2018 Plan as a specific priority for control.

The 2018 Work Plan includes control of roadside Category 2 weed targets in agriculture and forestry areas as identified in Tables 4-6. These selections reflect input from farmers and foresters. Other Category 2 weeds may be treated as requested and as time and resources allow.

Early Detection Rapid Response (EDRR) sites are small roadside infestations, defined here as those that are less than 100 square feet, previously unknown, and/or requested by an affected owner or entity during the course of the treatment season. An EDRR strategy is efficient, reduces costs, and increases efficacy of control. EDRR is a preferred strategy for this program, but by nature cannot be determined in advance. All sites that are treated under EDRR will be individually posted on site (with *Herbicide Notice*) and published online as soon as possible. Unknown county infestations found *outside* of the road right-of-way, such as county owned wetlands or riparian corridors, may be treated as EDRR sites up to 500 square feet.

The public may request control of Category 1 or Category 2 species at locations not listed in this plan. Control measures may include the use of herbicide, but more likely, will be controlled using the most effective mix of measures as site or species appropriate. Public requests will be accommodated with the highest priority given to Category 1 weeds, followed by Category 2 weeds in they are received. Requests received prior to March 1st most likely to be accommodated in the same year as requested. Requests received after March 1st are most likely to be verified and included in a subsequent year's work plan.

East Clallam County Selected Roads

East Clallam County includes areas around Carlsborg, Sequim, Blyn and the Miller Peninsula (reference Focus Area Maps 1 and 2). The Dungeness Valley, situated between Sequim and Carlsborg, is the primary agricultural region in Clallam County. Roadside Canada thistle infestations impose significant impacts on adjacent agricultural producers and have been elevated in priority in East Clallam County to reflect the input and requests of local land managers. Old Olympic Highway and Olympic Discovery trail have been identified as excellent candidates for potential post-treatment, native revegetation projects to create stable, natural and pollinator friendly environments.

Table 4. East Clallam County roads selected for herbicide treatment in 2018 (listed alphabetically).

East Clallam Road Name	Description	Est. Road Miles	Target Weed Species For Control
Abbott Rd	Agricultural Request 2018	0.2	Canada thistle
Atterberry Rd	Isolated Cat. 1 Weeds	2.7	field bindweed, meadow knapweed, spotted knapweed
Business Park Loop		0.4	poison hemlock , spotted knapweed
Cameron Rd		0.8	Canada thistle, hairy nightshade, Scotch broom,
Carlsborg Rd	Agricultural Request 2018	0.5	Canada thistle, Scotch broom, spotted knapweed
Cat Lake Rd	Public Request 2017	0.5	tansy ragwort
Cays Rd	Agricultural Request 2018	0.9	Bohemian knotweed , Canada thistle, Scotch broom
Chicken Coop Rd	Isolated Cat. 1 Weeds	3.5	common teasel, tansy ragwort
Corriea Rd	Isolated Cat. 1 Weeds	0.8	common teasel, poison hemlock
Deer Park Rd	Clallam Co Restoration Project	8.0	Scotch broom, tansy ragwort
Diamond Point Rd	Public Request 2017	0.9	tansy ragwort
E Runnion Rd		0.2	Scotch broom, spotted knapweed
Easterly Rd		0.2	Canada thistle , meadow knapweed, Scotch broom
Evans Rd	Agricultural Request 2018	1.7	Canada thistle, common teasel, Scotch broom,
Finn Hall Rd	Agricultural Request 2018	1.4	Canada thistle
Gasman Rd	Isolated Cat. 1 Weeds	2.0	tansy ragwort
Gehrke Rd		0.3	Canada thistle, Scotch broom
Glass Rd	Isolated Cat. 1 Weeds	1.0	Bohemian knotweed
Gunn Rd	Agricultural Request 2018	0.8	Canada thistle, Scotch broom
Happy Valley Rd		5.9	Canada thistle, chicory, common teasel, meadow knapweed, tansy ragwort
Henry Boyd Rd	Isolated Cat. 1 Weeds	1.5	Bohemian knotweed
Heuhslein Rd	Agricultural Request 2018	0.4	Canada thistle
Hogback Rd	Agricultural Request 2018	0.8	Canada thistle, Scotch broom
Holland Rd	Agricultural Request 2018	1.6	Canada thistle, Scotch broom
Jamestown Rd	Clallam Co Restoration Project	1.5	common teasel, poison hemlock
Jimmy Come Lately Rd	Isolated Cat. 1 Weeds	1.0	meadow knapweed
Johnson Creek Rd		0.3	Canada thistle, meadow knapweed, Scotch broom

East Clallam Road Name	Description	Est. Road Miles	Target Weed Species For Control
Kirner Rd	Isolated Cat. 1 Weeds	1.2	spotted knapweed
Kitchen-Dick Rd	Agricultural Request 2018	2.9	absinth wormwood, Canada thistle, common tansy, common teasel, diffuse knapweed, field bindweed, hairy whitetop, hoary alyssum, meadow knapweed, poison hemlock , Scotch broom, spotted knapweed, tansy ragwort
Lewis Rd		0.6	Canada thistle, Scotch broom
Lost Mountain Rd	USFS Request 2018	3.9	butterfly bush, common teasel, meadow knapweed, spotted knapweed
Lotzgesell Rd	Agricultural Request 2018	3.3	Canada thistle, Scotch broom
Matson Road	Agricultural Request 2018	0.5	bull thistle, Canada thistle, Scotch broom
Medsker Rd	Isolated Cat. 1 Weeds	1.3	yellow archangel
N Barr Rd		1.3	tansy ragwort
North St	Public Request 2018	0.5	scotch broom
Old Olympic Hwy	Agricultural Request 2018	6.9	absinth wormwood, butterfly bush, Canada thistle, common tansy, field bindweed, hairy nightshade, meadow knapweed, poison hemlock, spotted knapweed, spurge laurel, Scotch broom, tansy ragwort
Palo Alto Rd		7.8	Canada thistle, meadow knapweed, Scotch broom, sulphur cinquefoil, tansy ragwort
Panorama Blvd	Public Request 2017	0.2	tansy ragwort
Pinnell Rd		0.5	Canada thistle, meadow knapweed
Port Williams Rd	Agricultural Request 2018	2.4	Canada thistle, Scotch broom
River Rd		2.7	Canada thistle, common fennel, common tansy, meadow knapweed, Scotch broom, spotted knapweed, sulphur cinquefoil
S Bean Rd	Isolated Cat. 1 Weeds	0.3	meadow knapweed
Sequim-Dungeness Way	Agricultural Request 2018	NA	common fennel, common teasel, field bindweed, meadow knapweed, poison hemlock, spotted knapweed, tansy ragwort
Schmuck Rd	Agricultural Request 2018	1.3	Canada thistle, Scotch broom
Shore Road	Public Request 2017	0.4	Canada thistle
Slab Camp Rd		0.7	meadow knapweed, Scotch broom, tansy ragwort
Spring Rd	Agricultural Request 2018	0.8	Canada thistle
Taylor Cut-Off Rd	USFS Request 2018	2.6	butterfly bush, meadow knapweed, spotted knapweed
Towne Rd	Agricultural Request 2018	2.9	Canada thistle, poison hemlock
Tripp Rd	Isolated Cat. 1 Weeds	0.3	orange hawkweed
Turnstone Ln		0.3	butterfly bush, scotch broom, spotted knapweed
Vautier Rd	Agricultural Request 2018	0.6	Canada thistle, scotch broom, spotted knapweed
Vistas Dr	Isolated Cat. 1 Weeds	0.1	poison hemlock, scotch broom, spotted knapweed
W Washington St		0.5	Canada thistle, spotted knapweed, spurge laurel,
Ward Rd	Public Request 2017, Clallam Co Restoration Project	1.6	Bohemian knotweed, poison hemlock, yellow archangel,

East Clallam Road Name	Description	Est. Road Miles	Target Weed Species For Control
Wild Currant Way		0.3	Canada thistle, Scotch broom
Woodcock Rd	Agricultural Request 2018	6.2	Canada thistle, common fennel, common tansy, hairy nightshade, meadow knapweed, , poison hemlock, Scotch broom
Woods Rd	USFS Request 2018	0.9	chicory, meadow knapweed, tansy ragwort
Total: **59**		Total: **95.2**	

Central Clallam County Selected Roads

Central Clallam County includes the approximate areas of Port Angeles, Joyce and the Elwha Valley (reference Focus Area Maps 3-5). The roads selected for potential herbicide treatment in 2018 primarily include infestations of Category 1 weed species and adjacent roads. Significant roadside infestations of meadow knapweed, knotweed and tansy ragwort were treated in 2017 and require retreatment and monitoring in 2018. Tansy ragwort invades pastures and is toxic to livestock, but also responds readily to control and is a priority for 2018. Category 2 weed species will be treated as time and resources allow. Little River Rd and Black Diamond Rd have been identified as excellent candidates for potential post-treatment, native revegetation projects to create stable, natural and pollinator friendly environments.

Table 5. Central Clallam County roads selected for herbicide treatment in 2018 (listed alphabetically).

Central Clallam Road Name	Description	Est. Road Miles	Target Weed Species For Control
Black Diamond Rd		4.8	common teasel, meadow knapweed
Blue Mountain Rd	USFW Request 2018	5.4	Bohemian knotweed, tansy ragwort
Dan Kelly Rd	Public Request 2018	3.1	Bohemian knotweed, tansy ragwort
Dry Creek	Public Request 2018	0.7	Bohemian knotweed, everlasting peavine, meadow knapweed,
East Beach Rd		0.6	meadow knapweed
East Lyre River Rd		0.5	meadow knapweed, tansy ragwort
Eden Valley Rd	Public Request 2018	1.8	Bohemian knotweed, common teasel, meadow knapweed, tansy ragwort
Elwha River Rd	Public Request 2017	1.7	Canada thistle, herb Robert
Farrington Rd		0.9	Canada thistle, meadow knapweed, Scotch broom, tansy ragwort
Fisher Cove Rd		0.8	Bohemian knotweed, Canada thistle, common tansy, meadow knapweed
Fors Rd		0.2	tansy ragwort
Gossett Rd		1.2	meadow knapweed,
Joyce-Piedmont Rd	Isolated Cat. 1 Weeds	4.2	meadow knapweed
Kacee Way	Public Request 2017	NA	herb Robert

Central Clallam Road Name	Description	Est. Road Miles	Target Weed Species For Control
Laird Rd		0.9	meadow knapweed, tansy ragwort
Lake Aldwell Rd	Isolated Cat. 1 Weeds	0.5	meadow knapweed
Lake Dawn Rd	Isolated Cat. 1 Weeds	0.5	orange hawkweed
Liljedahl Rd	Public Request 2018	1.0	scotch broom
Township Line Rd	Isolated Cat. 1 Weeds	1.6	Bohemian knotweed, meadow knapweed
Little River Rd		2.9	meadow knapweed, tansy ragwort
Lower Elwha Road	Clallam Co Restoration Project	0.7	meadow knapweed, tansy ragwort
Mcgarvie Rd		0.2	tansy ragwort
O'Brien Rd	Isolated Cat. 1 Weeds	3.8	tansy ragwort
Olympic Hot Springs Rd		2.1	common tansy, meadow knapweed, tansy ragwort
Power Plant Rd	Public Request 2017	0.8	Bohemian knotweed, meadow knapweed, tansy ragwort
Rife Rd		0.6	Bohemian knotweed
S Bagley Creek Rd	Isolated Cat. 1 Weeds	0.3	Bohemian knotweed, poison hemlock
S South Shore Rd	Isolated Cat. 1 Weeds	1.6	orange hawkweed
Schmitt Rd		0.4	tansy ragwort
Stratton Rd	Public Request 2017	NA	Canada thistle
W Edgewood Dr		2.2	meadow knapweed, tansy ragwort
W Lauridsen Blvd		0.7	common tansy, meadow knapweed
Wasankari Rd	Public Request 2018	0.8	Scotch broom
West Lyre River Rd		0.6	meadow knapweed, tansy ragwort
Whiskey Creek Beach Rd		0.5	meadow knapweed, tansy ragwort
Total: **35 roads**		Total: **48.6**	

West Clallam County Selected Roads

West Clallam County includes areas approximately west of Lake Crescent; the area includes Clallam Bay, Sekiu, Hoko-Ozette, Beaver, and Forks (reference Focus Area Maps 6-8). West Clallam County has a limited number of county roads and infestations include knotweed, tansy ragwort, and scotch broom. Roadside Scotch broom infestations impose significant negative impacts on adjacent forestry lands and have been elevated in priority at select locations in West Clallam County to reflect input and requests from local land managers. Additional resources and labor may be available through county partnerships (10,000 Years Institute, Makah Tribe, and Quileute Tribe). Potential roads in West Clallam County for post-treatment, native revegetation projects will be selected

Table 6. West Clallam County roads selected for herbicide treatment in 2018 (listed alphabetically).

West Clallam Road Name	Description	Est. Road Miles	Target Weed Species For Control
Bear Creek Rd	Public Request 2018	2	Scotch broom
Charley Creek Rd		1.3	Bohemian knotweed, yellow archangel
Cooper Ranch Rd	USFS Request 2018	NA	Scotch broom, tansy ragwort
Hermison Rd		0.3	Bohemian knotweed, tansy ragwort
Hoko-Ozette Rd		NA	Bohemian knotweed, Scotch broom
Iverson Rd	Public Request 2018	0.3	NA*
Kilmer Rd	Public Request 2018	0.9	NA*
Mary Clark Rd	USFS Request 2018	7.6	reed canary grass, Scotch broom, St Johnswort, tansy ragwort
Mina Smith Rd	Public Request 2018	3.2	NA*
Pillar Point Rd	Clallam Co Restoration Project	0.3	perennial sowthistle, Scotch broom
Quillayute Airport Rd	Public Request 2018	0.3	
Quillayute Rd		6.8	Canada thistle, reed canary grass, Scotch broom, St Johnswort, tansy ragwort
Shuwah Rd	Public Request 2018	0.5	NA*
Sitkum-Sol Duc Rd	USFS Request 2018	5.0	Bohemian knotweed, Scotch broom, tansy ragwort
Undi Rd	Public Request 2018	2.0	NA*
W Snider Rd	USFS Request 2018	0.6	Bohemian knotweed
Weel Rd	Clallam Co Restoration Project	0.4	NA*
Wentworth Rd	Public Request 2018	1.2	NA*
West Lake Pleasant Rd		1.2	Bohemian knotweed, Scotch broom
Whitcomb-Diimmel Rd	Public Request 2018	1.2	Scotch broom, tansy ragwort
Wilson Rd	Public Request 2018	0.75	NA*
Total: **21 Roads**		Total: **35.8**	

*Survey data not available

County Pits

An important component of the IWM Program is prevention, such as maintaining weed free rock sources. County owned-rock sources and borrow pits sites are routinely surveyed for weeds and specific management strategies are tailored to match each pit's county use and needs. Most are gated, with no public access.

The 2018 Work Plan includes all County owned pits as potential locations for weed control. The County Pits vary in size, activity, and weed pressures. Table 7 lists the county pits in order of priority for control determined by the likelihood to the spread of weeds (reference Focus Area Maps). Control methods may include physical or chemical methods, but more likely a combination of both, depending on weed species, area and available resources. Cultural practices, such as reseeding with locally sourced plant material will be pursued as materials become available and suitable pit locations identified.

Table 7. County Pit Sites for treatment in 2018 (listed highest to lowest priority).

Pit Name	Location	Target Weed Species For Control
Morse Creek Pit	Gravel Pit Rd, Port Angeles, WA	Bohemian knotweed, poison hemlock, Scotch broom, Yellow hawkweed,
Kirner Pit	Kirner Rd, Sequim, WA	Spotted knapweed, Poison hemlock, Scotch broom, Tansy ragwort
Ranger Pit	Place Rd, Port Angeles, WA	Butterfly bush, Meadow knapweed, Scotch broom, Common teasel, Bohemian knotweed, Tansy ragwort
Blyn Pit	Woods Rd, Blyn, WA	Butterfly bush, Hedge bindweed, Scotch broom, Common teasel, Bohemian knotweed, Tansy ragwort, Hairy nightshade
Mcinnes Pit	Vistas Drive, Sequim, WA	Meadow knapweed, Scotch broom, Bohemian knotweed
Quilayute Pit	Quilayute Rd, Forks, WA	Scotch broom, Bohemian knotweed, Tansy ragwort
Whitcomb Diimmel Pit	Whitcomb Diimmel Rd, Forks, WA	Scotch broom, Bohemian knotweed, Tansy ragwort
Lake Creek Pit	51 Bedrock Rd, Beaver, WA	Scotch broom, Bohemian knotweed, Tansy ragwort
Little River Pit	Little River Rd, Port Angeles, WA	Hedge bindweed, Meadow knapweed, Canada thistle, Bull thistle, Scotch broom, Herb robert, Everlasting peavine, Tansy ragwort
Umbrella Creek Pit	Hoko-Ozette Rd, Clallam Bay, WA	Scotch broom, Bohemian knotweed
La Push "Ballard" Pit	Ballard Rd, Forks, WA	Scotch broom, Bohemian knotweed, Tansy ragwort
Lower Elwha-Elwha Pit	Lower Elwha Rd, Port Angeles, WA	NA*
Forks Pit	Pit Lane, Forks, WA	NA**
Place Pit	Place Rd, Port Angeles, WA	Scotch broom, Common teasel, Bohemian knotweed
Herrick Gravel	Herrick Rd, Port Angeles, WA	Meadow knapweed, Scotch broom, Herb robert
Piedmont Pit	Joyce-Piedmont Rd, Joyce, WA	Meadow knapweed

*Pit under construction, current infestation status unknown
**No weeds seen in 2017

Roadside Restoration Sites and Additional Management Areas

The Road Department has land management responsibilities for a number of non-roadside properties and environmental restoration sites. Locations listed in Table 8 have been prioritized for weed management and may include the use of herbicides. Other Road Department-managed lands that are encountered during the course of other weed control projects that are not listed in Table 8 may be included as EDDR sites.

Table 8. Additional Road's Department managed locations selected for treatment in 2018 (listed alphabetically).

Site Name	Location	Description	Target Weed Species For Control
61 Marjory Ln	61 Marjory Ln, Carlsborg	County owned property adjacent to Hwy 101	hoary alyssum
Deer Park Underpass	PIN: 053008420230	Revegetation project planned on slopes around underpasses. Cut stump and foliar spray for scotch broom and foliar treatment of vegetative invasive blackberries ONLY.	Evergreen blackberry, Himalayan blackberry, Scotch broom
Dungeness Dike	Towne Rd, Sequim	Category 1 species required for control and Canada thistle adjacent to agricultural area; control of vegetative invasive blackberries ONLY.	Bohemian knotweed, Canada thistle, herb Robert, poison hemlock, Scotch broom, wild carrot
Jamestown Beach Bank Stabilization	Jamestown Rd, Sequim	Revegetation and bank stabilization project; control of invasive weeds and support the establishment of native plantings.	NA*
Lower Elwha Rd	Lower Elwha Rd Culverts	Control of invasive weeds and support the establishment of native plantings at culvert locations.	Canada thistle, evergreen blackberry, Himalayan blackberry, Scotch broom, ,
McDonald Creek Bridge	4100 - 4132 Old Olympic Highway	Revegetation project planned after bridge construction is complete. Monitor and treat weeds as needed to protect native plantings.	butterfly bush, poison hemlock
Olympic Discovery Trail (*select locations*)	Siebert Creek Bridge to Whitefeather Way; Fairholme Olympic Discovery Trail head to USFS Rd 2918	Category 1 species required for control and Canada thistle adjacent to agricultural area; control of vegetative invasive blackberries ONLY.	Canada thistle, herb Robert, , meadow knapweed, poison hemlock spotted knapweed, Scotch broom
Olympic Wetland Site	91 E Hwy 101	Control invasive weeds and protect native plantings.	Canada thistle, sulphur cinquefoil
Pillar Point Bank Stabilization	Pillar Point Recreation Area	Revegetation and bank stabilization project; control of invasive weeds and support native plantings.	perennial sowthistle, Scotch broom, tansy ragwort

*Survey data not available

Focus Area Maps of Selected Roads

The following maps display the county roads selected for the 2018 Work Plan listed in Tables 4-6 and are grouped according to region. The Maps include 2017 Category 1 noxious weed treatment points for reference, publicly owned lands, active agricultural areas, and the County pit locations.

East Clallam County

Map 1. Happy Valley-Blyn 2018 Treatment Area Map
Map 2. Sequim- Carlsborg 2018 Treatment Area Map

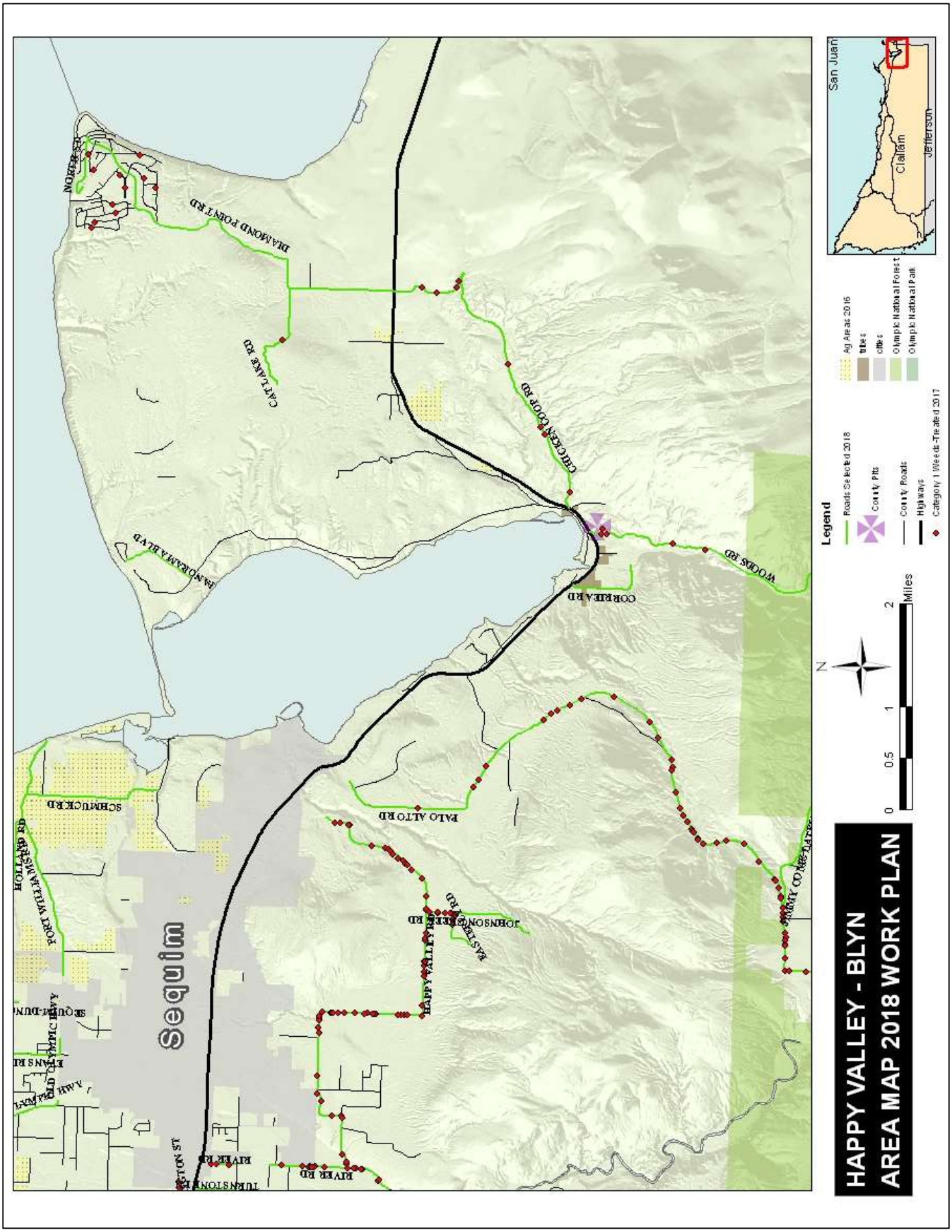
Central Clallam County

Map 3. Port Angeles 2018 Treatment Area Map
Map 4. Elwha Valley 2018 Treatment Area Map
Map 5. Joyce 2018 Treatment Area Map

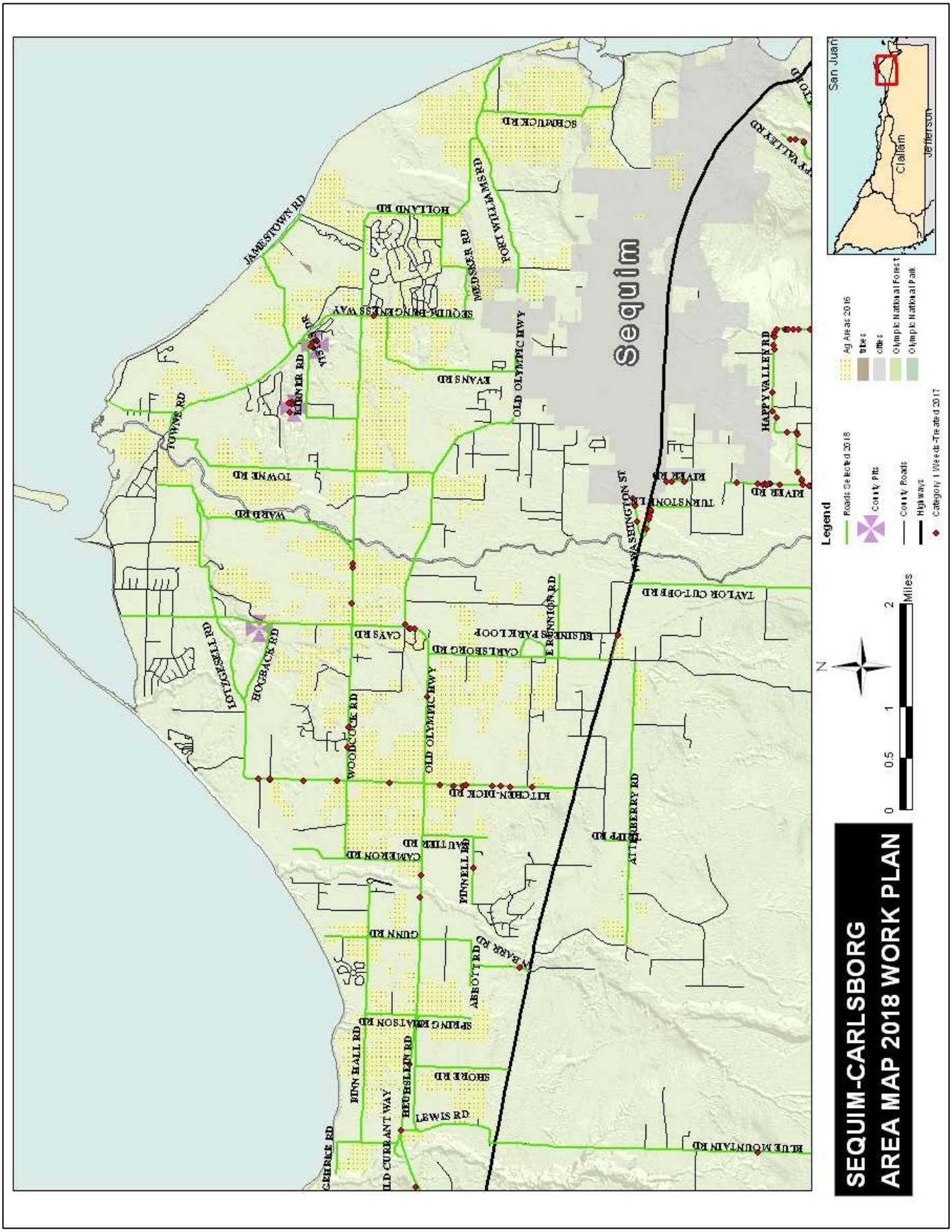
West Clallam County

Map 6. Lake Pleasant 2018 Treatment Area Map
Map 7. Forks 2018 Treatment Area Map
Map 8. Clallam Bay – Hoko 2018 Treatment Area Map

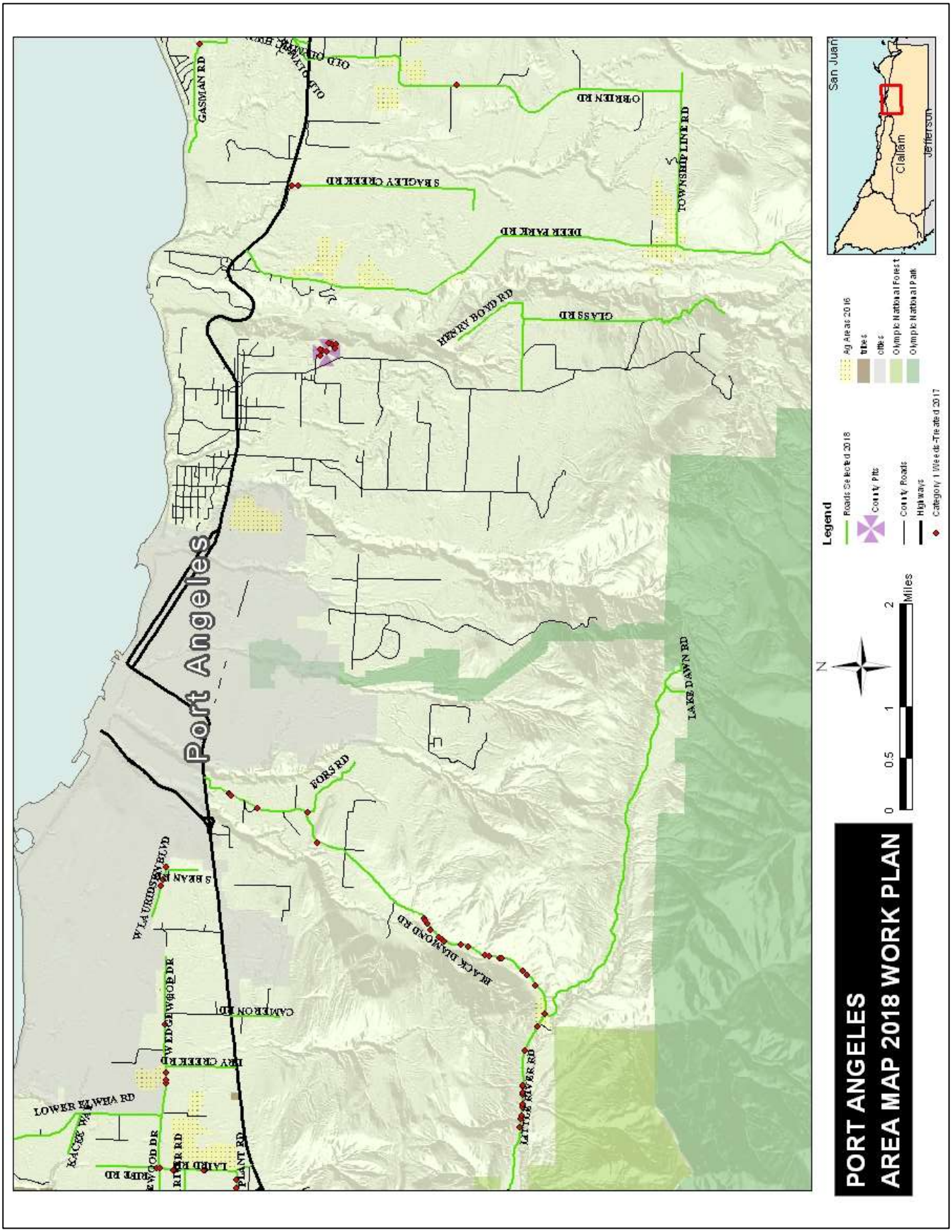
Map 1. Happy Valley-Blyn 2018 Treatment Area Map



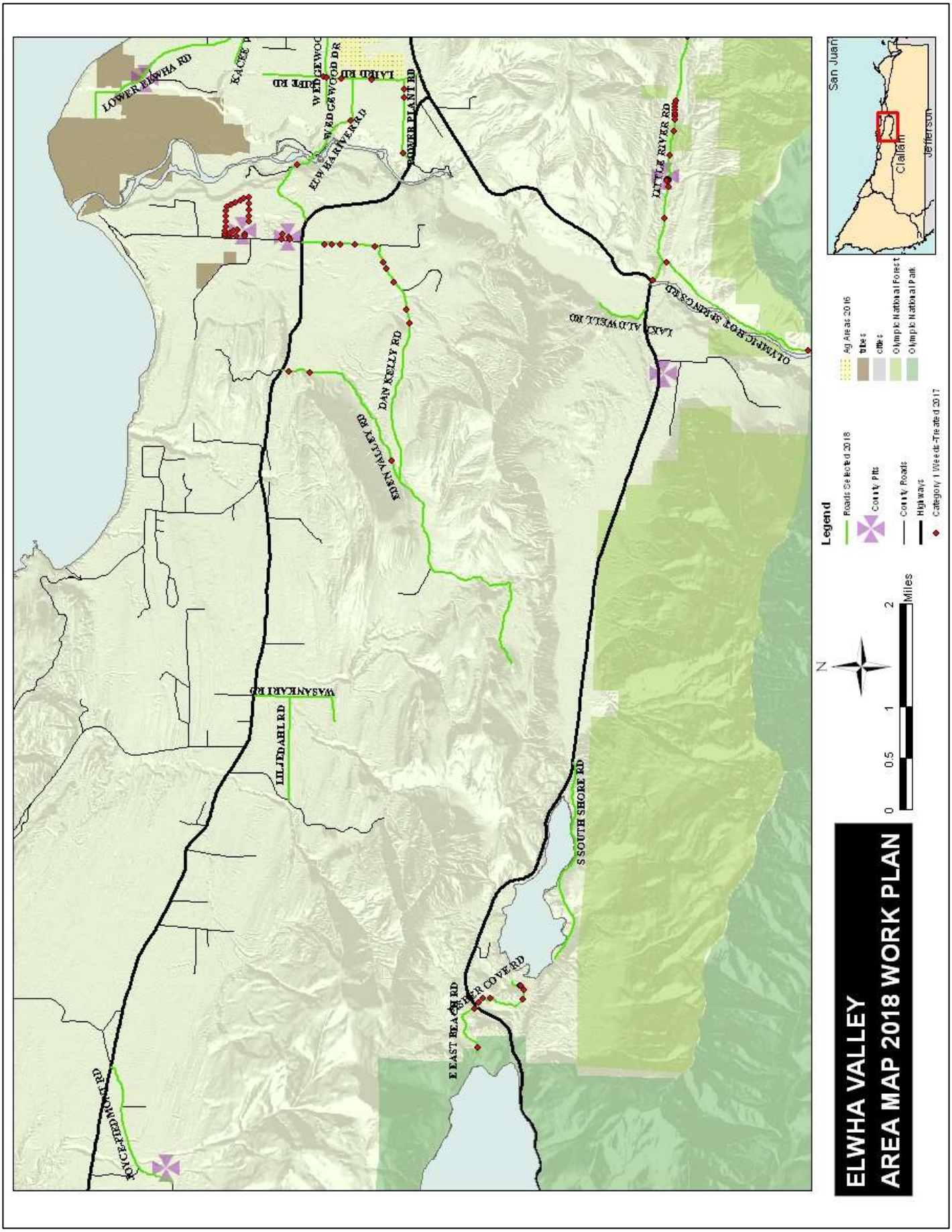
Map 2. Sequim- Carlsborg 2018 Treatment Area Map



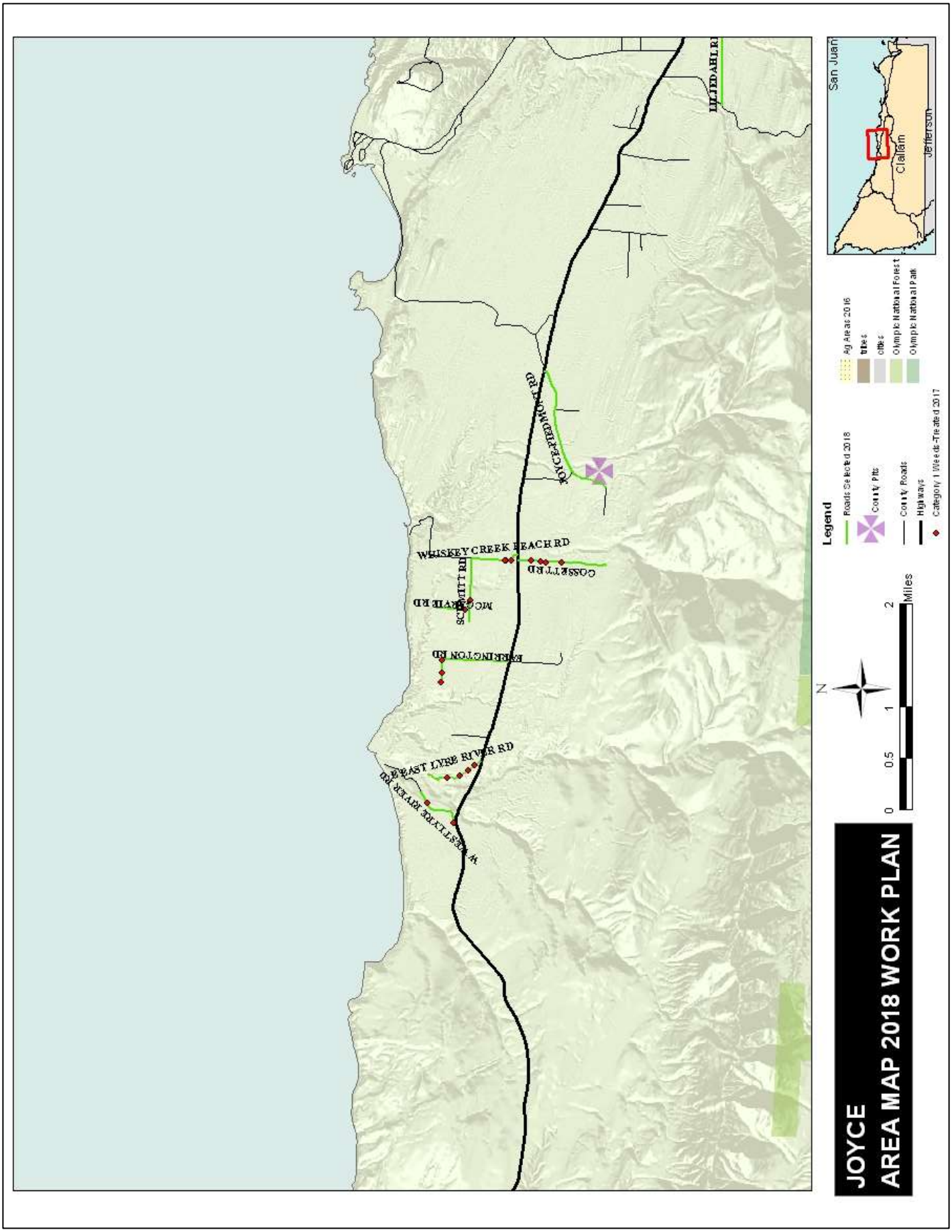
Map 3. Port Angeles 2018 Treatment Area Map



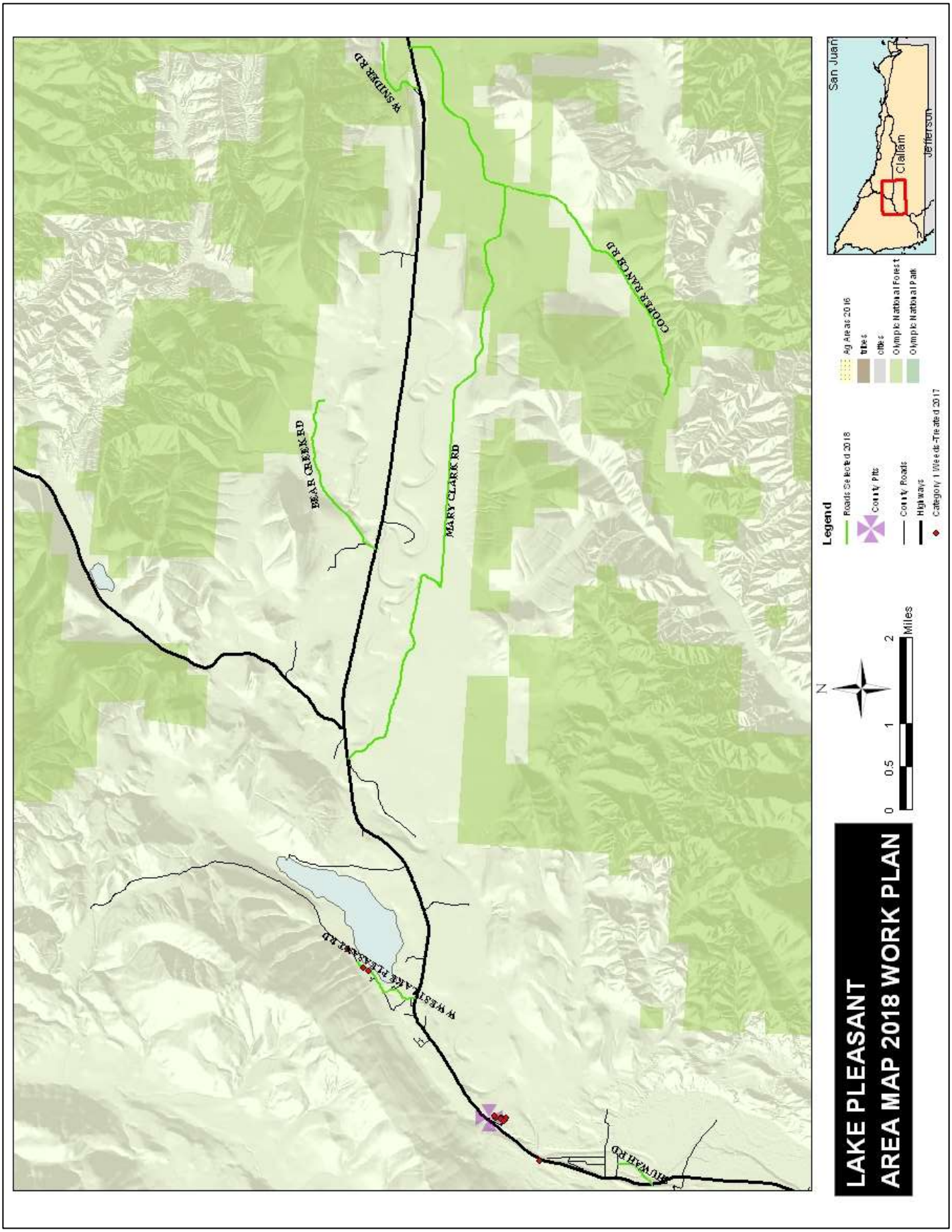
Map 4. Elwha Valley 2018 Treatment Area Map



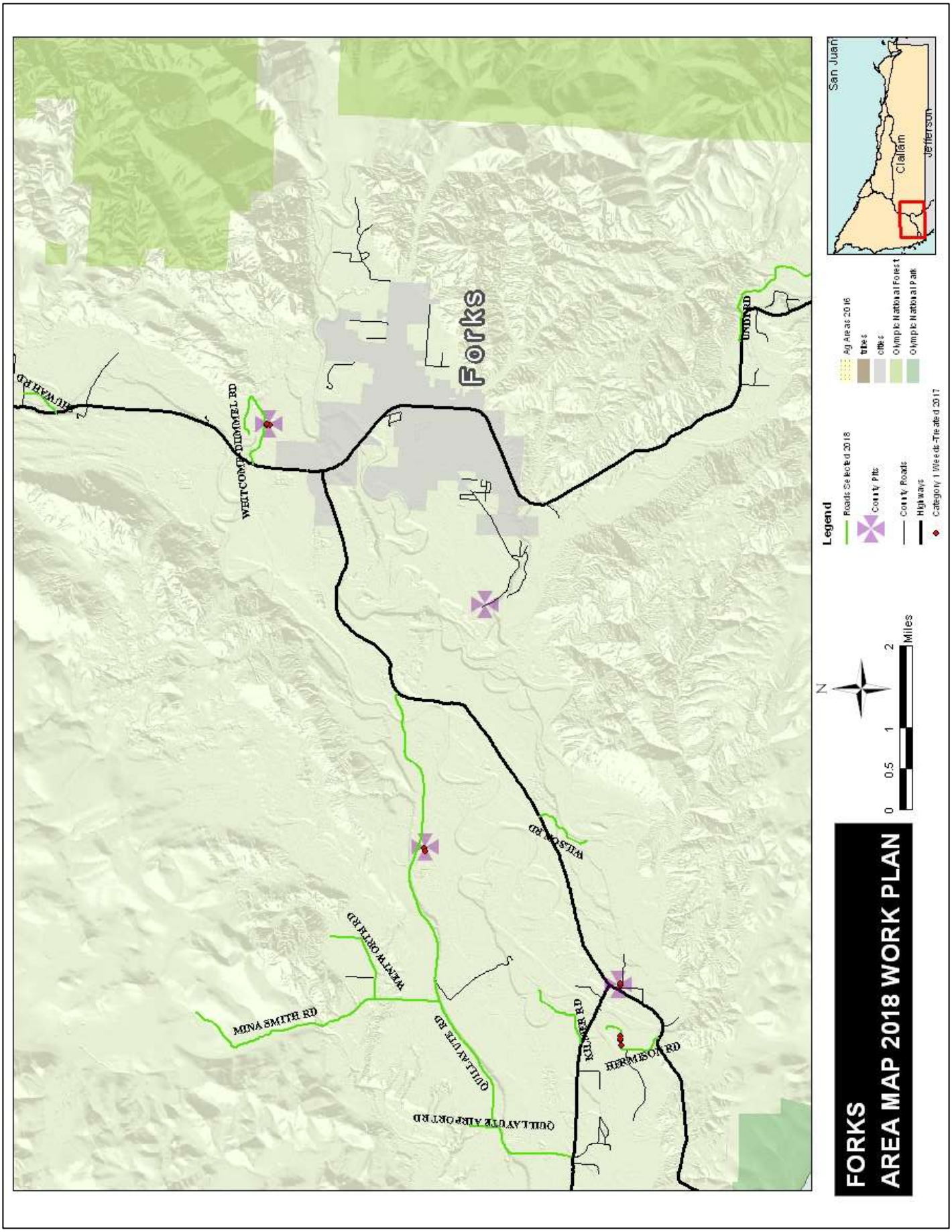
Map 5. Joyce 2018 Treatment Area Map



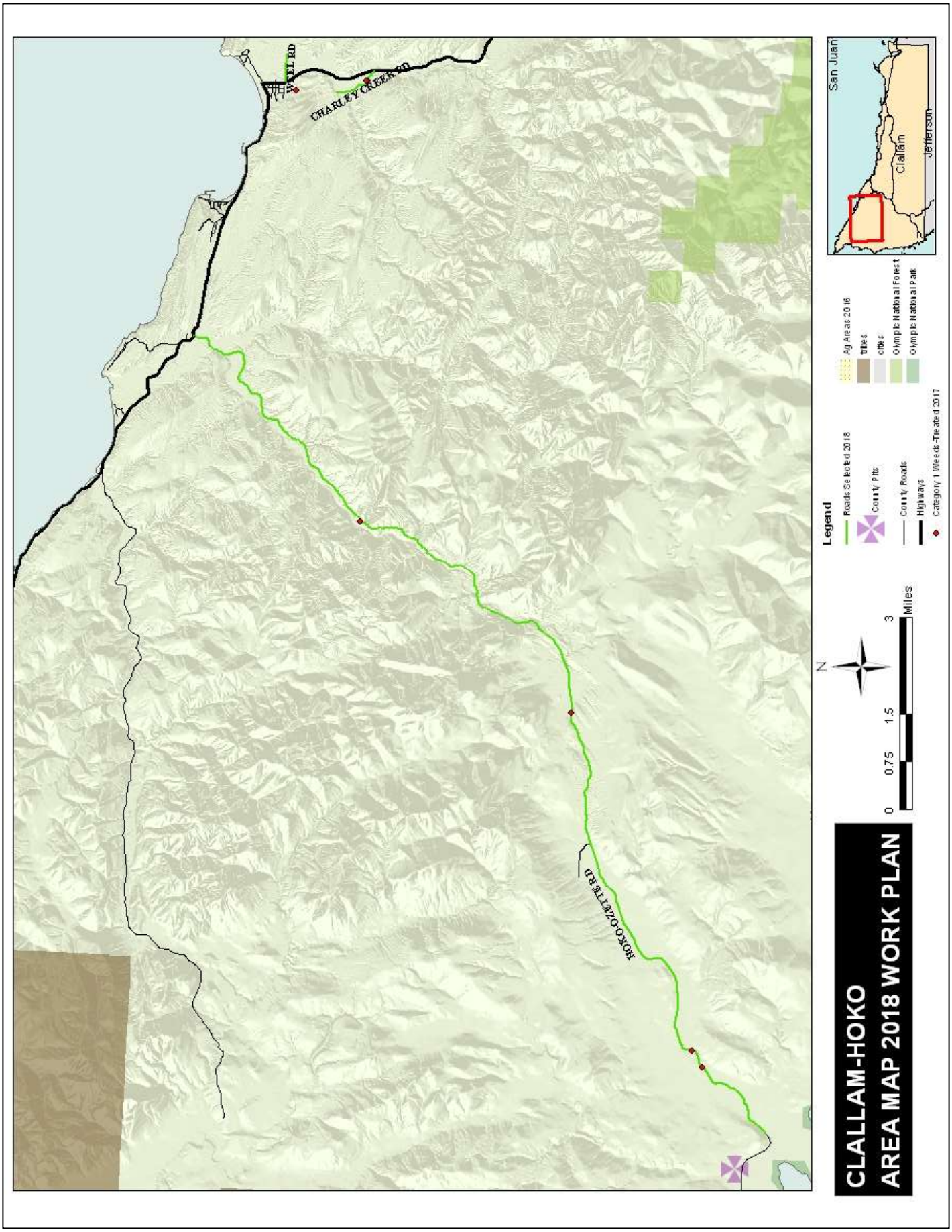
Map 6. Lake Pleasant 2018 Treatment Area Map



Map 7. Forks 2018 Treatment Area Map



Map 8. Clallam Bay – Hoko 2018 Treatment Area Map



Herbicide Product List

Products chosen for this program are effective on known roadside weeds, offer the greatest weed selectivity, maximize worker and public safety (no wait, access when the spray has dried), and pose the lowest risk for wildlife and the environment. See Appendix B for greater detail of risk analysis, product selection process and description of application methods.

Clallam County identifies the following products for targeted herbicide applications:

AquaNeat® (aquatic formulation glyphosate)
Element® 3A (aquatic formulation triclopyr)
Fusilade II® (fluazifop-P)
Milestone® (aquatic formulation aminopyralid)
Polaris® (aquatic formulation imazapyr)
Transline® (clopyralid)
Vastlan® (aquatic formulation triclopyr)
WeeDestroy AM-40® (aquatic formulation 2,4-D).

APPENDICES

Appendix A Ordinance 923 – Integrated Weed Management

Appendix B Non-target Impacts and Risk Assessment, Herbicide Selection Process, Product List, and Application Methods

Appendix C Sample Record Keeping Forms

Appendix D Sample Press Release and Public Notice

Appendix E Sample Herbicide Notice

Appendix F Sample Owner Will Control Packet-Draft

Appendix G Roadside Weed Life Cycle, Growth Form, Category and Status

Appendix H Focus Area Maps of Target Roads

Appendix I Known Roadside Weed Locations

Appendix J References

Ordinance 923

AN ORDINANCE creating a chapter titled *"Integrated Weed Management"*

BE IT ORDAINED BY THE BOARD OF CLALLAM COUNTY COMMISSIONERS:

Section 1. Section .010, Purpose, is created to read as follows:

The purpose of this chapter is to establish an integrated weed management approach that aids Clallam County in keeping county owned or managed lands, including its improved and unimproved right-of-ways, quarries, parks and other county lands safe and operating at an efficient level of service while meeting its legal obligations and stewardship responsibilities to control noxious weeds.

Furthermore, it is the legislative body's intent that Clallam County's departments, employees, and designees have the ability and flexibility to address and combat the spread of noxious weeds in our community.

Integrated weed management should promote desirable vegetation and remove noxious and invasive plant species of special concern, through comprehensive, strategic, environmentally responsible, and cost effective methods, including mechanical, biological, cultural, chemical, and prevention control methods as needed.

This chapter is subject to applicable federal and state laws as adopted and hereafter amended; and supersedes the Clallam County Roadside Vegetation Management Policy and any subsequent resolutions relating thereto.

Section 2. Section .020, Applicability, is created to read as follow:

The provision of this chapter applies to any Clallam County department, employee, or designee that may perform work within county right-of-ways, parks or other county owned or managed lands with regard to weed control as defined in this chapter.

Inclusion of this chapter in this specific title is not intended to limit its scope and application to all county owned or managed lands.

Section 3. Section .030, Definitions is created to read as follows:

For purposes of this section, the following definitions apply:

(1) "Biological control" means using living organisms that suppress the host plant. Insects, diseases, and foraging animals are examples of biological controls.

(2) "Chemical control" means using conventional or natural herbicides to eliminate noxious weeds or additional invasive, non-native plant species that present a special concern within a specified area. It does not mean treatments for general vegetation management.

(3) "Cultural control" means enhancing the vigor of desirable plants which may crowd-out or prevent weed infestations. Hydroseeding or planting low-growing, self-maintaining shrubs are examples of cultural practices.

(4) "Feasible" means a control method or combination thereof that is capable of being carried out or achieving a goal. This includes consideration of such factors as plant biology, site characteristics, scope of the problem, and available resources.

(5) "Integrated Weed Management (IWM) " means a coordinated decision making process that uses the most appropriate weed management methods and strategies, along with a monitoring and evaluation system, to achieve weed management goals and objectives in an environmentally and

economically sound manner. It allows for the use of mechanical, biological, cultural, chemical, and prevention control methods.

(6) "Invasive plant" means an introduced, non-native plant that is aggressive and causes economic loss and adverse effects to agricultural, natural and human resources.

(7) Invasive plant of special concern means an invasive plant identified as a threat by the US Department of Agriculture, the Washington Departments of Agriculture and Ecology, or the Washington Invasive Species Council.

(8) "Mechanical, manual control" means cutting or cultivating in a manner to reduce or slow undesirable plant growth (*i.e.*, using hand labor, mowers, graders, and ditching equipment).

(9) "Planning and prevention" means creating design standards that enhance or complement other control methods (such as slope grade within mower reach) and policies or standard operating procedures such as equipment cleaning or weed free material standards that prevent contamination or spread of noxious or non-native invasive species.

(10) "Weeds" means both noxious weeds which are so designated under State law, and additional non-native invasive plants of special concern that have been added to a County specific list of plants targeted for control and elimination.

(11) "Work Plan" means a plan prepared annually by the Clallam County Road Department or any other county department with land management responsibilities, and approved by Clallam County Noxious Weed Control Board prior to the commencement of seasonal weed management.

Section 4. Section .040, Integrated Weed Management Plan, is created to read as follows:

Each department with land management responsibilities, such as the Road Department, shall develop and implement an Integrated Weed Management Plan (hereinafter "IWM Plan" or "work plan"), that is specific to land under their management. Each work plan will be reviewed annually, and amended as needed, in concert with and approved by the Noxious Weed Control Board.

Each IWM Plan shall contain a list of priority species and must include the Clallam County Noxious Weed List. Other invasive species may be added as resources allow and according to the level of threat posed. Work plans shall also contain provisions for early detection/rapid response (EDRR) that allows additional weeds, locations, and techniques to be added to a work plan as necessary should new infestations of high priority weeds be discovered during the course of the treatment season.

IWM Plans shall contain detailed information about departmental practices and standards, including but not limited to:

(1) Location of high-priority weed infestations, sensitive areas, and other areas with special management considerations.

(2) Guidelines and prescriptions for best management practices in dealing with weed problems and opportunities, including planning and prevention measures.

(3) Monitoring protocols used to evaluate infestation status and treatment effectiveness, the results of which are publically available and used to inform subsequent work plans.

(4) Creation of an outreach and education component including coordinated volunteer opportunities as time and resources allow.

A copy of each IWM Plan will be maintained by the Department for which it is developed and the Noxious Weed Control Board.

Section 5. Section .050, Citizen Option, is created to read as follows:

(1) Property owners that do not wish herbicides to be applied to eliminate noxious weeds or other invasive weeds of special concern to road right-of-ways or county managed lands directly bordering their property may enter into an annual "owner will control" agreement with Clallam County. Those with current agreements are allowed to post the county adjacent boundary as no spray areas.

(2) Under an "owner will control" agreement, the property owner must undertake specific measures, prescribed within the agreement that will ensure the timely and effective control and reduction of target weed species within the right-of-way or within a proscribed area specifically identified in the agreement

(3) If the property owner fails to effectively control or reduce targeted weed species as agreed, then Clallam County will issue a single written warning. If the problem persists after 10 days from when the written warning was sent, then Clallam County reserves the right to void the agreement upon written notice to the property owner.

(4) If any agreement is subsequently voided, Clallam County may immediately proceed with any planned weed control deemed necessary.

(5) A property owner may re-apply for a new agreement in a subsequent season; however, the County reserves the right to deny said application if there is a documented history of failure to adhere to the terms of such agreements or history of voided agreements.

ADOPTED this tenth day of January 2017

BOARD OF CLALLAM COUNTY COMMISSIONERS

Mark Ozias, Chair

Randy Johnson

Bill Peach

ATTEST:

Loni Gores, Clerk of the Board

Appendix B Non-Target Impacts and Risk Assessment, Herbicide Selection Process, Product List, and Application Methods

Non-Target Impacts and Risk Assessment

Not only must a weed control strategy be effective and efficient, but it must consider potential adverse impacts to non-target plant and animal species and include measures to mitigate those impacts to the greatest extent possible.

Any potential impacts to humans, pets, livestock, wildlife, desirable plants and the environment from noxious weed and invasive plant removal are of concern to the project managers. Every control method has benefits and costs. For example the disturbance caused by workers and mowing or excavation equipment which allows weeds to proliferate can be more significant than impacts from herbicides. Hand removal may result in trampling and soil disturbance. Although all control methods pose some level of risk, potential risks associated with herbicide use will receive the greatest scrutiny. Best management practices that reduce or mitigate potential herbicide impacts to non-target organisms will be incorporated into all aspects of the work plan.

An assessment of risk involves understanding the toxicity and likely exposure paths for various organisms that may be exposed to an herbicide. Risk assessments are used by project managers to identify those exposures that might be problematic. The project manager then uses this information to decide whether herbicides can be used without undue risk and to develop mitigation actions to reduce risks. A critical component of properly applying this risk assessment process is creating the institutional conditions for obtaining and retaining project managers who either receive or have had significant training and depth of experience to make and apply these decisions.

Several concepts are important in minimizing adverse effects. At a minimum, herbicide users should be familiar with:

1. The relative risk posed by the herbicide to the applicator and general public, and the anticipated exposure scenarios.
2. The types of wildlife and vegetation present, including endangered species. The invasive weed manager should learn enough about each species (life cycle, breeding habitat, food supply, shelter needs, etc.) to avoid impacts.
3. The relative risk posed by the herbicide to different wildlife and plant taxa that may be present and the anticipated exposure scenarios. Consideration should be given not only to the active ingredient, but also other compounds added to an herbicide formulation or added to the “tank mix” to be applied, such as surfactants.
4. The relative persistence of the herbicide in the environment, primarily in soil. Herbicide persistence is measured in terms of “half-life.” One half-life is the amount of time it takes for the herbicide to break down to 50% of its original concentration in soil or water. As a general rule, it takes five half-lives for more than 97% of the herbicide to be fully degraded. Herbicide persistence is discussed in more detail in Appendix B.
5. The mobility of the herbicide in runoff water. Off-site movement in surface water and leaching to groundwater are both primarily influenced by the amount applied, the herbicide’s water solubility and its tendency to adsorb to soils. Factors affecting herbicide mobility are discussed in more detail in Appendix B.

Important background information regarding the types of animals that may be impacted by noxious weed and invasive plant control in a roadside setting has been synthesized from the California Invasives Species Council (Cal-IPC) 2015 manual titled, *Best Management Practices for Wildland Stewardship: Protecting Wildlife When Using Herbicides for Invasive Plant Management* and presented below. The full document is available at www.cal-ipc.org. Such information is vital to making informed decisions on ways to mitigate or avert potential effects where possible; especially when making control choices in regard to herbicide selection, application methods and timing. Although the Cal-IPC manual's focus is on wildlands, many of the same types of animals may be found living near if not on, county roadsides and should therefore be considered.

Organisms that are endangered or under threat of becoming endangered receive special protection under The Endangered Species Act. An Information for Planning and Conservation (IPaC) Trust Resource report of threatened and endangered plant and animal species found in Clallam County was provided by the US Fish and Wildlife Service. These species are included in Table 10.

Insects

Insects are a diverse class of animals that are part of the food web on which many vertebrate species depend. Butterflies, bees, wasps and even mosquitoes pollinate plants that then provide fruits and seeds for other animals. Flies and beetles eat rotting debris, which helps recycle nutrients in the ecosystem. Aphids and many other soft-bodied insects suck the juices of plants and are themselves a high-protein food for other insects, reptiles, amphibians, birds and mammals.

Most insects are so small and so intimately connected to vegetation that it is difficult to avoid spraying them directly, along with the invasive plants being treated. Honeybees are routinely tested for sensitivity to herbicides and are broadly representative of other insects. While most herbicide active ingredients used in wildland weed management pose very low toxicological risks to invertebrate species, some of the inert ingredients in formulated herbicide products may pose a greater risk. For example, some oil-based emulsifiable concentrate formulations may be harmful to soft-bodied adult or larval insects like aphids or caterpillars. The Taylor's checkerspot butterfly is the only endangered insect listed in Clallam County. No roadside habitat for the Taylor's checkerspot butterfly has been identified.

Reptiles and Amphibians

Lizards, snakes, turtles, frogs, newts and salamanders are frequently residents of areas where invasive plant management is planned. These species can be exposed to herbicides through direct sprays and spray drift, and through consuming herbicide-contaminated water, prey, or plants. Amphibians may be especially vulnerable, since they spend a portion of their life cycle as aquatic organisms and often only need small puddles or seasonal streams for growth. The inert ingredients in a formulated herbicide product may be as important to evaluate as the active ingredient in terms of the risk they pose to amphibians. No endangered or threatened reptiles or amphibians have been identified in Clallam County.

Fish and Aquatic Invertebrates

Fish and aquatic invertebrates are often more sensitive to herbicides than terrestrial animals because of their physiology or the increased exposure potential that may result from herbicide movement into aquatic sites. Aquatic species can be exposed to herbicides through direct spray, spray drift, spills or surface runoff. Though few commonly-used herbicide active ingredients are highly acutely toxic to

aquatic organisms, toxic effects can result from the exposure to other ingredients in formulated products, such as surfactants. With the current suite of herbicides typically used in invasive plant management, bioaccumulation of herbicides in fish tissue is not a problem, since these herbicides are typically metabolized and/or excreted fairly quickly. A number of fish species (salmonids and trout) found in Clallam County are listed as threatened or endangered and many creeks and rivers are the subject of habitat restoration projects intended to help restore these stocks to healthy population levels.

Mammals

Deer, coyotes, mountain lions, wood rats, gophers, and mice are just a few of the mammals that may populate or feed on animals that populate typical roadsides. Pets, such as dogs and cats, with their owners or wandering freely, might be exposed in a more limited manner. Animals may be exposed to herbicides through contaminated food or water, as well as direct sprays, spray drift, and contact with treated vegetation. The toxicity of herbicides to mammals has been better studied than for most other species because they are used as surrogates for human toxicity assessments. Studies on mammals allow for evaluation of a wide variety of parameters, including reproductive, developmental, and neurological effects in exposed populations, as well as effects on blood chemistry, organ weights, and body weight gain or loss.

The most abundant mammals on a typical roadside area are rodents. They are small enough and abundant enough that they may be directly sprayed or exposed to drift during an herbicide application, particularly with ground spray equipment.

Deer and other herbivores may browse on treated vegetation. Once the vegetation is dead, it becomes less attractive to eat; however, in situations where a selective herbicide is used that kills only broadleaf plants or only grass plants, the treated, but unaffected plant species may pose a dietary exposure risk.

Fishers, while not currently listed as an endangered species, have received special management consideration and have been reintroduced into Clallam County in Olympic National Park. No county roadside habitat has been identified.

Birds

Potentially impacted birds include large carnivorous birds like hawks or ospreys, herbivorous species like geese and ducks, small insectivorous birds, and small fruit and seed-eating birds. All of these species can be exposed to herbicides through their food and drinking water. The highest risks are typically for birds eating sprayed vegetation since that is often the target of the application, and the likelihood of being exposed is higher than for those species eating contaminated prey. In general, the herbicides used to control invasive plants do not pose significant acute toxicity risks to birds when used under typical use scenarios; however, less is known about chronic and reproductive effects. To minimize risk, applications during nesting season should be avoided if possible. Several federally listed bird species are found in Clallam County, but there are no habitat listings for county right-of-way.

Plants

All types of plants may be affected by weed control activities. Because herbicides are designed to kill plants, an applicator’s ability to distinguish desirable plants from weeds is critical. Certain native plant species are protected under state or federal laws. The most current data set (as a GIS shapefile) was obtained from the Natural Heritage Program which is managed by the Washington State Department of Natural Resources. It contained general locational information of rare, threatened and endangered

plant species. It was reviewed for species and sites that warrant special management consideration on Clallam County roadsides. Pink fawn lily, which is noted as sensitive (a non regulatory status) was found in the vicinity of six county roadsides. No noxious weed infestations have yet been documented in close proximity to these pink fawn lily sites, but all shall be noted and continue to be under special consideration. Whitebark pine which is a candidate for federal listing is known to exist in Clallam County, but no sites have been identified on county right of way. No rare, endangered or threatened species were identified on county roadsides in the DNR Natural Heritage Program dataset.

Table 9. Species in Clallam County with potential for special management consideration

Common Name	Populations Present /Habitat	Population Identified on County Roadside?	Listing Status
PLANT			
Pink fawn lily	Yes	In vicinity of Walgren Rd, Grant Rd,Pavel Rd, River Breeze Wy, W. Lake Pleasant Rd, Hoko-Ozette Rd.	State-Sensitive, (non regulatory)
Whitebark pine	Yes	none	Fed Candidate
BIRD			
Streaked Horned Lark	Yes	none	Fed-Threatened
Marbled murrelet	Yes/plus habitat overlap	none	Fed-Threatened
Northern spotted owl	Yes/plus habitat overlap	none	Fed-Threatened
Short-tailed Albatross	Yes	none	Fed-Endangered
Yellow-billed Cuckoo	Yes	none	Fed-Threatened
FISH			
Bull Trout	Yes/plus habitat overlap	Indirect	Fed-Threatened
Dolly Vardon	Yes	Indirect	Fed-Threatened
INSECT			
Taylor's checkerspot butterfly	Yes-FS, private, ONP, DNR/ plus habitat overlap	None-possible potential habitat?	Fed-Endangered
MAMMAL			
Fisher	Yes, reintroduced in ONP	None	Fed-Threatened
HABITAT OVERLAP ONLY			
Chinook	Habitat designation	Indirect	Threatened
Chum	Habitat designation	Indirect	
Sockeye	Habitat designation	Indirect	
Killer whale	Habitat designation	Indirect	

Risk Charts

The herbicide risk charts, tables, and text that follow have been reproduced with permission from the publication: Cal-IPC. 2015 *Best Management Practices for Wildland Stewardship: Protecting Wildlife When Using Herbicides for Invasive Plant Management.* Cal-IPC Publication 2015-1. California Invasive Plant Council, Berkeley, CA. The charts include the most common herbicides used by wildland managers for invasive plant management and include those chosen for use on Clallam County roadsides (see Table 13 in Appendix B). Fluazifop, which would be allowed for use under this plan, was not included in the Cal-IPC risk charts because the data needed to conduct the analysis was not available at the time the risk charts were completed.

Wildlife

The risk charts provide information on the comparative risk of each herbicide to each type of wildlife from selected exposure scenarios. A summary of the methods used to generate these charts follows, and refers the reader to the primary sources for more detail. Each chart summarizes potential risk for a specific exposure scenario and is based on a risk assessment model developed by the USFS. See the spreadsheet of calculations on the PRI website for detailed information on risk charts. Using the spreadsheet, you can modify application rates to assess changes in risk profiles. It is important to note that many of the scenarios are “worst case” and do not represent typical real-world situations. The assumptions for each scenario, with a description about how they relate to typical real-world situations are listed on the risk charts.

Risks that fall outside an acceptable zone should prompt the land manager to consider steps to mitigate the risk.

Risk to Wildlife Depends on Both Toxicity and Exposure

Risks to wildlife are dependent on the herbicide’s toxicity to that particular taxonomic group and the animal’s exposure to the herbicide. Toxicity is described using Toxicity Reference Values (TRVs), which represent the dose of herbicide generally assumed to be without adverse effects. Lower TRVs indicate a more toxic herbicide for the particular taxonomic group. The TRVs used to develop the risk charts for the different wildlife taxa are summarized in below.

An important determinant of exposure is the herbicide application rate. For the risk charts, the application rates were set to half of the maximum application rate as indicated on the herbicide’s product label. This “half- max” application rate was used to better approximate typical wildland herbicide applications. For example, invasive plant management typically involves portions of acres to be spot treated, but not entire acres. Alternatively, entire acres might be treated via broadcast spray, but at rates below maximum allowable rates. Since application rate is directly proportional to risk, the risk values at maximum application rates would simply be twice the values shown in the charts (likewise, lower rates would have proportionally less risk)—with the exception of spills, where application rate is not relevant. Table 11 provides the application rates used to estimate exposure for each herbicide in terms of pounds of the active ingredient (or the acid equivalent of the active ingredient) and the equivalent rate per acre for the formulated product.

While hazard assessment for most chemicals typically involves investigating the relationship between increasing exposure and increasing observed adverse effects in laboratory studies, some chemicals may have the potential to cause impacts at very low doses.
Examples of this are the endocrine disrupting chemicals (EDCs), which can interfere with an animal's endocrine (hormone) system, potentially at very low exposure levels. Certain chemicals such as the plasticizers found in plastic bottles are suspected to be EDCs. At the present time, there is no evidence that any of the herbicide active ingredients used in invasive weed control are EDCs. The US EPA studied glyphosate and 2,4-D through their Endocrine Disruptor Screening Program and determined that no convincing evidence exists that either substance disrupts estrogen, androgen, or thyroid pathways. Studies have not been conducted for the other herbicides discussed in this manual, but none are on the European Union list of suspected endocrine disruptors.

Hazard Quotients Defined

The Hazard Quotient (HQ) is a measure of risk and is defined as the ratio of the predicted exposure to a Toxicity Reference Value (TRV) for the particular type of wildlife being assessed. HQ values >1 indicate that exposure exceeds the "No Effect" level, and wildlife may be at risk of adverse effects. For these exposure scenarios, action should be taken by the land manager to reduce exposure.

Table 10. Half-Maximum Application Rates Used in Risk Charts

Herbicide Active Ingredient	Half-Max Application Rate (lbs AE or AI per acre)	Half-Max Application Rate (rate per acre)
Aminopyralid	0.055	3.5 oz of Milestone®/acre
Chlorsulfuron	0.061	1.5 oz of Telar®/acre
Clopyralid	0.125	0.335 pints Transline®/acre
Glyphosate	4.0	3.5 quarts RoundupProMax®/acre (with surfactant) 4 quarts Aquamaster®/acre (no surfactant)
Imazapyr	0.75	3 pts Habitat®/acre
Triclopyr BEE	4.0	4 quarts Garlon 4®/acre
Triclopyr TEA	4.5	1.5 gals Garlon 3®/acre
2,4-D	2.0	4 pts Weedar®/acre

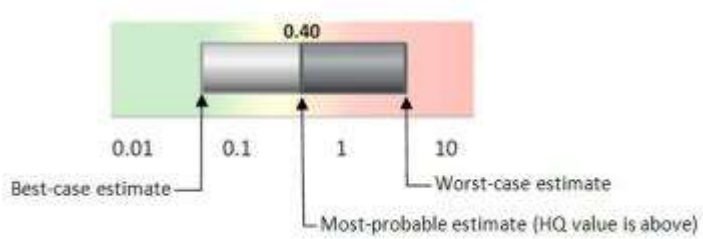
AE = Acid Equivalent; AI = Active Ingredient.

**Fluazifop (Fusilade®) is the one widely-used active ingredient not included in the risk charts because USFS risk analysis was completed after the risk charts were developed*

How to Read the Risk Charts

In the risk charts that follow, risk is expressed as a Hazard Quotient (HQ), which is the ratio of the predicted exposure to a Toxicity Reference Value (TRV), a level of exposure that is anticipated to be without adverse effects.

Each bar on the chart shows a range of estimated risk for a specific exposure scenario based on three estimates of exposure—best-case (low exposure), most-probable (the most likely exposure), and worst-case (high exposure). Each estimate is based on a set of assumptions, such as the amount of herbicide residue on food (such as foliage, fruits, and insects) and the amount of food eaten or the amount of runoff into a water body. Factors used to estimate exposure specific to each scenario are listed in the caption for each chart.



The **best-case risk estimate** is at the left end of each bar and assumes the lowest exposure. The **most-probable risk estimate** (HQ=0.40 in the example above) is located at the point at which the bar changes color from light gray to dark gray, and assumes the most likely exposure. The **worst-case risk estimate** is at the right end of the bar and assumes worst-case exposures.

The background of each risk chart is color-coded, with a HQ in the green zone indicating low risk, an HQ in the yellow zone indicating that anticipated exposures are approaching a level of concern, and an HQ in the red zone indicating that the predicted exposure will exceed the TRV, and adverse effects may result. Because wildlife TRVs are derived from No Observable Adverse Effect Levels (NOAELs), a bar in the red zone does not necessarily mean that harm will occur, but risks that fall in this zone should prompt the land manager to consider steps to mitigate the risk. The further the bar is into the red zone, the more likely it is that adverse effects will occur. The BMPs in Section 3 describe steps that can be taken to reduce risks when HQ values risk calculations exceed a level of concern.

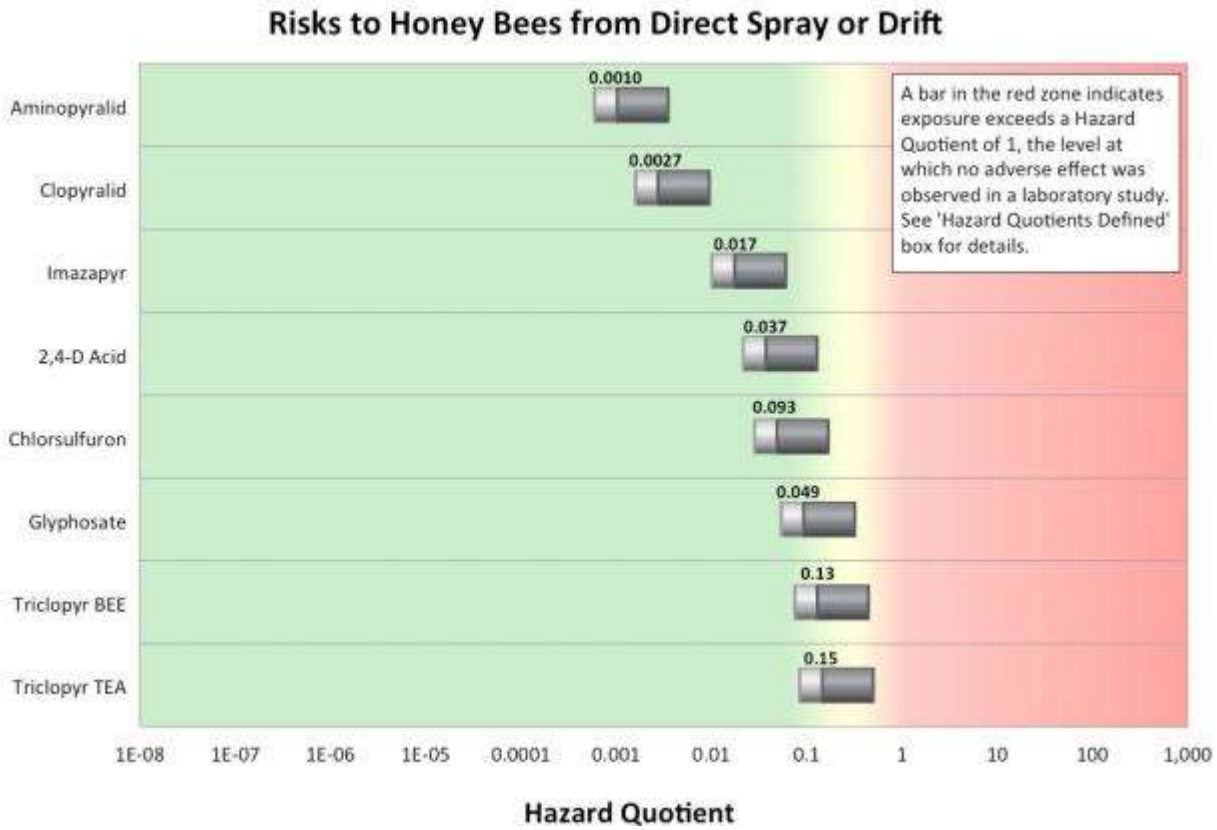
The scale of the charts is logarithmic, which allows for the display of values that differ by many factors of ten. The logarithmic scale also visually compresses the bars and skews plots slightly to the right—for example, a HQ value of 0.5 is not exactly in the middle between 0.1 and 1, but slightly to the right of the halfway point.

Overview of Risks to Wildlife from Use of Common Herbicides

Overall, the risk estimates shown in the charts demonstrate that for the majority of the most-probable acute exposure scenarios, the herbicides pose low risks to wildlife. An exception to this involves fish and aquatic invertebrates exposed to glyphosate formulations that contain certain higher-toxicity surfactants such as polyethyleneamine (POEA). These products cannot be legally applied directly to water, and applicators should also use caution when making applications near aquatic sites, such as ephemeral pools that may be used as breeding areas for amphibians and insects. Using glyphosate products that do not contain POEA in these settings can reduce the potential for impacts.

A second example of risks that may exceed the level of concern under the most-probable exposure scenarios involves products that contain either triclopyr BEE or triclopyr TEA. In these cases, the HQ values can exceed the level of concern for chronic exposure scenarios when large, herbivorous mammals consume vegetation that contains residues of these herbicides.

With regard to the worst-case (highest) exposure level scenarios, 2,4-D acid, glyphosate/surfactant combinations and triclopyr BEE and TEA can all pose risks that exceed the level of concern. These scenarios include both acute and chronic exposures for aquatic invertebrates, fish, mammals and birds.



Taxa: Adult stage honey bees are used as a surrogate for all terrestrial insects.

Assumptions: Terrestrial application of herbicide at half of the maximum rate on a representative product's label (see Table 11); 50% of the bee's body surface is covered with herbicide; 100% of herbicide is absorbed; the distance between the bee and the sprayer is 0-10 feet.

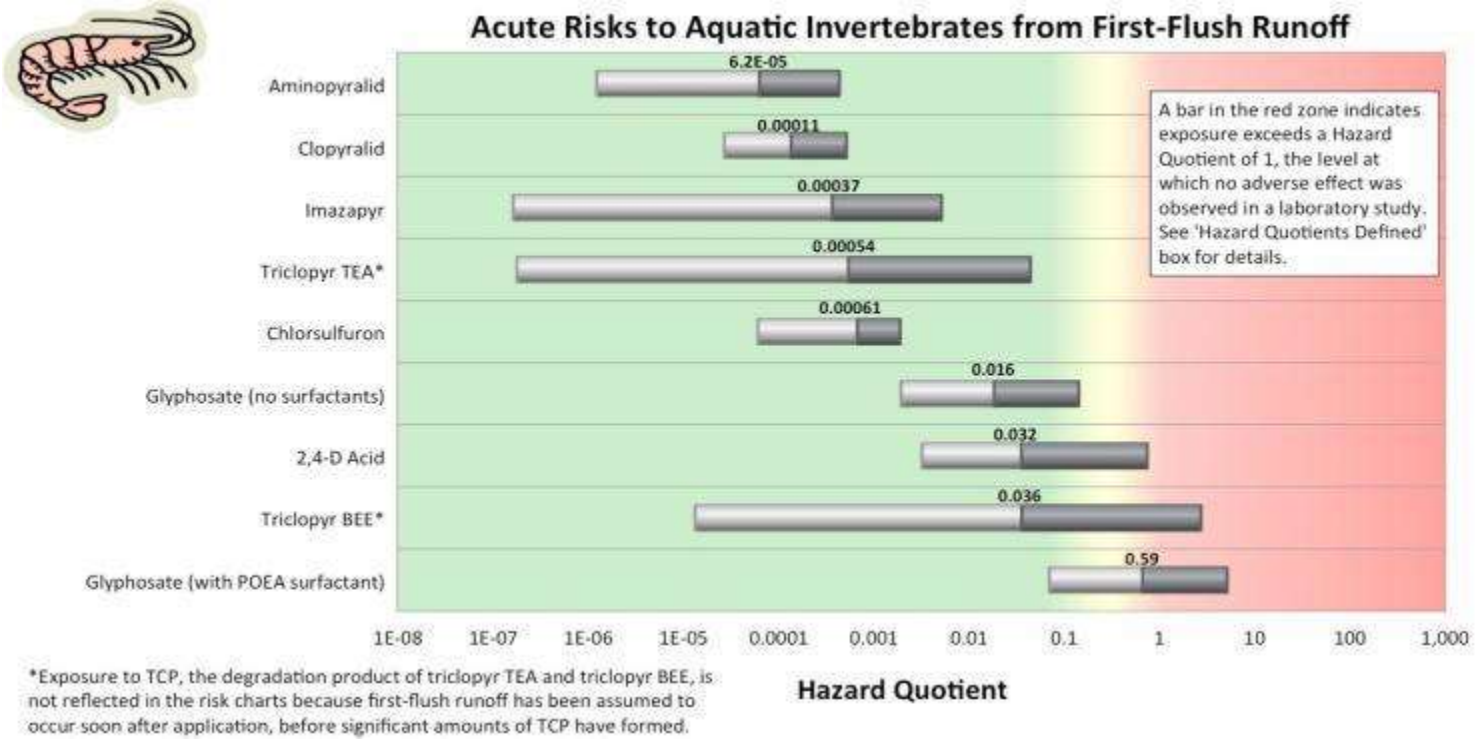
Likelihood: Most likely with spray-to-wet applications on blooming plants or those with extrafloral nectaries.

Mitigation: Do not apply to blooming plants. Apply early in the morning or close to sunset when insects are less active. Use low-volume applications and reduce the amount applied per acre.

Risk calculated as a function of: The inherent toxicity of the herbicide to honey bees; the amount of active ingredient sprayed; and the distance between bee and applicator. Risks in this chart do not account for potential toxicity of any surfactants that are part of the product formulation or added to spray mixtures.

Methodology and sources: See description following risk charts and PRI website, where you can access a spreadsheet for adjusting application rates and other variables.

Reading the chart: For each bar, the labeled central value is the most likely estimate. The right end of the bar assumes worst-case conditions for all underlying variables; the left end of the bar assumes best-case conditions. Mitigation is advised if risk enters the red zone.



Taxa: Aquatic invertebrates.

Assumptions: Terrestrial application of herbicide at half of the maximum rate on a representative product's label (see Table 11); 10-acre treatment with no buffer zone between treatment area and water body.

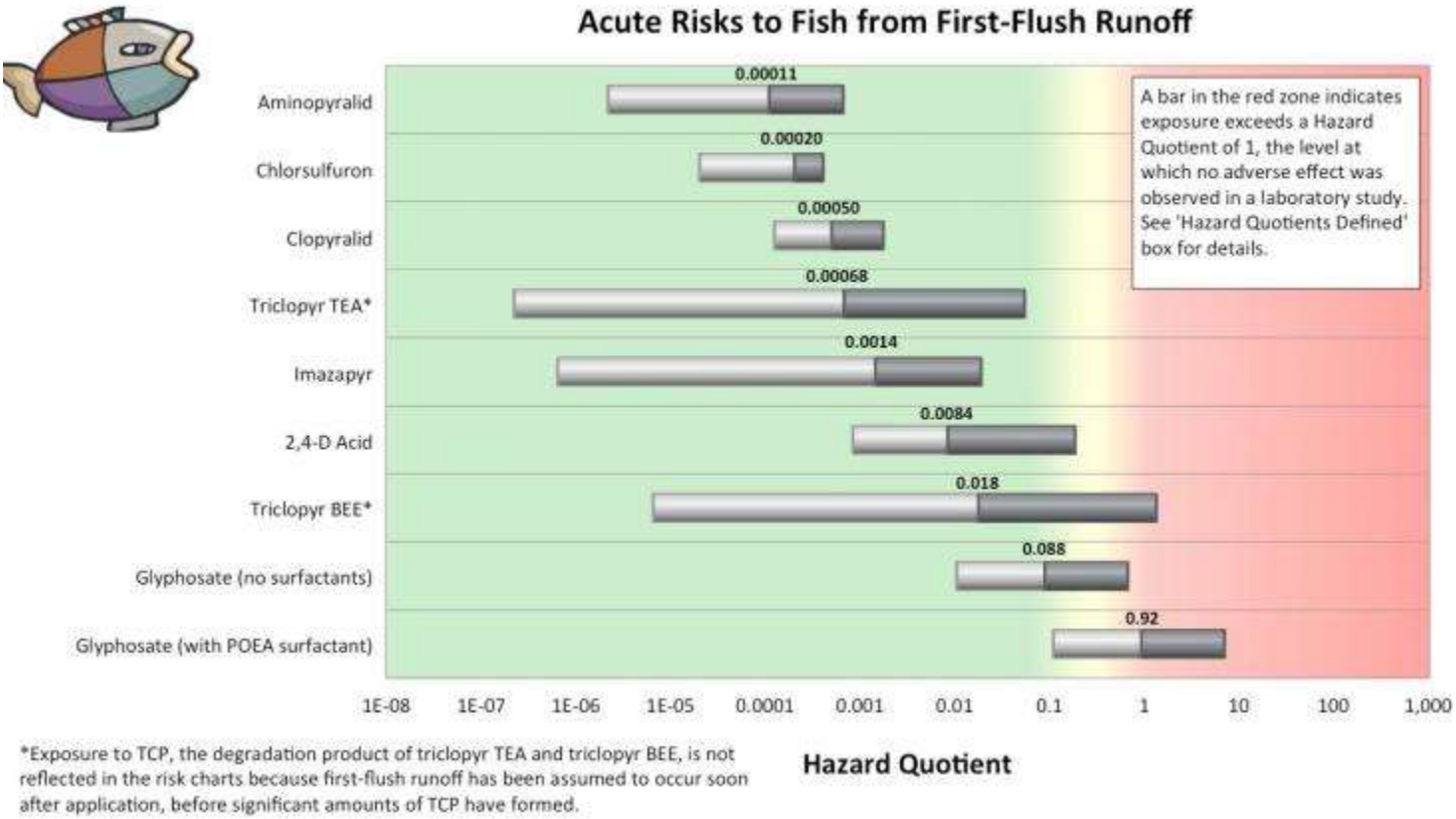
Likelihood: Buffer zones may be required on some water ways and are common practice when using herbicides not approved for aquatic use. Dry season applications can result in long intervals before a rain event, resulting in lower residues for runoff.

Mitigation: Use low-volume applications and reduce the amount applied per acre. Use buffer zones (see Bakke (2001) to help gauge effective buffer distances). Make applications during the dry season to avoid runoff. For applications near waterways, consider using herbicide formulations intended for use in aquatic systems.

Risk calculated as a function of: The inherent acute toxicity of the herbicide to aquatic invertebrates; herbicide characteristics that affect transport through soil to water (water solubility, ability to adsorb to soil); soil type; and the application rate. Herbicide degradation is not considered, as the estimate is for runoff occurring soon after the application. Except for glyphosate with the POEA surfactant, risks in this chart do not account for potential toxicity of any surfactants that are part of the product formulation or added to spray mixtures.

Methodology and sources: See description following risk charts and PRI website where you can access a spreadsheet for adjusting application rates and other variables.

Reading the chart: For each bar, the labeled central value is the most likely estimate. The right end of the bar assumes worst-case conditions for all underlying variables; the left end of the bar assumes best-case conditions. Mitigation is advised if risk enters the red zone.



Taxa: Fish are also used as a surrogate for amphibians.

Assumptions: Terrestrial application of herbicide at half of the maximum rate on a representative product's label (see Table 11); 10-acre treatment with no buffer zone between treatment area and water body; rain within 24 hours of application.

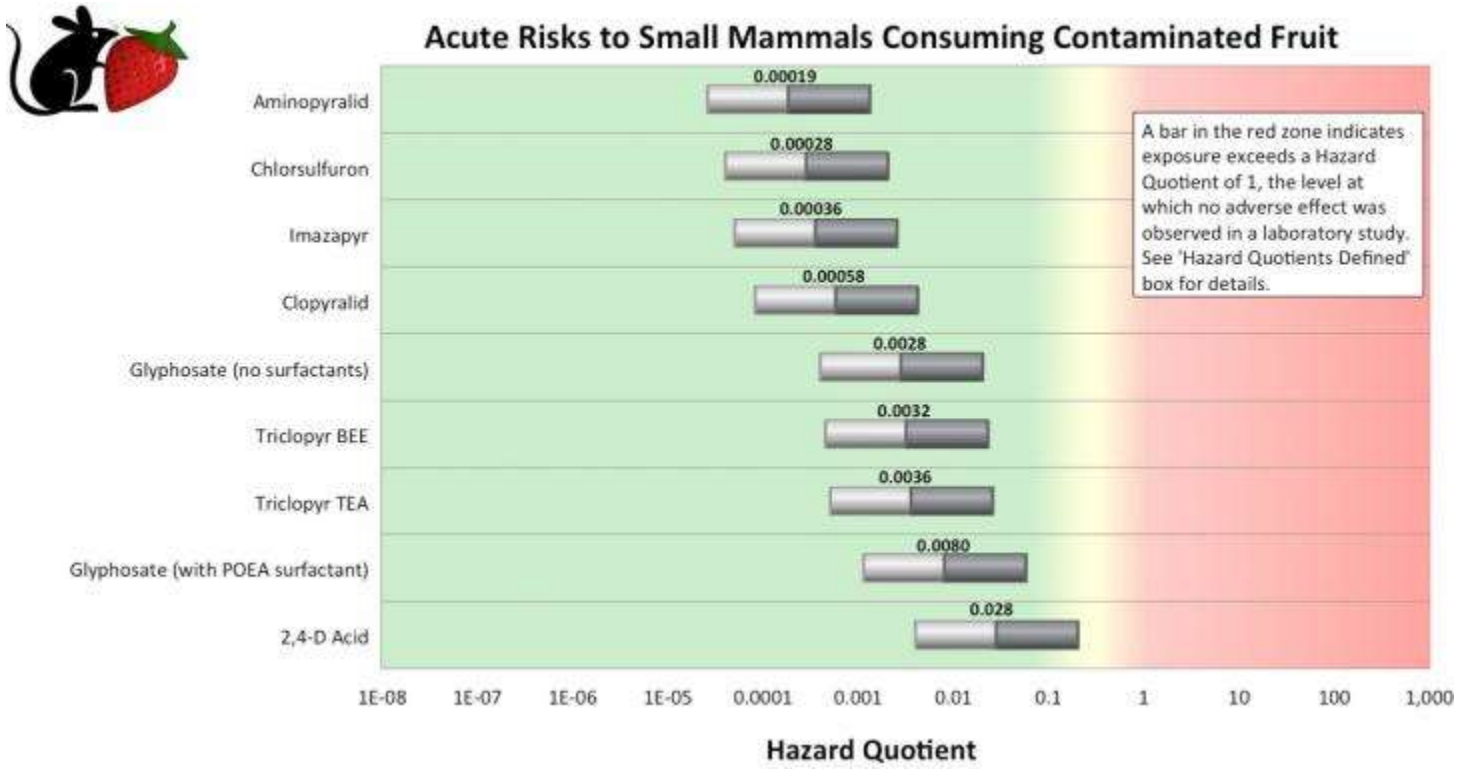
Likelihood: Buffer zones may be required on many water ways and are common practice when using herbicides not approved for aquatic use. Dry season applications in California will result in a long interval before a rain event, resulting in lower residues for runoff.

Mitigation: Use low-volume applications and reduce the amount applied per acre. Use buffer zones (see Bakke (2001) to help gauge effective buffer distances). Make applications during the dry season to avoid runoff. For applications near waterways, consider using herbicide formulations intended for use in aquatic systems.

Risk calculated as a function of: The inherent acute toxicity of the herbicide to fish; herbicide characteristics that affect transport through soil to water (water solubility, ability to adsorb to soil); soil type; and the application rate. Herbicide degradation is not considered, as the estimate is for runoff occurring soon after the application. Except for glyphosate with the POEA surfactant, risks in this chart do not account for potential toxicity of any surfactants that are part of the product formulation or added to spray mixtures.

Methodology and sources: See description following risk charts and go to PRI website where you can access a spreadsheet for adjusting application rates and other variables.

Reading the chart: For each bar, the labeled central value is the most likely estimate. The right end of the bar assumes worst-case conditions for all underlying variables; the left end of the bar assumes best-case conditions. Mitigation is advised if risk enters the red zone.



Taxa: Small mammals.

Assumptions: Terrestrial application of herbicide at half of the maximum rate on a representative product's label (see Table 11); 10-100% of diet is contaminated.

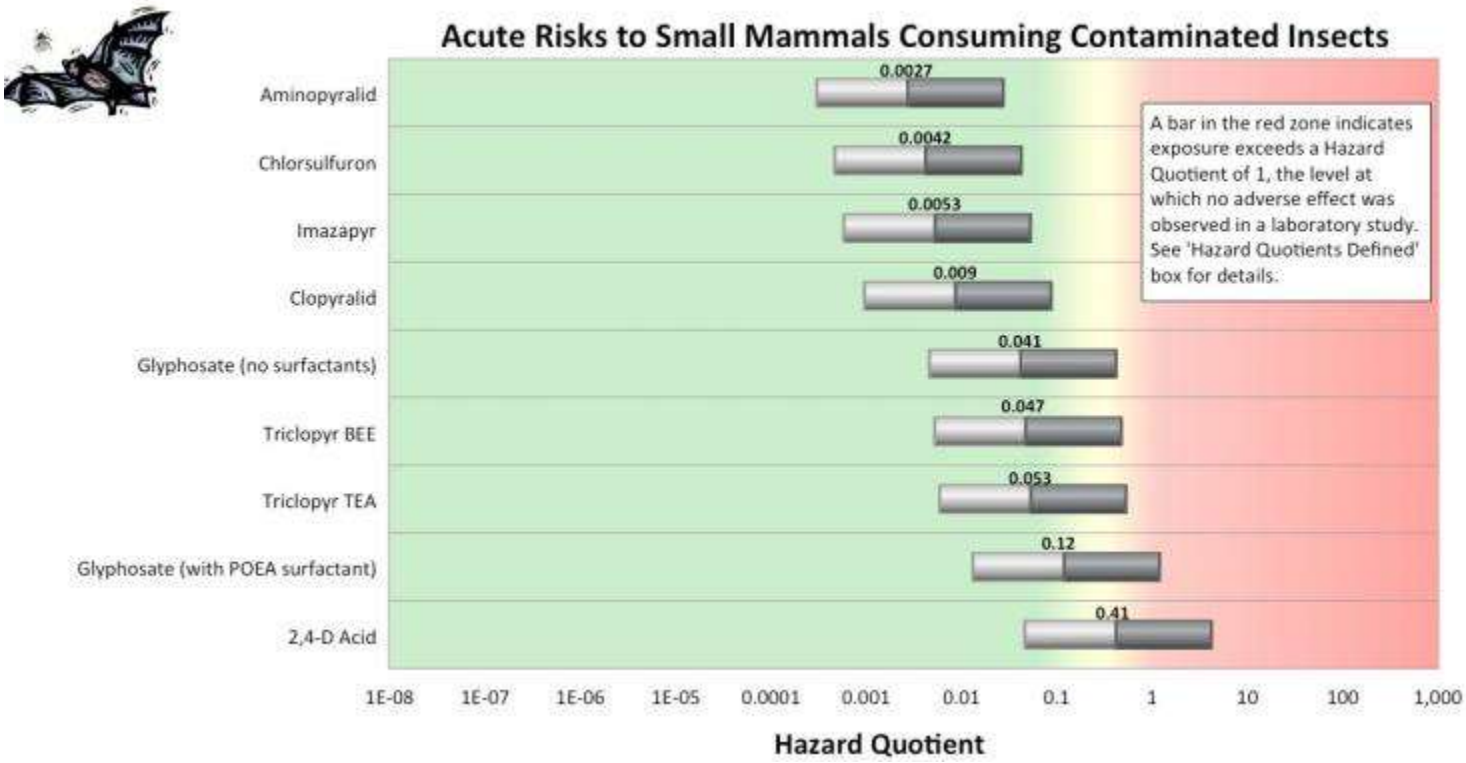
Likelihood: Under spot applications it is possible that a significant portion of a small mammal's diet could be contaminated. With broadcast applications over any sizable area (unusual for wildland management) contamination is likely for some small mammals.

Mitigation: Use low-volume application and reduce the amount applied per acre. If possible, don't treat large contiguous areas all at once. Avoid contamination of plants used as food sources by small mammals.

Risk calculated as a function of: The inherent acute toxicity of the herbicide to mammals; the residue rate of herbicide on fruit (which is proportional to the application rate). Except for glyphosate with the POEA surfactant, risks in this chart do not account for potential toxicity of any surfactants that are part of the product formulation or added to spray mixtures.

Methodology and sources: See description following risk charts and go to PRI website, where you can access a spreadsheet for adjusting application rates and other variables.

Reading the chart: For each bar, the labeled central value is the most likely estimate. The right end of the bar assumes worst-case conditions for all underlying variables; the left end of the bar assumes best-case conditions. Mitigation is advised if risk enters the red zone.



Taxa: Small mammals.

Assumptions: Terrestrial application of herbicide at half of the maximum rate on a representative product's label (see Table 11); 10-100% of diet is contaminated.

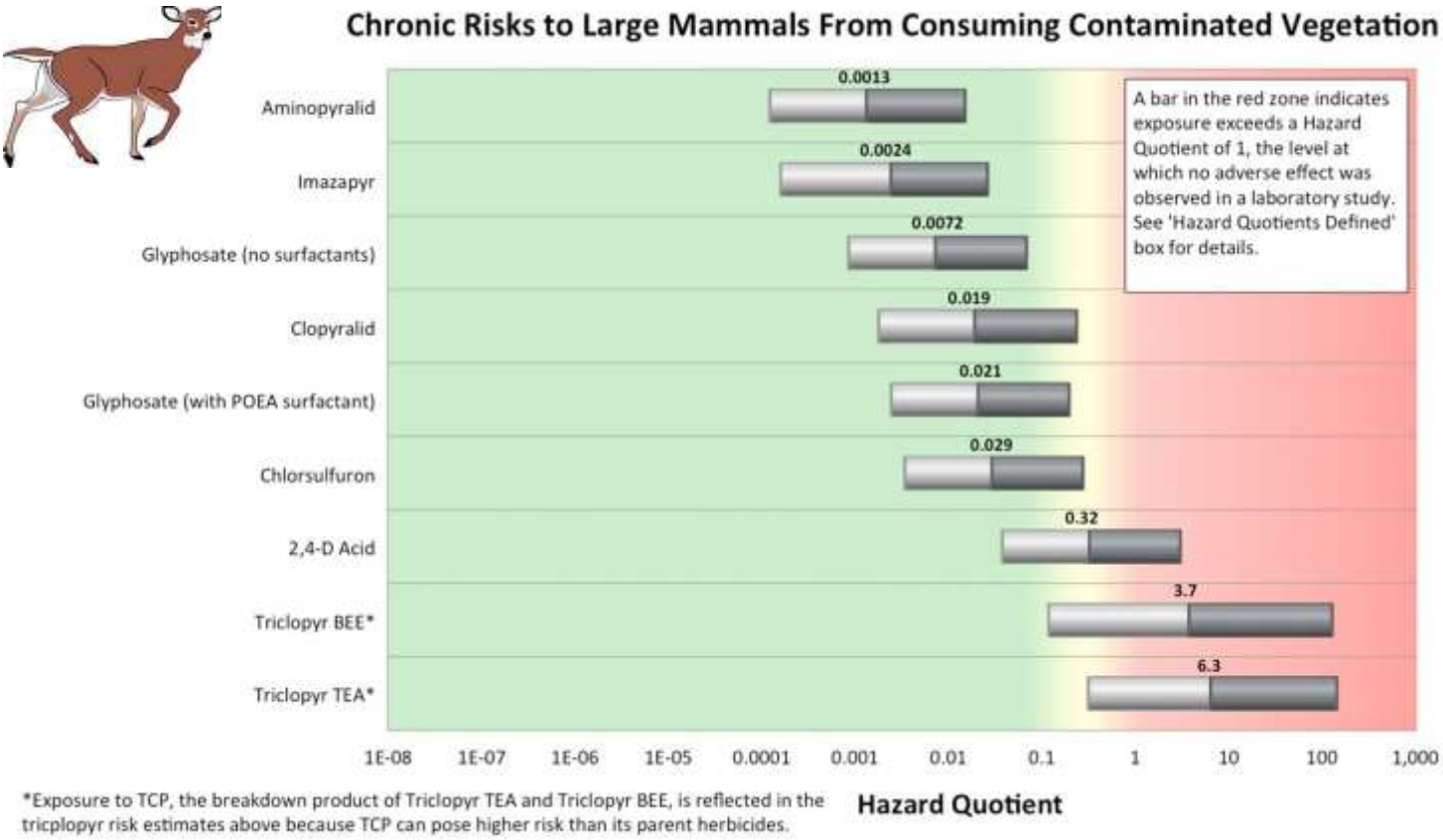
Likelihood: Under spot applications it is unlikely that a significant portion of a small mammal's insect-based diet could be contaminated. With broadcast applications over any sizable area (unusual for wildland management) contamination is possible for some small mammals.

Mitigation: Use low-volume applications and reduce the amount applied per acre. If possible, don't treat large contiguous areas all at once. Avoid treating plants when feeding by insects is likely, if known.

Risk calculated as a function of: The inherent acute toxicity of the herbicide to mammals; the residue rate of herbicide on insects (which is proportional to the application rate). Except for glyphosate with the POEA surfactant, risks in this chart do not account for potential toxicity of any surfactants that are part of the product formulation or added to spray mixtures.

Methodology and sources: See description following risk charts and go to PRI website, where you can access a spreadsheet for adjusting application rates and other variables.

Reading the chart: For each bar, the labeled central value is the most likely estimate. The right end of the bar assumes worst-case conditions for all underlying variables; the left end of the bar assumes best-case conditions. Mitigation is advised if risk enters the red zone.



Taxa: Large mammals.

Assumptions: Terrestrial application of herbicide at half of the maximum rate on a representative product's label (see Table 11); 10-100% of diet is contaminated for several months.

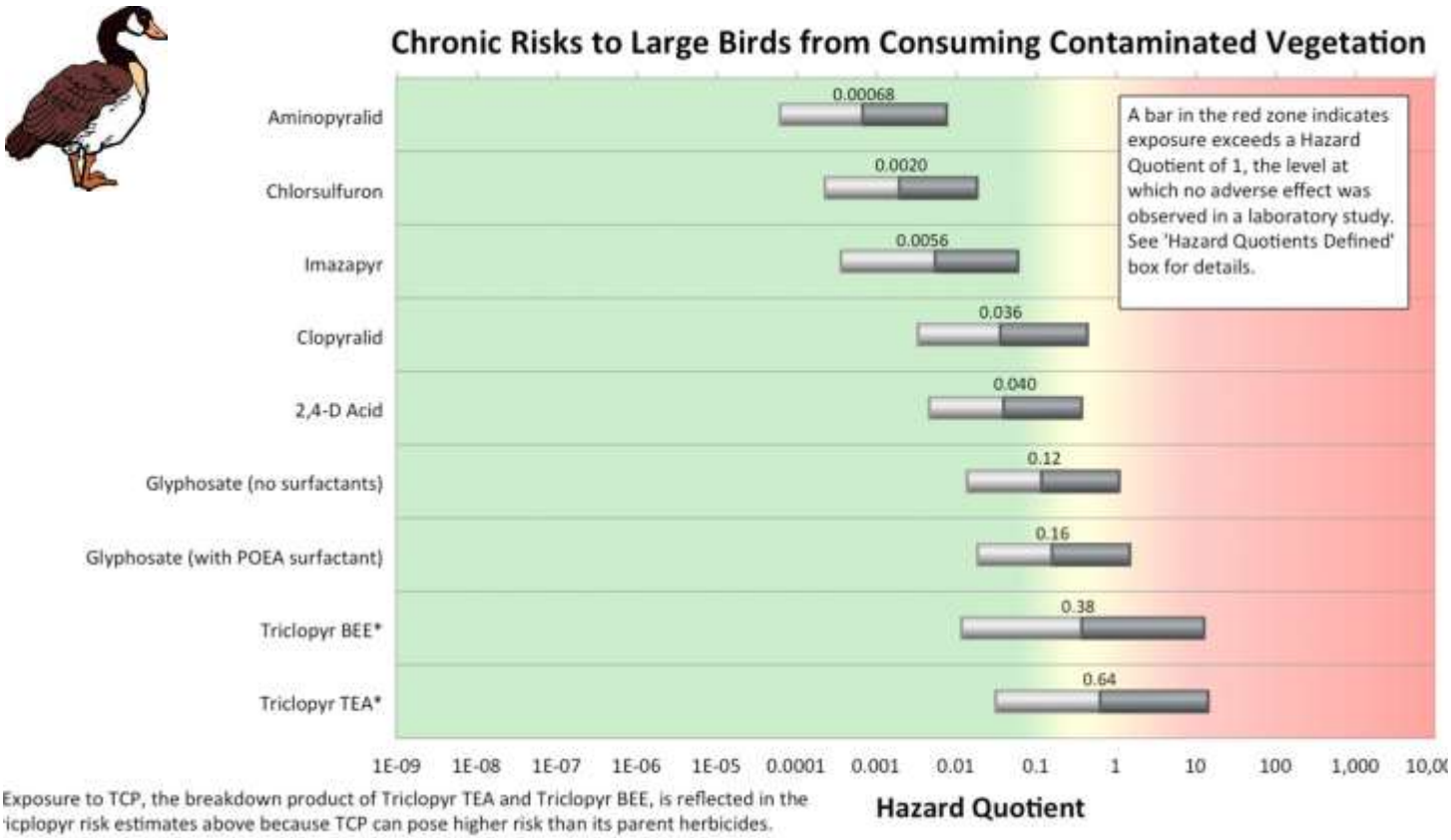
Likelihood: Under spot applications it is unlikely that a significant portion of any large mammal's diet would be contaminated. With broadcast applications over any sizable area (unusual for wildland management) consider the feeding range of the wildlife relative to the treatment area.

Mitigation: Use low-volume applications and reduce the amount applied per acre. If possible, don't treat large contiguous areas all at once. Avoid contamination of plants known to be used as food sources by large mammals.

Risk calculated as a function of: The inherent chronic toxicity of the herbicide to mammals; the residue rate of herbicide on vegetation (proportional to the application rate). Except for glyphosate with the POEA surfactant, risks in this chart do not account for potential toxicity of any surfactants that are part of the product formulation or added to spray mixtures.

Methodology and sources: See description following risk charts and go to PRI website, where you can access a spreadsheet for adjusting application rates and other variables.

Reading the chart: For each bar, the labeled central value is the most likely estimate. The right end of the bar assumes worst-case conditions for all underlying variables; the left end of the bar assumes best-case conditions. Mitigation is advised if risk enters the red zone.



Taxa: Large birds.

Assumptions: Terrestrial application of herbicide at half of the maximum rate on a representative product's label (see Table 11); 10-100% of diet is contaminated for several months.

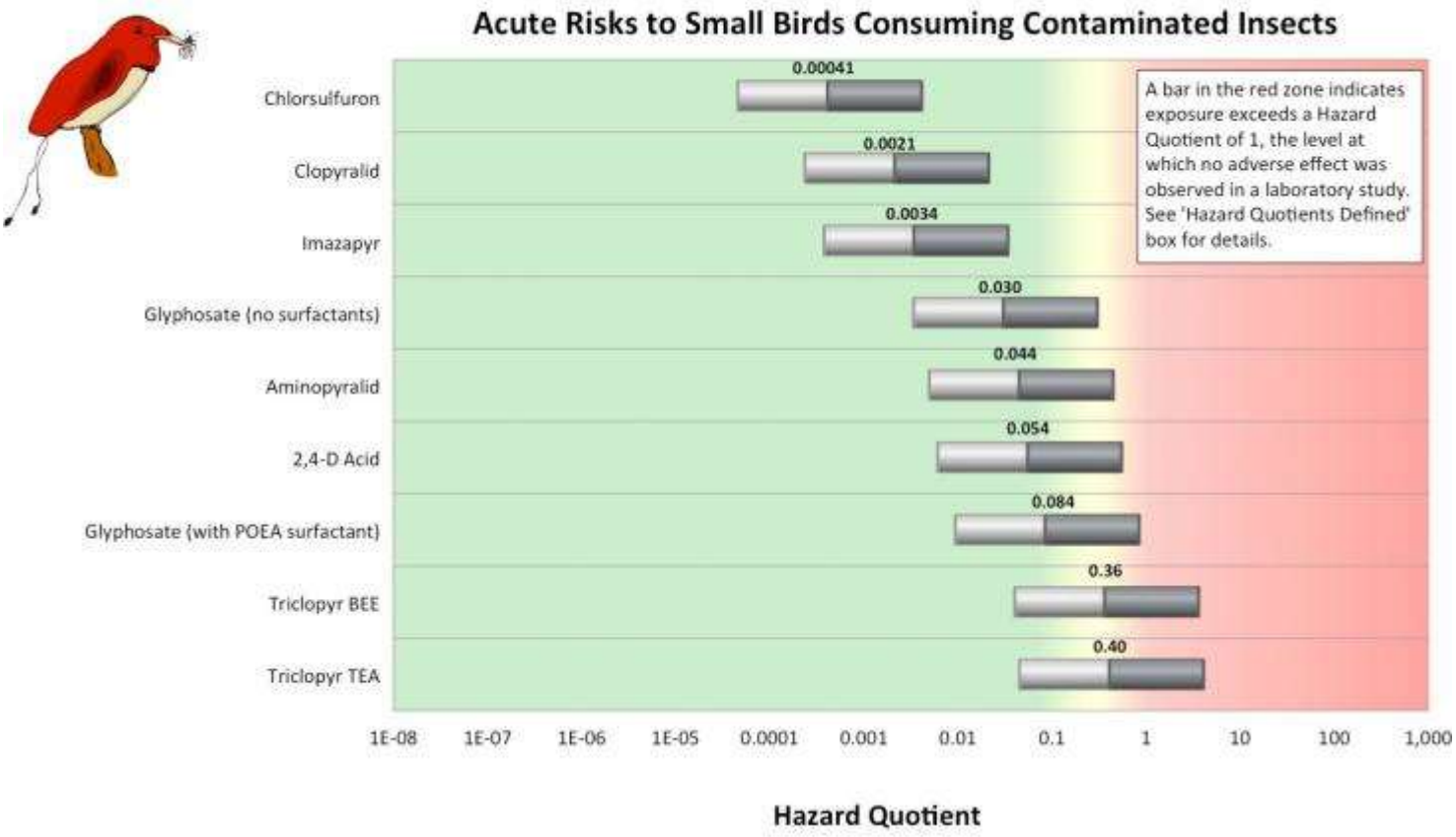
Likelihood: Under spot applications it is unlikely that a high portion of any bird's diet would be contaminated. With broadcast applications over any sizable area (unusual for wildland management) consider the feeding range of the wildlife relative to the treatment area.

Mitigation: Use low-volume applications and reduce the amount applied per acre. If possible, don't treat large contiguous areas all at once. Avoid contamination of plants known to be used as food sources by birds. Avoid treatments during nesting season.

Risk calculated as a function of: The inherent chronic toxicity of the herbicide to birds; the residue rate of herbicide on vegetation (which is proportional to the application rate). Except for glyphosate with the POEA surfactant, risks in this chart do not account for potential toxicity of any surfactants that are part of the product formulation or added to spray mixtures.

Methodology and sources: See description following risk charts and go to PRI website, where where you can access a spreadsheet for adjusting application rates and other variables.

Reading the chart: For each bar, the labeled central value is the most likely estimate. The right end of the bar assumes worst-case conditions for all underlying variables; the left end of the bar assumes best-case conditions. Mitigation is advised if risk enters the red zone.



Taxa: Small birds.

Assumptions: Terrestrial application of herbicide at half of the maximum rate on a representative product's label (see Table 11); 10-100% of diet is contaminated.

Likelihood: Under spot applications it is unlikely that a high portion of any bird's insect-based diet would be contaminated. With broadcast applications over any sizable area (unusual for wildland management) consider the feeding range of the wildlife relative to the treatment area.

Mitigation: Use low-volume applications and reduce the amount applied per acre. If possible, don't treat large contiguous areas all at once. Avoid treating plants when insects are feeding. Avoid treatments during nesting season.

Risk calculated as a function of: The inherent acute toxicity of the herbicide to birds; the residue rate of herbicide on insects (which is proportional to the application rate). Except for glyphosate with the POEA surfactant, risks in this chart do not account for potential toxicity of any surfactants that are part of the product formulation or added to spray mixtures.

Methodology and sources: See description following risk charts and go to PRI website, where you can access a spreadsheet for adjusting application rates and other variables.

Reading the chart: For each bar, the labeled central value is the most likely estimate. The right end of the bar assumes worst-case conditions for all underlying variables; the left end of the bar assumes best-case conditions. Mitigation is advised if risk enters the red zone.

Risk Assessment Methodology

The methods used for estimating risk are based closely on USFS risk assessment methodology (link), in which three estimates are calculated for the exposure (dose) received as a result of various herbicide use scenarios. Each dose estimate is based on a set of best-case, most-probable, or worst-case assumptions based on exposure parameters appropriate to that scenario. The dose estimates are then compared to Toxicity Reference Values to assess risk if the scenario were to occur.

Exposure estimates were calculated using the risk assessment spreadsheets developed by Syracuse Environmental Research Associates (SERA) for the USFS and the Bureau of Land Management (BLM), published between 2007 and 2014. A full description is available in the report "Preparation of Environmental Documentation and Risk Assessments." Risk assessments for each of the herbicides discussed here are also downloadable from the USFS site. A detailed explanation of the methods used to estimate risk in this report is also available in Chapter 2 of the "2010 Marin Municipal Wastewater District (MMWD) Herbicide Risk Assessment." However, some parameter values and methods used for the risk estimates above differ from the *2010 MMWD Herbicide Risk Assessment*. Each of these changes is discussed below. Finally, the PRI website provides detailed information on how the risk charts were developed and allows users to modify application rates to assess changes in risk profiles.

Modifications to USFS Risk Estimation Methods

Several modifications to USFS/SERA default values were made for this evaluation:

TRVs: Toxicity Reference Values (TRVs) based on LD_{50} or LC_{50} transformed to "No Effect" levels by incorporating an additional uncertainty factor of 20, the methodology used by US EPA to adjust TRVs for assessment effects to endangered species. This transformation ensures that all TRVs are based on "No Effect" levels and allows direct comparison of herbicides. This change has been incorporated into the more recent USFS herbicide risk assessments, and PRI updated the older risk assessments to include this change.

Percent of diet contaminated: In more recent versions of the USFS/SERA herbicide risk assessments, the percentage of an animal's diet assumed to be contaminated was modified to 10% (best-case), 30% (most-probable) or 100% (worst-case). PRI applied the same change to herbicides not yet adopted by USFS, to ensure an "apples to apples" comparison between herbicides. Residue rates assumed for herbicides on food (fruit, vegetation and prey) were based on the most up-to-date values from USFS/SERA (WorksheetMaker 6.0). The caloric error factor, which was introduced in recent versions of USFS/SERA worksheets, was not utilized here.

Herbicide Residue Rates: USFS changed the residue rates used in the latest version of their risk calculation spreadsheets for estimating exposures from consumption of contaminated fruit, insects and vegetation. This change lowers the best-case predicted dose for wildlife from consumption of contaminated food. In the new versions of the spreadsheets, a new lower residue rate was introduced that is equivalent to the following:

Best-case residue rate = Most-probable rate x (Most- probable rate ÷ Worst-case rate)

These values were incorporated into the calculations for all of the herbicides to ensure comparison of equivalent value.

Insect Contamination Rate: The USFS changed the mass of a honey bee from 93 mg to 116 mg and the surface area from 2.66 cm^2 to 1.42 cm^2 in the more recent herbicide reviews. The net effect is to reduce the estimated dose received by the honey bee. These values were incorporated into the calculations for all of the herbicides to ensure comparison of equivalent values.

Toxicity Reference Values Used to Estimate Risk

Toxicity Reference Values (TRVs) are given in terms of mg of acid equivalent (AE) or active ingredient (AI). NOAEL is the No-Observed-Adverse-Effect Level.

Table 11. Toxicity reference values used to estimate risk

Receptor (units)	Herbicide	TRV Used	USFS	Endpoint
Honeybees (mg/bee)	2,4-D Acid	1075	1075	NOAEL
	Aminopyralid	1075	1075	NOAEL
	Chlorsulfuron	25	25	NOAEL
	Clopyralid	909	909	NOAEL
	Glyphosate	860	860	NOEC
	Imazapyr	860	860	NOAEL
	Triclopyr BEE	620	620	NOAEL[b]
	Triclopyr TEA	620	620	NOAEL[b]
Birds, acute (mg/kg body weight)	2,4-D Acid	415	415	NOAEL
	Aminopyralid	14	14	NOAEL
	Chlorsulfuron	1686	1686	NOAEL
	Clopyralid	670	670	NOAEL
	Glyphosate	1500	1500	NOAEL
	Imazapyr	2510	2510	NOAEL
	Triclopyr BEE	126	126	NOAEL[b]
	Triclopyr TEA	126	126	NOAEL[b]
Birds, chronic (mg/kg body weight)	2,4-D Acid	76	76	NOAEL
	Aminopyralid	184	184	NOAEL
	Chlorsulfuron	140	140	NOAEL
	Clopyralid	15	15	NOAEL
	Glyphosate (no surfactants)	58	58	NOAEL
	Glyphosate (with POEA)	43	43	NOAEL
	Imazapyr	610	610	NOAEL
	TCP[c]	116	116	NOAEL[b]
	Triclopyr BEE	7.5	7.5	NOAEL[b]
	Triclopyr TEA	7.5	7.5	NOAEL[b]
Mammals, small (mg/kg body weight)	2,4-D Acid	25	25	NOAEL
	Aminopyralid	104	104	NOAEL
	Chlorsulfuron	75	75	NOAEL
	Clopyralid	75	75	NOAEL
	Glyphosate	500	500	NOAEL
	Imazapyr	738	738	NOAEL
	Triclopyr BEE	440	440	NOAEL[b]
	Triclopyr TEA	440	440	NOAEL[b]

Receptor (units)	Herbicide	TRV Used	USFS	Endpoint
Mammals, large (mg/kg body weight)	2,4-D Acid	5	5	NOAEL
	Aminopyralid	50	50	NOAEL
	Chlorsulfuron	5	5	NOAEL
	Clopyralid	15	15	NOAEL
	Glyphosate	500	500	NOAEL
	Imazapyr	738	738	NOAEL
	TCP[c]	12	12	NOAEL[b]
	Triclopyr BEE	0.4	0.4	NOAEL[b]
	Triclopyr TEA	0.4	0.4	NOAEL[b]
Fish (mg/liter of water)	2,4-D Acid	4.8	95.6	$LC_{50} \div 20$
	Aminopyralid	50	50	NOEC
	Chlorsulfuron	30	30	NOEC
	Clopyralid	5[a]	103	$LC_{50} \div 20$
	Glyphosate (no surfactants)	0.5	0.5	NOAEC
	Glyphosate (with POEA)	0.048	0.048	NOAEC
	Imazapyr	10.4	10.4	NOAEC
	TCP[c]	0.18	0.18	NOAEC[b]
	Triclopyr BEE	0.091	0.091	NOAEC[b]
	Triclopyr TEA	20	20	NOAEC[b]
Aquatic Invertebrates (mg/liter of water)	2,4-D Acid	1.25[a]	25	$LC_{50} \div 20$
	Aminopyralid	89	89	NOEC
	Chlorsulfuron	10	10	NOEC
	Clopyralid	23.1	23.1	NOEC
	Glyphosate (no surfactants)	2.7	2.7	NOAEC
	Glyphosate (with POEA)	0.075	0.075	NOAEC
	Imazapyr	41	41	NOAEC
	TCP[c]	0.55	0.55	NOAEC[b]
	Triclopyr BEE	0.045	0.045	NOAEC[b]
	Triclopyr TEA	25	25	NOAEC[b]

[A] *To ensure comparison of equivalent endpoints between herbicides, all* TRVs *values expressed as LC_{50} or LD_{50} values were translated by either USFS or PRI to "No Effect" levels by incorporation of an uncertainty factor of 20, similar to that used by US EPA to protect endangered species. This practice was only recently incorporated into the USFS methodology, so PRI implemented these changes for the herbicides reviewed by USFS prior to the change.*

[b] *For triclopyr and TCP toxicity to mammals, USFS used allometric parameters that correct the NOAEL for the amount of food and water consumed, based on body weight and size, to adjust for differences between the test species and the taxa to which the TRV is applied.*

[c] *TCP is the primary degradation product of triclopyr. Because triclopyr must degrade before any TCP is produced, only the chronic scenarios of large mammals and birds eating vegetation involve potential exposure to TCP. The other scenarios are acute events, where triclopyr has not yet degraded to form TCP. Chronic exposure to treated vegetation will result in exposure to a combination of the parent compound and TCP, which degrade at similar rates. The risk bars are based on the TRV for the more toxic (lower value) of the two to produce a more protective risk estimate. For both mammals and birds, the risk charts are based on the TRV for triclopyr acid, since it has the lower value.*

Herbicide Half-Life

Herbicide half-life is a measure of persistence in the environment. Herbicides that are persistent in the soil environment continue to have herbicidal activity and cause adverse effects on the ecosystem until the concentration drops below a level that is toxic to plants. The range of half-lives for the herbicides in soil under aerobic conditions—in the presence of oxygen and microbes—can vary by a factor of ten or more for each herbicide. Exposure to sunlight can accelerate decomposition of some herbicides. The longest half- lives are typically relevant under arid conditions where microbial degradation rates are low. Anaerobic degradation is usually slower than aerobic degradation. In general, glyphosate is expected to be less persistent than other herbicides considered in this assessment, while imazapyr and aminopyralid are among the most persistent. Triclopyr BEE and TEA rapidly degrade or dissociate to triclopyr acid, so the persistence of triclopyr degradates—triclopyr acid and TCP— is most relevant to triclopyr applications. Organic herbicides such as clove oil, pelargonic acid, and limonene have very short half- lives (a few days to a week), which limits their potential for exposure.

Figure 4 shows the range of half-lives for the herbicides in soil under aerobic conditions. In the plot, herbicides are arranged in order of the Central value of their measured half-life. The Upper, Lower and Central values on Figure D-1 are based on a review of the academic literature and the values used by government agencies, including US EPA, USFS, California Department of Pesticide Regulation (DPR), and the Oregon Department of Environmental Quality (ODEQ) (see PRI website for more information).

The Central values for the herbicides used in the plots (except for 2,4-D and aminopyralid) in Figure D-1 are the half-life values used by USFS in its risk assessments as the Central half-life estimate in soil, with the values for 2,4-D from DPR's environmental fate review and for aminopyralid from US EPA's risk assessment. Lower and Upper values used in the figure are taken from US EPA's risk assessments or from DPR's or ODEQ's environmental fate documents summarizing the available literature studies. Half-lives vary depending on test conditions, and comparable studies conducted under the same test conditions were not always available for every herbicide. When soil values were unavailable, the half-life on fruit was used.

Figure 4 is intended to provide as much as possible an "apples-to-apples" comparison of aerobic soil half- lives. However, imazapyr does not degrade in soil under aerobic conditions, so a field dissipation half-life (5.9 years) is used, in order to provide a numerical point of comparison to other herbicides. Note that half-lives of herbicides in water or in anaerobic sediments (such as wetlands) may be different than the aerobic soil half- lives presented in Figure 4 For most pesticides, the anaerobic half-life (in the absence of oxygen) is longer than the aerobic half-life. Sunlight and processes that dissipate herbicides in the environment like rainfall runoff, absorption by plants, or irreversible binding to soils can also alter the persistence of a chemical in the treated area.

Figure 4 shows the total range of half-lives observed for the different chemicals. Half-life values used by the USFS in their worksheets are those used to produce the charts and are more narrowly constrained to reflect half- lives under the most common conditions.

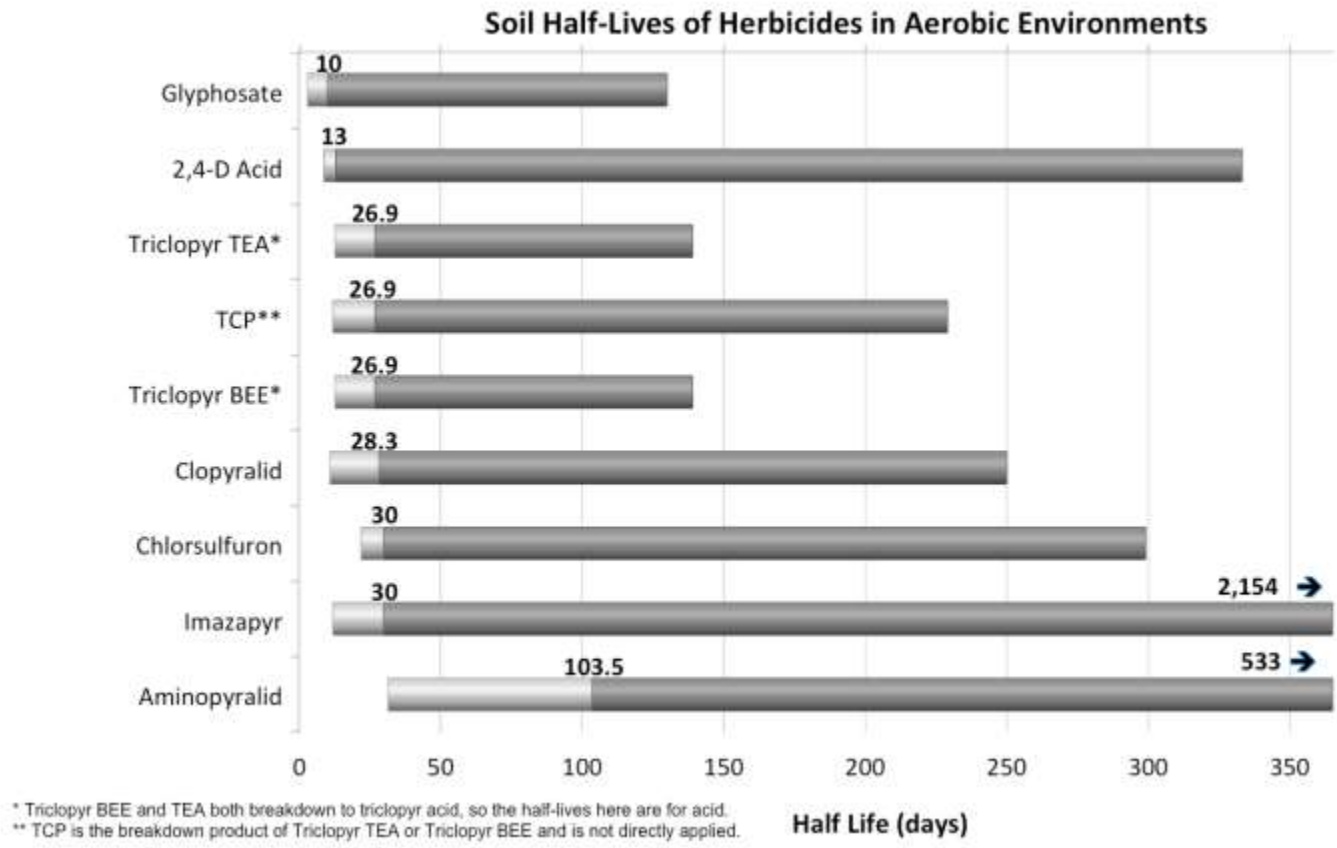


Figure 4: Comparison of the range of herbicide half-lives under aerobic conditions in soil. The high end of the range is typically under arid conditions where microbial degradation rates are low. Exposure to sunlight can accelerate decomposition and shorten the half-life of some herbicides. Sources are described after Table 12. For aminopyralid, see EPA Fact Sheet 2005. For imazapyr, see EPA 2007 Appendix A Imazapyr Effects Determination for the CA Red-legged frog.

Water Contamination Rates

Water contamination rates are a measure of how much of an applied herbicide will run off of the treated area into nearby water bodies. Maximum or peak concentrations of herbicides in water bodies receiving runoff are typically observed when rainfall or irrigation occurs soon after treatment, before the herbicide has degraded substantially. The concentration of herbicide in this "first-flush" runoff may potentially impact aquatic organisms and terrestrial animals that make contact with or drink contaminated water. The potential of herbicides to move off-site in runoff water depends on water solubility, half-life, and the ability of the herbicide to bind to soil. The site characteristics are relevant too, as different soil types bind to herbicides differently. Bare or impermeable soils are much more prone to runoff than vegetated areas; sandy soils are susceptible to leaching that may result in groundwater contamination.

The risk charts use the USFS method (based on the Groundwater Loading Effects of Agricultural Management Systems (GLEAMS) model) to estimate the concentration of each herbicide in water for an application to 10 acres, no buffers along the edge of the treated area, and rainfall after the application based on averages for a variety of sites. The range of water contamination rates is based on the range of site variables such as soil type and chemical properties. Use of buffer zones around water bodies will reduce water contamination.

Water contamination rates are measured in units of milligrams of herbicide per liter per pound of herbicide applied per acre (mg/L per lb/acre). Actual herbicide concentrations in the receiving water body will depend on how many pounds of active ingredient are applied to land that drains to the water body. Use of herbicides with application rates of fractions of a pound per acre (see Table 11) will generally result in lower concentrations than herbicides with higher application rates. Predicted concentrations in the receiving water bodies for the half-maximum application rates for each active ingredient are shown in Figure 5. These concentrations were used to estimate the risks displayed in the charts for aquatic species and for animals drinking the water.

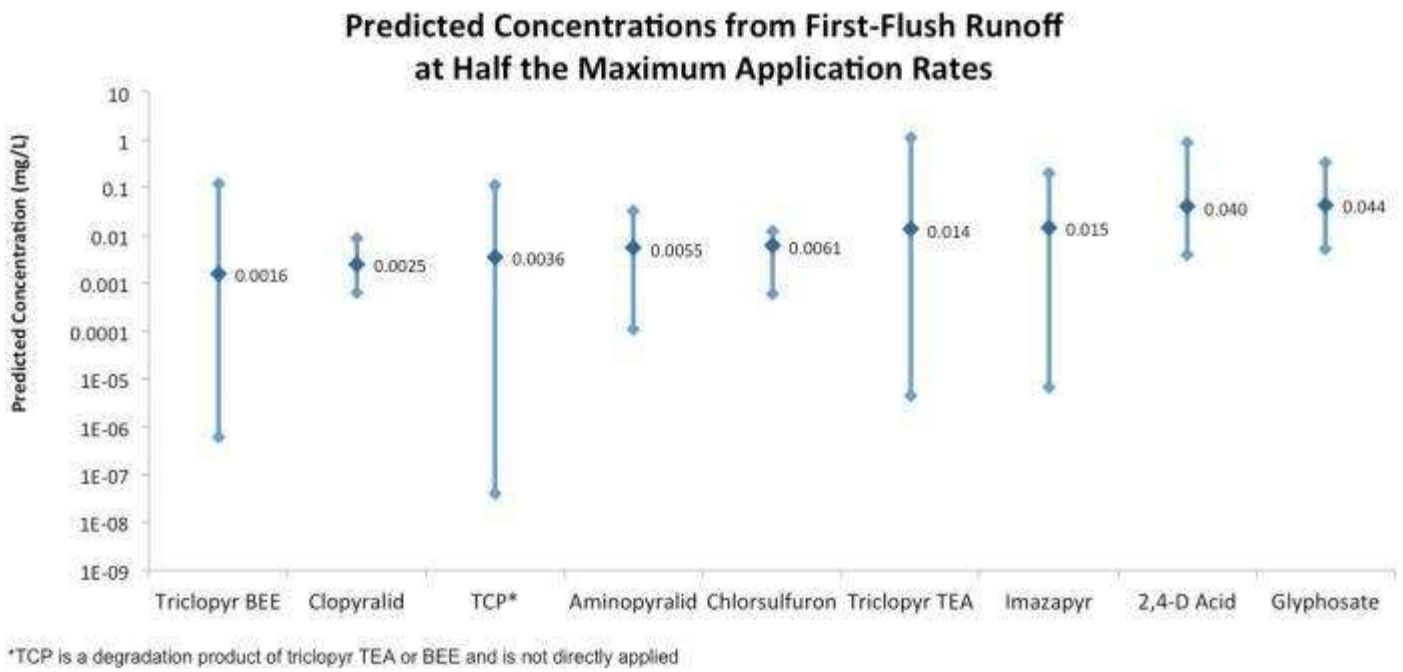


Figure 5: Comparison of the range of predicted concentrations in peak runoff after terrestrial application at half-maximum application rate. Factors affecting predicted concentrations include application rate, water solubility, half-life, and the ability of the herbicide to bind to soil (Koc). Use of buffer zones near surface waters will help to reduce water contamination. Source: "Estimated Water Contamination Rates" in USFS risk assessment worksheets at www.fs.fed.us/foresthealth/pesticide/worksheets.shtml.

Herbicide Selection Process

Several factors contributed to selecting particular herbicides to control noxious weeds on Clallam County roadsides.

- **EPA Approved for Roadside Use --** All of the selected herbicides are fully labeled for use on roadsides and are registered for use in the state of Washington. The herbicide label does not have to list all the weeds, but the label does have to list roadsides or rights-of-way as a use site.
- **Effectiveness on Target Species –** AquaNeat and Polaris are very broad spectrum and will control most of the county's noxious weeds. Milestone, Transline, Vastlan, and 2,4-D are selective and very effective only on broadleaf plants. Fusillade II is effective only on grass species. Many of the targeted weeds have a perennial life cycle with persistent root systems. Effective control requires translocated herbicides that kill the roots. All of the selected herbicides translocate to the roots.
- **Selectivity –** Several of the herbicides were chosen because they selectively target broadleaf weeds, not grasses. This allows grass to be unaffected and to colonize space previously occupied by broadleaf weeds. The grass herbicide gives the program a selective chemical for controlling weedy grasses, such as reed canarygrass, in a mixed plant community.
- **Human and Environmental Safety –** A carefully selected, limited palette of herbicides rated with low toxicity to humans and wildlife has been chosen for this program. Some of the products are labeled for aquatic use so inadvertent occurrence in water is anticipated to have minimal effects on aquatic organisms. Most are labeled for use on grazed areas such as range and pasture. Most are labeled for use in maintaining wildlife habitat, fence rows, as well as rights-of-way.

Herbicide Product List

Clallam County proposes to use the following products for targeted herbicide applications:

AquaNeat® (aquatic formulation glyphosate)
Element® 3A (aquatic formulation triclopyr)
Fusilade II® (fluazifop-P)
Milestone® (aquatic formulation aminopyralid)
Polaris® (aquatic formulation imazapyr)
Transline® (clopyralid)
Vastlan (aquatic formulation triclopyr)
WeeDestroy AM-40® (aquatic formulation 2,4-D).

The chosen products are effective on known roadside weeds, offer the greatest weed selectivity, maximize worker and public safety (no wait, access when the spray has dried), and used as proposed, pose low risk for wildlife and the environment (Table 13). See Appendix B for risk analysis.

The standard, minimum personal protection equipment (PPE) when using herbicides includes:

Long sleeved shirt, long pants
Shoes plus socks
Chemical resistant gloves made of any waterproof materials

(Any additional PPE requirements are shown in Table 7).

Table 12. Selected herbicide characteristics.

Chemical Name Product Name	Selective	Aquatic Sites	Target Weeds	Personal Protection Equipment	Comments
2,4-D WeeDestroy AM-40	✓	✓	Broadleaf	Standard; eye protection + apron for mixing	Inexpensive, often used in mix; short residual
Aminopyralid[1] Milestone	✓	✓	Broadleaf	Standard	Moderate residual may help suppress seed germination; very low rates
Clopyralid Transline	✓		Broadleaf	Standard	Very selective; will not affect many native and desirable plants; moderate residual; low rates
Fluazifop-P Fusilade II	✓		Grasses	Standard + eye protection	For dry sites; reed canary-grass and annual grasses
Glyphosate AquaNeat		✓	All weeds	Standard	Minimal to no residual; protect desirable vegetation
Imazapyr Polaris		✓	All weeds	Standard	Long residual; protect desirable vegetation
Triclopyr amine Vastan Element 3A	✓	✓	Broadleaf, shrubs	Standard; Eye protection for mixing (Element 3A only)	Moderate residual

[1]Registered as a reduced risk pesticide under the EPA reduced risk pesticide program

Adjuvants are compounds added into an herbicide mix to improve efficacy. They perform various functions, including: enhanced plant uptake of the herbicide; better mixing of otherwise incompatible herbicides; increased adhesion of the spray to plant surfaces; and reduced spray drift. In many herbicide products, adjuvants are included as part of the pre-mixed formulation as purchased. Applicators can also add adjuvants to spray mixtures prior to application. Adjuvants include marker dyes, which are visible indicators of freshly treated weeds, include Blazon and Highlite (aquatic formulation).

Surfactants, or “surface active agents", are a type of adjuvant added to a mix to increase the dispersing, spreading, wetting, or other properties of the liquids. Surfactants disperse water droplets and help penetrate a plant’s waxy surface. (Table 13).

Some states require registration of adjuvants as pesticide products, but the US EPA does not, so relatively less is known about adjuvants compared to pesticide active ingredients. Acute toxicity information is often available, with some of these compounds being labeled as strong eye or skin irritants, but information regarding chronic toxicity is sparse. Washington State and European countries require environmental toxicology data on adjuvants.

For many pesticide products containing adjuvants as part of the formulation, the compounds are not explicitly identified on the label or the Safety Data Sheet. Unless they are on one of US EPA’s lists of more toxic chemicals, they do not have to be identified. The identity of these ingredients in a pesticide or adjuvant product is legally protected from full disclosure as “Confidential Business Information.”

Without more detailed information, it is not possible to conduct a comprehensive risk assessment on adjuvants, so they are not included in the risk charts shown as part of Appendix B, which focus on herbicidal active ingredients. However, at least one adjuvant is known to pose hazards to wildlife—the surfactant used in the original formulation of RoundUp®, polyoxyethyleneamine (POEA). This surfactant is more toxic to aquatic life than the active ingredient glyphosate—it has been included as a separate entry in the risk charts. Nonylphenol ethoxylates (NPEs), which are used in some adjuvants (and many consumer products), may be linked to endocrine disrupting effects. No products containing polyethoxylated tallowamine (POEA) or nonylphenol ethoxylates (NPEs) will be allowed for use in this program. Adjuvants with low toxicity to wildlife include modified seed oils, alkyl ethoxylates, and silicones. Liberate®, Competitor®, DyneAmic®, and Agri-Dex® (all aquatic formulations) are brand names of some adjuvants from these low toxicity categories and have been selected for use in this program. Research is developing on this subject and will be regularly added to updates for this program

Government agencies negotiate for favorable pricing and award a contract to a preferred provider for many goods and services. Herbicides will be purchased under state contract whenever possible to conserve tax dollars. Because the preferred provider may vary from year to year; different brand names than listed in the previous tables, with the same active ingredient may be substituted. New products or different formulations with the same active ingredient that are more user or environmental friendly, and cost beneficial will be substituted as they become available.

Table 13. Adjuvants used to enhance herbicide effectiveness.

Adjuvants	Aquatic use	Treatment effects	PPE	Comments
Competitor - vegetable oil Agri-Dex, - crop oil concentrate Dyne-Amic - nonionic surfactant Liberate - fatty acids	✓	Increases herbicide uptake	Standard	Used at low rates
Blazon - marker dye Highlite - marker dye	✓	No active effect	Standard	Highlights recently sprayed weeds; washable

A number of studies have shown non-synthetic products (or “natural”) are considerably less effective for controlling weeds, especially biennials or perennials, than synthetic ones. However, three of these products, acetic acid, clove oil, and limonene are the subject of an on-going study for control of the annual weed, herb Robert. Pending study results,, one or more of these herbicides may be added to the herbicide product list for control of this or other annual weeds.

Application Methods

- **Foliar.** Applications to the plants' leaves are an easy way to control weeds with maximum amount of herbicide directed to the target plants and optimum up take by the plants for both herbaceous forbs and grasses.
- **Wiping Applicators.** Wiping applicators (also called rope wicks) rub the concentrated herbicide solution on the plant's leaf and stem surfaces. Because only the weeds tall enough to contact the rubbing surface are affected, n onselective herbicides can be used selectively to release low-growing plants or plants below the treatment height. Drift does not occur with wiping applicators so there is no potential exposure for adjacent crops and gardens.
- **Stem Injection.** Some species, such as knotweeds, have stems of sufficient size that herbicide can be injected directly into the stem. While this is an effective treatment, it is a very labor intensive treatment for treating dense stands. Only some herbicides are labeled for this application method.
- **Stem Injection/Spaced Cuts/Cut Surface/Cut Stump/Basal Bark.** Stem injection, spaced cuts, cut surface, cut stump, and basal bark are treatments often used for controlling tall growing woody plants. As the name implies, herbicide is applied to just the cut surface or the woody stem. The herbicide rate and carrier is adjusted according to the part of the woody plant being treated. Unlike foliar treatments done during the growing season, these treatments can be applied year round. These treatments are particularly effective for large butterfly bush and Scotch broom in excess of 1-2 inches in diameter.

2018 CLALLAM COUNTY-ROADS
Herbicide/Manual Treatment Data Form

Project ID #:

Project Complete? **Y** or **N** (add notes)

Name of Entity/Person for whom Treatment was applied: Clallam County

Street Address: 223 E 4 th St City: Port Angeles State: WA Zip: 98362

Address or Exact Location of Site:

PIN#:

General Activity Fields

County (circle one)	WRIA (circle one)	Project Name (from project list)	Department (circle one)	Workforce**
Clallam	15 16 17 18 19		Roads Parks DCD Other	

**Workforce: County Name, WCC Crew Name, County Weed Board

Crew Members Present:

Site/Inventory Fields

Start Date	Stop Date	acres examined for weeds	Treatment Site (circle one)	**Total Manual Infested Area Treated: (DO NOT lump plants together)**
			Road edge/ROW Park Other	acres

Weeds Treated (Just the PLANTS code is OK)	**Infested Area Treated** (DO NOT lump plants together)	% of area examined for weeds infested with this species (lump plants together – use cover classes 1 - 9 listed below)	**M**anual/**H**erbicide or **S**urvey
	sq ft		
	sq ft		
	sq ft		
	sq ft		
	sq ft		

[7] **Cover Classes: 1** = Trace, **2** = 1 – 3%, **3** = 3 – 5% **4** = 5 – 10%, **5** = 10 – 25%, **6** = 25 – 50%, **7** = 50 – 75%, **8** = 75 –95%, **9** = 95 – 100%
Note: Cover classes are meant to be *approximations only*.

All Licensed Applicators: Name and License # _____

Firm Name: Clallam County Noxious Weed Control Board Phone # 360-417-2442

Firm Address: 223 E 4th St. Suite 15 City: Port Angeles State: WA Zip: 98362

Application Date	Time Start	Time Stop	Temp (F)	Wind Speed (MPH)	Wind Direction	Cloud Cover	Remarks – Weather forecast

Application Area (acre)	Total Volume of Mix Applied (gal)	Diluent	Special comment
		Water	

Product Name	EPA Registration #	Amount of herbicide used (oz)	Herbicide Applied/Acre or other measure	Concentration Applied

Was this application made as a result of a permit? Yes No
If yes, Permit # _____

WA State NPDES Acres:

Notes:

Page 2

Clallam County
Weed Treatment Monitoring

Examiner name:_____

Evaluation Date:_____

Ref #	
Project # and Name	
<u>From "Comments":</u> **Road name with BMP & EMP** **–OR-** **Min and Max Address**	
Date(s) of treatment	
Herbicide or Manual treatment (circle one)	

Weeds Treated (Scientific name or code)	**Infested Area Treated (acres)**	**Cover class from "% area examined for weeds infested with this species"**	**Percent efficacy of treatment (use codes on next page)**

Do you think this treatment area is a high priority for retreatment next year? Yes / No

Please provide comments on the next page, if you have any.

Instructions: All information on page 1 of this datasheet comes from the "Herbicide/Manual Treatment Data Form", except for:

- **Examiner name**
- **Evaluation Date**
- **Percent efficacy of treatment**

For Percent efficacy of treatment, enter the code that best approximates the percent of the population that was eradicated:

Code	% Efficacy	Rating	Description
0	0	No effect	No effect can be detected on the target species population
03	1 – 5	Failure	Little to no effect can be detected on the target species population.
15	6 – 25	Poor	Treatment killed less than a quarter of the target species population.
35	26 – 50	Marginal	Less than half of the target species population was controlled.
65	51 – 75	Fair	Over half of the target species population was controlled.
85	76 – 90	Good	Treatment was successful in killing most of the target species population
95	91 – 99	Excellent	Over 95% of the target species population has been killed with the treatment.
100	100	Complete	Not a single individual of the target species population was found after a complete survey of the site. The infestation was eradicated.
UN	UNK	Unknown	Treatment efficacy/success cannot be determined.

Comments:

Appendix D Sample Press Release and Public Notice

March 1, 20__

PUBLIC NOTICE

Clallam County is beginning the year 20__ Integrated Weed Control program which may include spot treatments of herbicide to control specific noxious weeds and invasive species of special concern along selected portions of county right-of-way. Approximately _____ miles of road are scheduled for treatment this year. Notices indicating which herbicide has been applied, the application date, and the target weed species will be posted onsite. The Integrated Weed Management Plan, which contains information about target weeds, locations, and treatment methods can be viewed online at _____ or contact the county for further information at 360-417-2442.

Property owners who do not wish to have their adjoining right-of-way treated with herbicide have the option of keeping the right-of-way abutting their property weed free by applying for an Owner Will Control Agreement with Clallam County. Forms can be obtained online at _____ or by contacting the county at (360) 417-2442.

NOTICE

The herbicides aminopyralid, glyphosate, imazapyr, triclopyr, or clopyralid will be applied to this site to control noxious weeds, which threaten native vegetation and habitat in this area.

Planned / Actual application date*: _____

*Actual date of application contingent upon weather conditions.

Targeted Noxious Species: _____**

**Other weed species in this area may also be treated at this time.

NO USE RESTRICTIONS ARE IN PLACE

Avoid contact with treated vegetation until after it has dried.

Clallam County Noxious Weed Control Board
Jim Knape, Noxious Weed Control Specialist
223 East Fourth Street, Suite 15
Port Angeles, WA 98362
(360) 417-2000 ext 2703
(360) 999-6734

Appendix F Owner Will Control Packet

Available online at: **http://www.clallam.net/weed/iwmp.html**

OWNER WILL CONTROL APPLICATION

Introduction:

The Noxious Weed Control Board thanks you for your interest regarding the Clallam County Integrated Weed Management Plan and the Owner Will Control opportunity. This packet contains an Owner Will Control Agreement application to be filled out completely and returned to the Noxious Weed board by mail or email. The Agreement releases all noxious weed control responsibility to the agreement holder dependent on Owner's compliance with the County control guidelines.

Owner Will Control Agreement:

The Agreement application must be completely filled out and returned to the Noxious Weed Board at:

Clallam County Noxious Weed Control Board (Or) **OwnerROW@co.clallam.wa.us**
Attn: Roadside Coordinator
223 E 4th St. Suite 15
Port Angeles, WA 98362

Incomplete applications cannot be accepted. The County will return the agreement holder a copy of the completed application at the email or mailing address provided within ten (10) business days of receipt.

It is important to return the application as soon as possible to ensure the county work plan can be modified to honor the application request. Applications will be processed until a May 1st - deadline; after this date sites may have already been treated for this season. If this occurs, the applicant will be notified and may request an application for the following year. The County will email a reminder notice regarding applications for the following year to all current agreement holders.

Control Guidelines:

Appendix A of this document includes best management practices for Owner control methods. The Owner must adhere to the county guidelines for effective control for each designated species found on county right-of-way. Failure to completely remove weeds as stipulated by this agreement will prompt a ten (10) day notice to comply with control guidelines or the Agreement may be terminated.

Native Plant Enhancement Program:

The goal of this program is to create natural, site appropriate plant communities along county road sides. Once weeds are controlled Owners may be eligible for native material and pollinator friendly plants from the County. Please indicate your interest in this program on your application.

OWNER WILL CONTROL AGREEMENT

By entering into this agreement an adjacent property owner (hereinafter referred to as “Owner”) will agree to control noxious weeds and other weeds of concern as described in Appendix A of this agreement on county right-of-way adjacent to property located at:

_____

(Street) (City) (Zip)

The County will send a confirmation email upon receiving a completed application and return a copy of the finalized Owner Will Control Agreement (hereinafter referred to as “Agreement”).

For the purpose of this Agreement, ‘control’ will consist of complete removal of all above ground biomass and as much of the root system as is feasible of weeds listed in your packet, as well as any additional weeds of concern as determined by the County.

If noxious or other weeds of concern are observed on right-of-way adjacent to above named address, County will notify property owner of their presence. Owner will then have ten (10) days to completely remove weeds as required by this Agreement. If Owner fails to control weeds in that timeframe, this Agreement will be terminated and weeds will be controlled as determined by the County, including the use of herbicides.

This Agreement is valid from the date signed by both parties until December 31 of the same year.

If the Owner Will Control Agreement is terminated as described above the Owner may apply to re-enter into a new Owner Will Control Agreement the following calendar year.

*_____ *_____ *_____

Owner Name (Print) (Signature) Date

*_____ *_____

(Owner Email) (Owner Phone #)

Interested in Native Plant Enhancement Program? (circle one) **YES** **NO**

*_____ *_____ *_____

County Representative (Signature) Date

*Required Field

APPENDIX F.1:

Owner will be responsible for the complete control of species listed below in the accordance to the county guidelines.

Species List for Control:

Vegetative Propagation*		***Non-Vegetative Propagation***	
bindweed, field	laurel, spurge	alyssum, hoary	hogweed, giant
blackberry, evergreen	peavine, everlasting	birdsrape mustard	iris, yellow flag
blackberry, Himalayan	ribbon grass	brome, ripgut	knapweed, diffuse
canarygrass, reed	sowthistle, perennial	broom, Scotch	knapweed, meadow
hawkweed, orange	tansy, common	burdock, common	knapweed, spotted
Hawkweed, yellow	thistle, Canada	butterfly bush	loosestrife, purple
knotweed, Bohemian	whitetop, hairy	carrot, wild	nightshade, hairy
knotweed, giant	yellow archangel	cheatgrass or downy brome	old man's beard
knotweed, Japanese	-	chicory	poison hemlock
		cinquefoil, sulfur	tansy, ragwort
		comfrey	teasel, common
		English hawthorn	thistle, bull
		fennel, common	wormwood, absinth
		herb robert	-

*Vegetative Propagation is the ability to reproduce from root and stem fragments. Indicated species must be thoroughly excavated from the ground, collected, and disposed into trash for control.

Control:

Do NOT mow any plants listed for control in table above

Completely remove all above ground biomass and as much of the root system as feasible (care must be taken to ensure proper collection and disposal of waste)

Ensure all flowers and seed heads are cut, bagged and disposed of into trash

Be aware of species listed as *Vegetative Propagation* and dispose of all plant material into trash and NOT compost

Additional control and identification resources can be found online at Clallam County's Noxious Weed page (http://www.clallam.net/Weed/weedinfo2.asp) and the State Weed Board's website (http://www.nwcb.wa.gov/).

Sample Failure to Control Warning
County Logo
223 E Fourth St, Suite 15
Port Angeles, WA 98362

Date

RE: Failure to fulfill 'Owner will Control' agreement

Dear Property Owner,

You entered into an Owner will Control agreement with Clallam County Road Department regarding noxious and invasive weeds on the county roadside adjacent to your property.

Crews were recently in your area and found the roadside adjacent to your property has not been maintained as required by the terms and conditions of the agreement (see enclosed).

You have ten (10) days from date of this letter to control weeds as outlined in the Owner Will Control agreement. If the right-of-way is not adequately maintained as described in the agreement the agreement will be immediately terminated and weeds of concern will be controlled as determined by the County, including by the use of herbicides.

If the Owner will Control agreement is terminated as described above, you may still apply to reenter into an Owner will Control agreement for next calendar year.

If you have any questions, please call _____ at _____

Or email us at:_____

This is the only notice you will receive regarding this matter.

Sincerely,

County Representative
Clallam County Roads Department

Enclosed: Owner Will Control agreement

Appendix G Adopt-a-Patch Permit

The list of potential 2018 "Adopt-a-Patch" locations to be published online once 2018 Work Plan has been adopted. Permits online at: **http://www.clallam.net/weed/iwmp.htm**

Clallam County Public Works Department
223 East Fourth Street, Suite 15 Port Angeles, WA 98362
360- 417-2703 Phone 360-417-2414 Fax

$160 plus all costs beyond public use**
****See C.C.C. 5.100.245 – Fee Schedule 245-A**

PROJECT NO._____
ROAD NAME _____
PERMIT NO. _____
COUNTY USE ONLY

APPLICATION FOR SPECIAL USE OR EVENT ALONG CLALLAM COUNTY RIGHT OF WAY

In Clallam County, a "Right-of-Way" permit is required to work along a county-owned road within the county right of way.

PLEASE PRINT

Name of Applicant:	County Road:
Mailing Address:_____ _____ _____ Phone:_____ Cell Phone:_____ Fax:_____	Address/ Milepost of Project Site: _____ **When the project is approved:** (check one item below) ☐ Mail permit when approved ☐ Call when approved ☐ Fax when approved

USE PROPOSED & PURPOSE

Special Use: _____NOXIOUS WEED CONTROL_____
_____

Name of Event Coordinator:
_____
Start Date _____
End. Date _____

IMPORTANT:

Project Location Description:_____
(Reference "Adopt-A-Patch Site List" for location"

THE EXACT LOCATION OF THE ENTIRE EVENT/USE AREA MUST BE CLEARLY MARKED SO AS TO BE EVIDENT TO COUNTY PERSONNEL. FAILURE TO COMPLY WILL RESULT IN A DELAY OF THE PROCESSING OF THIS PERMIT.
It is the responsibility of the applicant to notify all utilities and private property owners when such property is liable to injury or damage through the performance of the permitted work. The applicant shall make all necessary arrangements relative to the protection of such property and/or utilities.

By signing this permit, the applicant agrees to comply with all conditions as stated on the PERMIT, Form RWPCOND041604, Permit Conditions Addendum and C.C.C. 5.100.245 – Fee Schedule 245-A. Applicant has 10 days from permit approval date to request clarification or modification to permit conditions attached.

Signed_____ Date_____

**********COUNTY USE ONLY**********

PERMISSION IS HEREBY ☐ GRANTED ☐ DENIED
Call 360-417-2703 for the following:
☑ Start Date ☐_____ ☐_____ ☑ Final
The Approved Permit Must be Posted on Site Until Final Inspection.

COMMENTS:_____
_____
_____
_____

FEE CALCULATION
_____
_____
_____
AMT WAIVED:_____
NET FEE:_____
DATE:_____
RECEIPT#_____
CHECK#_____
REC'D BY:_____

This permit shall be void unless the work herein contemplated is completed before the following date:_____

_____
Area Supervisor/Design Review Engineer Date

Final Inspection By: _____
Date:_____

CLALLAM COUNTY "RIGHT-OF-WAY" WEED CONTROL PERMIT
INSTRUCTIONS AND CONDITIONS FOR APPLICANTS

Applicants for permits to occupy County property with utilities, or holders of granted franchise rights contemplating work upon, along, over, under or across any County road, bridge wharf, trestle, public place, street, avenue or alley on property in the County, shall first file with the County Engineer or their designee, their application to do such work.

Applications for controlling noxious weeds on County right-of-ways shall clearly indicate a specific road section under consideration, and must be chosen from a list of available sites which can be viewed on line at http://www.clallam.net/Weed/iwmp.html. The actual location of the work to be done under this permit, and its depth below or above surface or grade of any County structure, road, street, avenue, alley or public place shall be approved by the County Engineer Engineer, his agents or representatives before any work shall be done by the applicant.

The applicant shall specify the species targeted for control and the manner in which the work is to be accomplished. All noxious weed control activites must be conducted in accordance with a method approved by the Noxious Weed Control Board, and must be consistent with the County's Integrated Weed Management plan. Signing, barricades and traffic control in the vicinity of the work shall strictly conform to provisions of "The Manual on Uniform Traffic Control Devices for Streets and Highways." All fees for acquiring this permit when strictly for manual noxious weed control shall be waived.

PERMIT CONDITIONS

1. The petitioner, designated herein as the "'Grantee', his agents, successors, assigns, and volunteers shall have the right and, authority to enter upon the right of way of the County road, street, alley, public place or structure as indicated on the front of this form, for the purpose of doing such work as applied for, and approved by the County Engineer and the Noxious Weed Control Board or their agents or representatives.
2. The location, type of work, materials and equipment used, safeguarding of public traffic during work or after doing same, and mode of operation shall be approved by the Noxious Weed Control Board or the County Engineer prior to start of work and shall be subject to the inspection by the County so as to assure proper compliance with the terms of this permit.
3. The Grantee shall commence work within 30 days after the granting of this permit. If the Grantee has not begun approved weed control work by the date specified on the permit, then the rights herein conferred shall cease and terminate, unless additional time is requested by the grantee and approved by the County.
4. The Grantee shall leave all roads, streets, alleys, public places, and structures after removing noxious weeds, in as good and safe a condition in all respects as same were in before commencement of work by Grantee. In case of any damage to any roads, streets, public places, structures or public property of any kind on account of said work by the Grantee, he will at once repair said damage at his own sole cost and expense.
5. The County Engineer, his agents or representatives may do, order, or have done any and all work considered necessary to restore to a safe condition any street, alley, public place or structure which is in a condition dangerous to a life or property resulting from the grantee's facility or its installation as permitted herein, and upon demand the grantee shall pay to the County all costs of such work and material.
6. All weed control work by the Grantee shall be done in such a manner as will cause the least interference with any of the County's work and shall be subject to the same provisions as stated above. The County shall in no ways be held liable for any damage to the grantee by reason of any such work by the County, its agents or representatives, or by the exercise of any rights by the County upon roads, streets, public places or structures in question. The grantee shall have twenty-four (24) hours written notice by the County Engineer or his representatives or agents of any blasting contiguous to the grantee's permit rights in order that he may protect his interests.
7. This grant or privilege shall not be deemed or held to be an exclusive franchise, nor prohibit the County from granting other permits of franchise rights of like or other nature to other public or private entities, nor shall it prevent the County from using any of its roads, street, public places for any and all public use, or affect its jurisdiction over all or any part of them.
8. All the provisions, conditions, regulation and requirements herein contained shall be binding upon the successors and assigns of the Grantee and all privileges of the grantee shall inure to such successors and assigns as if they were specifically mentioned.
9. The County Engineer, his agents or representatives may revoke, annul or terminate this permit if Grantee fails to comply with any or all of its provisions, requirements or regulations as herein set forth or through willful or unreasonable neglect, fails to heed or comply with notices given him or if the work herein permitted, is not conducted in conformity herewith or at all.
10. The Board of County Commissioners may at any time, change, amend, modify, or terminate any of the conditions herein enumerated so as to conform to any state statute or county regulation pertaining to the public welfare, safety, health, or highway regulations as are, or may hereinafter be enacted, adopted or amended, etc. The Board may terminate this permit if grantee fails to comply with any such changes.
11. In accepting this permit the Grantee agrees to notify and check with all utilities regarding their installations before commencing work, together with private property owners when such property is liable to injury or damage through the performance of such work, and the applicant shall make all necessary arrangements relative to the protection of such property and/or utilities.
12. In accepting this permit the Grantee, his agents, successors, assigns, and/or volunteers , agrees to defend, indemnify, and save harmless the County from all claims, actions or damages of every kind and description which may accrue to or be suffered by any person or persons, corporation or property by reason of the performance of any such work, character of materials used or manner of installation, maintenance and operation or by the improper occupancy of rights of way or public place or public structure, and in case any such suit or action is brought against said County for damages arising out of or by reason of any of the above causes, the the Grantee, his agents, successors, assigns, and volunteers will upon written notice to him or them or commencement of such action defend the same at his or their sole cost and expense and will fully satisfy any judgment after the said suit or action shall have finally been determined if adversely to the County.
13. Underground utility location required prior to start date. "Call Before You Dig" phone number 1-800-424-5555.
14. Applicant/Contractor shall not damage or leave mud or other debris on a County road. Restore all disturbed areas to original condition. Mark all hazards with appropriate safety.
15. All workers and/or flaggers within the right of way shall wear high visibility apparel per the 2009 MUTCD (available online) or subsequent revisions.
16. Traffic control signs are required, and shall conform to the standards specified in the 2009 MUTCD (available online) or subsequent revisions.
17. Must comply with County utility location standards.

FORM RWPCOND082412

Adopt-a-Patch_Permit_2018 12/19/17

PERMIT CONDITIONS – ADDENDUM

RDP

This permit is granted only for manual weed control work within the Clallam County right of way.

- Weed control activities conducted under this permit may only be performed at approved locations as determined by the County Noxious Weed Control Program, a complete list of which is available online at http://www.clallam.net/Weed/iwmp.html.
- The petitioner, hereinafter referred to as "Grantee" must be 18 years or older. A Grantee may be accompanied by up to no more than seven additional individuals, hereinafter known as "Volunteer" or "Assignee". The Grantee is responsible for ensuring each Volunteer/Assignee is at least 18 years old, completes a signed a participant waiver and operates under the conditions of the held permit. An original copy of each waiver must be submitted with the Activity Report.
- If the County discovers the Grantee has not required each Volunteer/Assign to sign a participant waiver or otherwise operate under conditions of the permit, then such failure constitutes a material breach that will allow Clallam County to revoke immediately the issued permit. Additionally, the Grantee agrees to assume responsibility for any individual who seeks to assist the Grantee's efforts under the permit, but who does not sign the requisite participant waiver or otherwise abide by the conditions of the held permit, and whose intentional or negligent acts harms people or property.
- Prior to commencing work, the Grantee and Volunteer/Assignee, shall view the WSDOT roadside safety video (https://www.wsdot.wa.gov/Operations/adoptahwy/video.htm) and review Adopt-A-Patch Safety Tips.
- Traffic control signs shall be set to current standards. All workers and/or flaggers in the right of way shall wear high visibility apparel per the 2009 MUTCD (available online) or subsequent revisions.
- Temporary signs warning traffic of shoulder work shall be erected at the beginning and end of a permitted road segment while work is being conducted.
- No more than two cars may be parked within the permitted area and shall not obstruct traffic. At least two wheels must be off the shoulder.
- Control work shall begin within 30 days of obtaining permit and shall be conducted at least twice during the duration of the permit.
- Only noxious weeds that are listed on the current Noxious Weed List shall be removed.
- Follow weed specific Best Management Practices.
- Invasive plant debris shall be left onsite, but may not be placed within three feet from the ditch or shoulder. Do not create piles.
- With the exception of Scotch broom, all flowers and seeds shall be collected from noxious weeds that are uprooted, and this debris shall be disposed offsite appropriately.
- All vegetated areas disturbed on County road right-of-way may be re-seeded or planted with native plants as available from a list approved by the Noxious Weed Control Board and the Clallam County Road Department.
- All hazards shall be shielded, during working hours, with safety devices to protect the walking and traveling public. All hazards shall be removed by the end of each work day.
- The Grantee shall be responsible for the repair of all located and un-located utilities that are damaged by this project on County road right-of-way.
- Care shall be taken to avoid disturbing existing drainage facilities.
- All tree removal and vegetation control issues in the County right-of-way shall be addressed with the County.
- Notify the Clallam County Road Department or the Noxious Weed Control Board when activity is complete
- Submit a completed Adopt-A-Patch activity report that includes the following information: the number of hours worked to complete the project, the species removed, and the quantity and extent of each species removed. Reports may be submitted as often as desired, but no later than October 31 of each year.

Appendix H Roadside Weed Life Cycle, Growth Form, Category and Status

Common Name	Scientific Name	Life Cycle[1]	Growth Form	Threat	Cate -gory	Status
alyssum, hoary	*Berteroa incana*	A, B, P	Forb	Aggressive invader in fields of forage crops; toxic to horses	1	NCR
bindweed, field	*Convolvulus arvensis*	P	Forb	Seriously interferes with agriculture	1	NR
brome, ripgut	*Bromus rigidus*	A	Grass	Long seed awns cause injury to nose and eyes of grazing animals; known to occur in Clallam County, but not on roadsides; will be treated under EDRR protocol if observed.	1	ISSC
butterfly bush	*Buddleia davidii*	P	shrub	Invades natural areas; dense stands crowd out native vegetation in riparian areas and interfere with natural succession	1	NR
cheatgrass or downy brome	*Bromus tectorum*	A	Grass	Depletes soil moisture in early spring; fire hazard in summer; known to occur in Clallam County, but not on roadsides; will be treated under EDRR protocol if observed.	1	ISSC
chicory	*Cichorium intybus*	P	Forb	Only found in the Dungeness Valley where it is starting to spread	1	ISSC
cinquefoil, sulfur	*Potentilla recta*	P	Forb	Not readily grazed by livestock and wildlife; forms dense stands	1	NCR
comfrey	*Symphytum officinale*	P	Forb	Used medicinally for poultices; liver damage when ingested; can form dense stands; difficult to control once established	1	ISSC
fennel, common*	*Foeniculum vulgare*	P	Forb	Dense stands exclude native vegetation	1	NCR
hawkweed, orange	*Hieracium aurantiacum*	P	Forb	Dense stands exclude other species; bitter and unpalatable, little forage for livestock and wildlife	1	NCR
herb Robert	*Geranium robertianum*	A, B	Forb	Rapid spreading; displaces native herbaceous plants; allelopathic, inhibits the germination of small seeded forbs in forest understory	1	N**
hogweed, giant	*Heracleum mantegazzianum*	B, P	Forb	Skin contact with sap causes severe dermatitis on people and animals	1	NR*
knapweed, diffuse	*Centaurea diffusa*	B, P	Forb	Spreads seed by tumbling; prickly flower heads; unpalatable after early spring	1	NCR*
knapweed, meadow	*Centaurea x moncktonii*	P	Forb	Outcompetes pasture species; degrades wildlife habitat; interferes with agriculture	1	NCR
knapweed, spotted	*Centaurea stoebe*	B	Forb	Allelopathic plant that can inhibit the germination of grasses; forms dense stands that exclude desired plants and wildlife	1	NCR
knotweed, Bohemian	*Polygonum x bohemicum*	P	Subshrub	Easily spreads by disturbance; dense colonies eliminate other plant species and can degrade fish habitat; causes structural damage to human structures	1	NCR
knotweed, giant	*Polygonum sachalinense*	P	Forb	Easily spreads by disturbance; dense colonies eliminate other plant species and can degrade fish habitat; causes structural damage to human structures	1	NCR
knotweed, Japanese	*Polygonum cuspidatum*	P	Subshrub	Easily spreads by disturbance; dense colonies eliminate other plant species and can degrade fish habitat; causes structural damage to human structures	1	NCR
laurel, spurge	*Daphne laureola*	P	Shrub	Toxic to humans and animals; contact with plants can cause dermatitis	1	NR
loosestrife, purple	*Lythrum salicaria*	P	Forb	Dense stands eliminate other plant species; poor palatability; degrades wildlife habitat and hunting and fishing areas.	1	NCR*
old man's beard	*Clematis vitalba*	P	Forb - vine	Climbing growth smothers other plants, even trees	1	NR
poison hemlock	*Conium maculatum*	B	Forb	Highly toxic to humans and animals; all parts of the plant are toxic; severe birth defects	1	NCR
ribbon grass	*Phalaris*	P	Grass	Aggressive invader displaces other plants in wet	1	NR

Common Name	Scientific Name	Life Cycle[1]	Growth Form	Threat	Cate -gory	Status
	arundinacea			sites; an ornamental form of reed canarygrass		
tansy ragwort	*Senecio jacobaea*	B	Forb	Poisonous to horses, cattle, and pigs; animals grazing tansy can produce tainted milk, may result in potentially toxic residue in honey	1	NCR
tansy, common	*Tanacetum vulgare*	P	Forb	Dense stands degrade forage value; toxicity issues for humans and livestock	1	NR
teasel, common	*Dipsacus fullonum*	B	Forb	Forms dense stands of prickly, unpalatable plants; degrades habitat and reduces accessibility	1	NR
whitetop, hairy	*Lepidium appelianum*	P	Forb	Monocultures displace desirable plants; unpalatable; can be form toxic to cattle	1	NR
wormwood, absinth	*Artemisia absinthium*	P	Shrub	Aggressive invader, will outcompete desirable forbs and grasses in pastures, fields and native grasslands; plants have a strong bitter taste and odor, may affect milk quality	1	NR
blackberry, evergreen	*Rubus laciniatus*	P	Subshrub	Dense canopies crowd out native species; impenetrable barrier	2	NW
blackberry, Himalayan	*Rubus armeniacus*	P	Shrub	Dense canopies crowd out native species; impenetrable barrier	2	NW
broom, Scotch	*Cytisus scoparius*	P	Shrub	Forms dense stands; unpalatable; interferes with forest regeneration; fire hazard; scent can exacerbate human grass allergies; seeds are toxic to horses and livestock	2	NW
burdock, common	*Arctium lappa*	B	Forb	Forms large rosettes; hooked spines on seeds become entangled in fur of animals	2	WR
canarygrass, reed	*Phalaris arundinacea*	P	grass	Unpalatable unless young, forms dense stands that crowd out native plants; especially difficult to control; serious wetland invader; can stop the process of succession in riparian sites, impedes tree seedling establishment	2	NW
carrot, wild	*Daucus carota*	B	Forb	Damages agricultural commodity as it may cross pollinates with domestic carrot, seriously degrading the quality of commercial carrot seed production	2	NW
iris, yellow flag	*Iris pseudacorus*	P	Forb	Toxic to humans and animals; displaces vegetation at wet margins of ditches, ponds, and lakes; plant resins can cause skin irritation in humans	2	NR
peavine, everlasting	*Lathyrus latifolius*,	P	Forb - vine	Forms dense thickets; seeds can be toxic to livestock; seriously interferes with forest regeneration where it invades from edges of timber units	2	ISSC
thistle, bull	*Cirsium vulgare*	B	Forb	Aggressive competitor, unpalatable for cattle	2	NW
thistle, Canada	*Cirsium arvense*	P	Forb	Aggressive competitor, unpalatable; decreases forage; host species for several agricultural pests	2	NW
bindweed, hedge	*Calystegia sepium*	P	Forb - vine		3	WW
buttercup, creeping	*Ranunculus repens*	P	Forb		3	WW
catsear, common	*Hypochaeris radicata*	P	Forb	Crowds out palatable forage species	3	NW
clover (several)	*Trifolium spp.*	P	Forb		3	WW
daisy, oxeye	*Leucanthemum vulgare*	P	Forb	Livestock avoid grazing; milk from dairy cows has unpleasant flavor	3	NW
dandelion, common	*Taraxacum officinale*	P	Forb		3	WW
horsetail	*Equisetum*	P	Forb	Large quantities poisonous to livestock	3	WW
orchard grass	*Dactylis glomerata*	P	Grass		3	WW
St Johnswort, common	*Hypericum perforatum*	P	Forb	Causes photo-sensitization when grazed; toxic at all stages of growth	3	NW

[1]A - annual; B - biennial; P - perennial

ISSC = **I**nvasive **S**pecies of **S**pecial **C**oncern, **NCR** = **N**oxious, **C**ontrol **R**equired**,** **NR** = **N**oxious**,** **R**are **NW** = **N**oxious, **W**idespread
WR = **W**eedy**,** **R**are, **WW** = **W**eedy**,** **W**idesprea

Appendix I Historical Survey Data For Known Roadside Weed Locations

The following table contains known roadside weed locations based on 2015 surveys of approximately 250 of 528 miles of the county road system. It does not include most Category 2 weeds unless they were part of the Thistle-Scotch Broom Demonstration Focus Area (approximately Dungeness Valley, see 2017 IWM Work Plan for details), or found to be locally limited during the survey (Table 9).

Min Address - the first location a weed was recorded on the associated road, based on information from the county's GIS system.
Max Address - the farthest address at which a weed infestation was noted.
Miles - the length of road where weed infestations were documented, not the total length surveyed.
 # Patches - the number of times an infestation was noted in the associated road segment.

The infestation area is noted in both square feet and the equivalent acres. These cells are blank where no information was recorded. Summaries for each road are **bolded**.

Table 14. All roadside weed locations in approximately 250 miles of roads surveyed in 2015.

Road	Weed	Min Address	Max Address	Miles	Area (ft^2)	Area (acres)	# Patches
Atterberry Road	Field bindweed	1080	2099	1.0	180	0.00413	1
	Meadow knapweed	2100	2159	0.2	2	0.00005	3
	Spotted knapweed	2340	2779	0.4			1
Summary		**1080**	**2779**	**2.0**	**182**	**0.00418**	**5**
Barker Road	Poison hemlock	**60**	**159**	**0.04**			**1**
Black Diamond Road	Herb Robert	2440	4419	2.0	500	0.01148	2
	Meadow knapweed	1	519	1.9	642	0.01474	13
Summary		**1**	**4419**	**3.9**	**1142**	**0.02622**	**15**
Blue Mountain Road	Common tansy	5540	6159	0.6			1
	Herb Robert	4000	4509	0.5	500	0.01148	2
	Meadow knapweed	590	1469	0.6	167	0.00383	13
	Spotted knapweed	590	1469	0.9	50	0.00115	1
	Tansy ragwort	310	479	0.8	16	0.00037	5
Summary		**310**	**4509**	**1.9**	**683**	**0.01568**	**22**
Business Park Loop	Poison hemlock	170	409	0.2	12	0.00028	1
	Spotted knapweed	1	169	0.2	521	0.01196	10
Summary		**1**	**409**	**0.4**	**533**	**0.01224**	**11**
Cameron Road	Tansy ragwort	1	119	0.1	45	0.00103	1
	Canada thistle	140	759	0.6			2
Summary		**1**	**759**	**0.7**	**45**	**0.00103**	**2**
Carlsborg Road	Canada thistle	1410	1519	0.2			3
	Scotch broom	1	109	0.2	45	0.00103	3
	Spotted knapweed	110	179	0.1	59	0.00135	11
Summary		**1**	**1519**	**0.5**	**104**	**0.00239**	**17**

Road	Weed	Min Address	Max Address	Miles	Area (ft^2)	Area (acres)	# Patches
Cat Lake Road	Tansy ragwort	**1**	**1259**	**1.2**	**8**	**0.00018**	**2**
Cays Road	Bohemian knotweed	2400	2519	0.1	90	0.00207	2
	Canada thistle	1	519	0.5			3
	Scotch broom	1	519	0.5			1
	Scotch broom	1400	1709	0.3			1
Summary		**1**	**2519**	**0.9**	**90**	**0.00207**	
Charley Creek Road	Bohemian knotweed	**1**	**769**	**0.8**	**100**	**0.00230**	**3**
Chicken Coop Road	Bohemian knotweed	1	369	0.4	0	0	1
	Tansy ragwort	370	1519	0.6	264	0.00606	5
Summary		**1**	**1519**	**1.0**	**264**	**0.00606**	**6**
Cook Road	Canada thistle	**1**	**259**	**0.3**			1
Corriea Road	Poison hemlock	**250**	**849**	**0.6**	**800**	**0.01837**	1
Dan Kelly Road	Bohemian knotweed	1250	3179	1.9	200	0.00459	1
	Tansy ragwort	1	669	0.7	6	0.00014	1
Summary		**1**	**3179**	**2.6**	**206**	**0.00473**	**2**
Deer Park Road	Herb Robert	4820	8739	3.9	1600	0.03673	1
	Scotch broom	4820	8739	3.9	1600	0.03673	2
	Tansy ragwort	250	369	2.3	481	0.01104	12
Summary		**250**	**8739**	**6.2**	**3681**	**0.08450**	**15**
Diamond Point Road	Tansy ragwort	**1**	**519**	**0.9**	**220**	**0.00505**	**8**
Discovery View Drive	Tansy ragwort	**240**	**449**	**0.1**			**2**
E East Beach Road	Meadow knapweed	1	119	0.2	13201	0.30305	17
	Scotch broom	1	119	0.1			1
Summary		**1**	**119**	**0.2**	**13201**	**0.30305**	**18**
E East Lyre River Road	Herb Robert	1	619	0.6	309	0.00709	3
	Meadow knapweed	1	619	0.6	1746	0.04008	14
	Tansy ragwort	1	619	0.6	30	0.00069	1
Summary		**1**	**619**	**0.6**	**2085**	**0.04787**	**18**
E East Sequim Bay Road	Tansy ragwort	**1**	**779**	**0.8**			3
Easterly Road	Meadow knapweed	**1**	**449**	**0.4**	**0**	**0**	**1**
E Runnion Road	Scotch broom	1	259	0.3	9	0.00021	1
	Spotted knapweed	1	259	0.2	1500	0.03444	2
Summary		**1**	**259**	**0.2**	**1509**	**0.03464**	**3**
Eden Valley Road	Fuller's teasel	1	289	0.8	202	0.00464	3
	Herb Robert	290	1389	0.9	120	0.00275	1
	Tansy ragwort	1	289	0.4	30	0.00069	1
Summary		**1**	**1389**	**1.7**	**352**	**0.00808**	**5**
Elwha River Road	Meadow knapweed	**100**	**749**	**0.4**	**13**	**0.00030**	**3**
Farrington Road	Meadow knapweed	670	899	0.3	250	0.00574	3

Road	Weed	Min Address	Max Address	Miles	Area (ft^2)	Area (acres)	# Patches
	Tansy ragwort	1	669	0.5	1604	0.03682	4
Summary		**1**	**669**	**0.8**	**1854**	**0.04256**	**7**
Fisher Cove Road	Meadow knapweed	1	659	0.3	1675	0.03845	12
	Scotch broom	1	659	0.6			1
Summary		**1**	**659**	**0.6**	**1675**	**0.03845**	**13**
Finn Hall Road	Bull thistle	300	1259	0.8			8
	Canada thistle	1	259	0.6			11
Summary		**1**	**1259**	**1.4**			**19**
Fleming Drive	Tansy ragwort	**90**	**319**	**0.2**	**34**	**0.00078**	**4**
Gasman Road	Tansy ragwort	**430**	**549**	**0.1**	**2**	**0.00005**	**2**
Gehrke Road	Canada thistle	1	349	0.3			2
	Scotch broom	1	349	0.3			1
Summary		**1**	**349**	**0.3**			**3**
Glass Road	Bohemian knotweed	**1190**	**2209**	**1.0**			**1**
Gossett Road	Meadow knapweed	**1**	**529**	**0.5**	**172**	**0.00395**	**5**
Gunn Road	Scotch broom	**1**	**119**	**0.1**			**1**
Happy Valley Road	Fuller's teasel	3100	3349	0.2	1400	0.03214	3
	Meadow knapweed	400	819	0.4	42341	0.97202	22
	Scotch broom	4730	5199	0.5	3000	0.06887	1
	Spotted knapweed	2270	2669	0.2	1374	0.03154	13
	Tansy ragwort	2970	3099	0.1	2	0.00005	1
Summary		**400**	**5199**	**1.3**	**48117**	**1.10461**	**40**
Heckle Road	Herb Robert	1	219	0.2	30	0.00069	1
	Scotch broom	1	219	0.2	16	0.00037	4
Summary		**1**	**219**	**0.2**	**46**	**0.00106**	**5**
Henry Boyd Road	Bohemian knotweed	**330**	**439**	**0.1**	**750**	**0.01722**	**1**
Heuhslein Road	Bull thistle	260	639	0.5			5
	Canada thistle	1	259	0.4			9
Summary		**1**	**259**	0.4			**14**
Hoko-Ozette Road	Bohemian knotweed	**1**	**9199**	**9.2**	**300**	**0.00689**	**1**
Hooker Road	Poison hemlock	**140**	**249**	**0.1**	**0**	**0**	**1**
Jamestown Road	Poison hemlock	**1**	**239**	**0.2**	**0**	**0**	**1**
Jimmy Come Lately Road	Meadow knapweed	**1**	**459**	**0.5**	**20**	**0.00046**	**2**
John Jacobs Road	Spotted knapweed	**1**	**679**	**0.7**	**0**	**0**	**1**
Johnson Creek Road	Meadow knapweed	1	269	0.3	4801	0.11022	5
	Yellow archangel	270	1639	0.8			1
Summary		**1**	**1639**	**1.1**	**4801**	**0.11022**	**6**
Kirner Road	Spotted knapweed	**250**	**379**	**0.1**	**4**	**0.00009**	**1**
Kitchen-Dick Road	Bull thistle	1270	1479	0.5			2

Road	Weed	Min Address	Max Address	Miles	Area (ft^2)	Area (acres)	# Patches
	Canada thistle	840	1269	0.6			6
	Fuller's teasel	480	749	0.4	298	0.00684	7
	Meadow knapweed	350	479	0.1	1	0.00002	1
	Scotch broom	1480	2229	0.8			1
	Spotted knapweed	480	749	0.3	153	0.00351	3
Summary		**350**	**1479**	**2.4**	**452**	**0.01038**	**20**
Laird Road	Meadow knapweed	**170**	**659**	**0.3**	**109**	**0.00250**	**5**
Lake Aldwell Road	Meadow knapweed	**1**	**639**	**0.6**	**400**	**0.00918**	**1**
Lake Dawn Road	Orange hawkweed	**1**	**309**	**0.3**	**200**	**0.00459**	**1**
Lewis Road	Bull thistle	500	589	0.2			4
	Canada thistle	350	499	0.2			4
	Scotch broom	890	1059	0.2			1
Summary		**350**	**1029**	**0.6**			**9**
Little River Road	Meadow knapweed	**1**	**3319**	**3.1**	**13575**	**0.31164**	**48**
Lost Mountain Road	Fuller's teasel	3290	4289	1.0	1000	0.02296	1
	Meadow knapweed	1690	2459	0.8	1000	0.02296	2
Summary		**1690**	**4289**	**1.8**	**2000**	**0.04591**	**3**
Lotzgesell Road	Spotted knapweed	**1**	**189**	**0.2**			**1**
Louella Road	Tansy ragwort	**290**	**609**	**0.3**	**20**	**0.00046**	**3**
Lower Elwha Road	Meadow knapweed	1	419	0.3	72	0.00165	6
	Tansy ragwort	1500	1639	0.2	5	0.00011	2
Summary		**1**	**1639**	**0.5**	**77**	**0.00177**	**8**
Lupine Drive	Tansy ragwort	**1**	**439**	**0.4**	**20**	**0.00046**	**2**
Macleay Road	Bull thistle	1	259	0.3			1
	Canada thistle	1	259	0.3			2
Summary		**1**	**259**	**0.3**			**3**
Madrona Way	Tansy ragwort	**1**	**169**	**0.2**	**38**	**0.00087**	**3**
Manzanita Drive	Tansy ragwort	**390**	**569**	**0.2**			**1**
Matson Road	Bull thistle	1	249	0.2			1
	Canada thistle	1	249	0.2			6
	Scotch broom	250	499	0.3			1
Summary		**1**	**499**	**0.5**			**8**
Medsker Road	Yellow archangel	**1**	**509**	**0.5**			**1**
Mount Baker Drive	Meadow knapweed	1	379	0.3			1
	Poison hemlock	1	379	0.3			1
Summary		**1**	**379**	**0.3**			**2**
N Barr Road	Canada thistle	**950**	**1079**	**0.2**			**3**
O'Brien Road	Meadow knapweed	1280	1409	0.1	400	0.00918	1
	Sulfur cinquefoil	1280	1409	0.1	200	0.00459	1

Road	Weed	Min Address	Max Address	Miles	Area (ft^2)	Area (acres)	# Patches
	Tansy ragwort	160	409	0.3	25	0.00057	1
Summary		**160**	**1409**	**0.4**	**625**	**0.01435**	**3**
Old Black Diamond Road	Tansy ragwort	**1**	**269**	**0.2**			**1**
Old Blyn Highway	Tansy ragwort	**2240**	**2539**	**0.3**			**1**
Old Olympic Highway	Bull thistle	2760	2939	0.4			7
	Canada thistle	920	1499	0.5			13
	Field bindweed	4510	5009	0.5	250	0.00574	1
	Meadow knapweed	4510	5009	0.5	13	0.00030	2
	Scotch broom	5770	6269	0.4			3
	Spotted knapweed	5010	5519	0.3	5	0.00011	2
Summary		**920**	**6269**	**2.6**	**268**	**0.00615**	**28**
Olympic Hot Springs Road	Herb Robert	1	239	0.2	200	0.00459	1
	Meadow knapweed	1	239	2.6	23621	0.54226	24
Summary		**1**	**239**	**2.6**	**23821**	**0.54685**	**25**
Palo Alto Road	Fuller's teasel	1590	2159	0.6	1	0.00002	1
	Herb Robert	4490	6479	2.0	90	0.00207	1
	Meadow knapweed	1590	2159	1.5	1573	0.03611	35
	Tansy ragwort	1590	2159	1.1	1883	0.04323	41
Summary		**1590**	**6479**	**3.5**	**3547**	**0.08143**	**78**
Panorama Boulevard	Tansy ragwort	**1**	**169**	**0.2**	**24**	**0.00055**	**2**
Port Williams Road	Tansy ragwort	**278**	**509**	**0.5**	**1**	**0.00002**	**2**
Rhododendron Drive	Tansy ragwort	**600**	**799**	**0.2**	**0**	**0**	**1**
River Road	Meadow knapweed	360	429	0.3	24971	0.57326	7
	Spotted knapweed	360	429	0.3	1685	0.03868	9
Summary		**360**	**429**	**0.3**	**26656**	**0.61194**	**16**
Salal Way	Tansy ragwort	**40**	**329**	**0.3**	**0**	**0**	**1**
Sequim-Dungeness Way	Common fennel	4610	4659	0.1	9	0.00021	1
	Fuller's teasel	4090	4139	0.1	301	0.00691	2
	Meadow knapweed	2260	2509	0.3	0	0	1
	Spotted knapweed	1510	1709	0.2	590	0.01354	3
	Tansy ragwort	3890	4089	0.2	300	0.00689	1
Summary		**1510**	**4659**	**0.6**	**1200**	**0.02755**	**8**
Sherwood Road	Tansy ragwort	**1**	**289**	**0.3**	**266**	**0.00611**	**5**
Shore Road	Bull thistle	670	919	0.2	0	0	1
	Canada thistle	540	609	0.1			3
Summary		**540**	**919**	**0.4**			**4**
Slab Camp Road	Meadow knapweed	1	679	0.7	25	0.00057	1
	Scotch broom	1	679	0.7	500	0.01148	1
	Tansy ragwort	1	679	0.7	4	0.00009	1

Road	Weed	Min Address	Max Address	Miles	Area (ft^2)	Area (acres)	# Patches
Summary		**1**	**679**	**0.7**	**529**	**0.01214**	**3**
S Airport Road	Tansy ragwort	**4000**	**4399**	**0.2**			**3**
S Bean Road	Meadow knapweed	**3750**	**3799**	**0.1**	**176**	**0.00404**	**3**
S Doss Road	Tansy ragwort	**4300**	**5030**	**0.5**	**415**	**0.00953**	**6**
S Mount Angeles Road	Meadow knapweed	4800	5619	0.6	1	0.00002	1
	Tansy ragwort	4300	4730	0.4	16	0.00037	2
Summary		**4300**	**4730**	**1.0**	**17**	**0.00039**	**3**
S South Shore Road	Orange Hawkweed	**1370**	**1519**	**0.2**	**0**	**0**	**3**
Spring Road	Bull thistle	1	29	0.3			2
	Canada thistle	30	559	0.5			2
Summary		**1**	**559**	**0.8**			**4**
Sunshine Avenue	Tansy ragwort	**350**	**429**	**0.1**	**20**	**0.00046**	**1**
Sunshine Plaza	Tansy ragwort	**1**	**129**	**0.1**	**50**	**0.00115**	**1**
Taylor Cut-Off Road	Butterfly Bush	810	1319	0.5	310	0.00712	4
	Poison hemlock	810	1319	0.3	0	0	2
	Tansy ragwort	1740	1919	0.2	4	0.00009	1
Summary		**810**	**1919**	**0.7**	**314**	**0.00721**	**7**
Taylor Ranch Road	Tansy ragwort	**1**	**529**	**0.5**	**90**	**0.00207**	**5**
Thompson Road	Tansy ragwort	**190**	**1299**	**1.1**	**0**	**0**	**2**
Township Line Road	Meadow knapweed	**640**	**729**	**0.1**	**200**	**0.00459**	**1**
TRIPP Road	Orange Hawkweed	**1**	**259**	**0.2**	**500**	**0.01148**	**1**
Turnstone Lane	Spotted knapweed	**180**	**689**	**0.5**			**2**
Vautier Road	Canada thistle	1	279	0.3			2
	Scotch broom	1	279	0.3			1
	Spotted knapweed	510	639	0.1			1
Summary		**1**	**639**	**0.4**			**4**
Vista View Drive	Poison hemlock	**1**	**229**	**0.2**	**150**	**0.00344**	**1**
Ward Road	Yellow Archangel	**420**	**589**	**0.2**			**1**
W Anderson Road	Field bindweed	**1**	**249**	**0.2**	**400**	**0.00918**	**1**
W Edgewood Drive	Meadow knapweed	2100	2299	0.4	3950	0.09068	24
	Tansy ragwort	2100	2299	0.3			1
Summary		**2100**	**2299**	**0.4**	**3950**	**0.09068**	**25**
W Lauridsen Boulevard	Meadow knapweed	**1240**	**1361**	**0.4**	**3511**	**0.08060**	**7**
West Street	Tansy ragwort	**140**	**159**	**0.0**	**75**	**0.00172**	**1**
W Washington Street	Spotted knapweed	**1500**	**1699**	**0.3**			**4**
W West Lake Pleasant Road	Bohemian knotweed	440	629	3.6	4870	0.11180	9
	Herb Robert	630	4729	4.0			1
	Yellow Flag Iris	630	4729	4.0	80	0.00184	2

Road	Weed	Min Address	Max Address	Miles	Area (ft^2)	Area (acres)	# Patches
Summary		**440**	**4729**	**7.7**	**4950**	**0.11364**	**12**
W West Lyre River Road	Meadow knapweed	**1**	**319**	**0.3**	**8102**	**0.18600**	**20**
W West Sequim Bay Road	Spotted knapweed	1410	1989	0.3	3	0.00007	3
	Tansy ragwort	1410	1989	0.3	1	0.00002	1
Summary		**1410**	**1989**	**0.3**	**4**	**0.00009**	**4**
Whiskey Creek Beach Road	Herb Robert	1	459	0.5	120	0.00275	1
	Meadow knapweed	1	459	0.5	180	0.00413	1
	Tansy ragwort	1	459	0.3	815	0.01871	7
	Yellow flag iris	1	459	0.5	80	0.00184	1
Summary		**1**	**459**	**0.5**	**1195**	**0.02743**	**10**
Wild Currant Way	Scotch broom	**1**	**99**	**0.1**			**1**
Woodcock Road	Bull thistle	1	339	0.2			5
	Canada thistle	340	759	0.3			14
	Meadow knapweed	1950	2269	0.3	1	0.00002	2
	Poison hemlock	1250	1639	0.3	1480	0.03398	5
	Scotch broom	340	759	0.3			4
Summary		**1**	**2269**	**1.1**	**1481**	**0.03400**	**30**
Woods Road	Chicory	1	2839	2.9	400	0.00918	1
	Herb Robert	1	2839	2.9	1420	0.03260	3
	Meadow knapweed	1	2839	2.9	20	0.00046	1
	Tansy ragwort	1	2839	2.9	2928	0.06722	25
Summary		**1**	**2839**	**2.9**	**4768**	**0.10946**	**30**
Grand Summary				**94.7**	**186,619**	**4.28418**	**793**

Appendix J References

Noxious weed list

2018 Washington State Noxious Weed List. Washington State Noxious Weed Control Board. https://www.nwcb.wa.gov/pdfs/2018-State-Weed-List_Common_Name-8.5x11.pdf

2018 Washington State Noxious Weed List. Washington State Noxious Weed Control Board. https://www.nwcb.wa.gov/pdfs/2018-State-Weed-List_Scientific_Name-8.5x11.pdf

2017 Clallam County Noxious Weed List Supplement. http://www.clallam.net/weed/doc/ClallamWeedList2017_000.pdf

Pictures of Class A Noxious Weeds. Washington State Noxious Weed Control Board https://www.nwcb.wa.gov/class-a-noxious-weeds

Pictures of Class B Noxious Weeds. Washington State Noxious Weed Control Board https://www.nwcb.wa.gov/class-b-noxious-weeds

Pictures of Class C Noxious Weeds. Washington State Noxious Weed Control Board. https://www.nwcb.wa.gov/class-c-noxious-weeds

Pictures of noxious weeds of Washington. Washington State Noxious Weed Control Board. Monitor list https://www.nwcb.wa.gov/noxious-weed-monitor-list

Pictures of noxious weeds of Washington. Washington State Noxious Weed Control Board. Quarantine list. https://www.nwcb.wa.gov/noxious-weed-quarantine-list

Noxious Weeds and Other Common Plants found in Clallam County. http://www.clallam.net/weed/weedinfo2.asp

Publications of the Washington State Noxious Weed Control Board. http://www.nwcb.wa.gov/nwcb_publications.htm

Literature

Bramble, W.C., W.R. Byrnes, and R.J. Hutnik. 1987. Development of plant cover diversity on an electric transmission right-of-way. pg. 89-93. In: Byrnes, W.R. and H.A. Holt (eds). Proceeding, Fourth Symposium on Environmental Concerns in Right-of-Way Management. Indianapolis, IN. Dept. Forestry & Nat. Res., Purdue University, W. Lafayette, IN. 595 pp.

Bramble, W.C., R.H. Yahner, and W.R. Byrnes. 1999. Effect of herbicide maintenance of an electric transmission line right-of-way on butterfly populations. Jour. Arboriculture 25(6):302-310.

Cal-IPC. 2015. Best Management Practices for Wildland Stewardship: Protecting Wildlife When Using Herbicides for Invasive Plant Management. Cal-IPC Publication 2015-1. California Invasive Plant Council, Berkeley, CA. Available: www.cal-ipc.org

Colquhoun, J. 2003. Pacific Northwest's least wanted list: Invasive weed identification and management. EC 1563, Oregon State University, Corvallis. 44 pp.

DiTomaso, J.M., G.B. Kyser et al. 2013. Weed control in natural areas in the western United States. Weed Research and Information Center, University of California, Davis. 544 pp.

Harper-Lore, B.L., M. Johnson, and W.F. Ostrum. 2013 Vegetation Management: An Ecoregional Approach. US DOT, Fed. Highway Admin. 239 pg.

Harper-Lore, B.L., M. Johnson, and M.W. Skinner (editors). 2007. Roadside weed management.FHWA-HEP-07-017, Fed. Highway Admin., US Dept. Transportation. 369 pp.

Hill, K. and R. Horner. 2005. Assessment of alternatives in roadside vegetation management. Final Research Report, Washington State Transportation Center, University of Washington, Seattle. Agreement T2695, Task 67. http://www.wsdot.wa.gov/NR/rdonlyres/0CB59701-542E-4DF2-B8C8-1ACA3CB72172/0/FinalUWReport.pdf

Holt, H.A., R.L. McKenzie, F. Whitford, H.L. Hipkins, J. DiTomaso, R. Dickens, J. Orr, G. Blase, P. Northcutt, and J. McKenzie. 2002. Model Certification Manual for Right-of-Way Pesticide Applicators. http://www.agriculture.purdue.edu/pesp/rowmanual/

Hopwood, J. et.al. 2015. Literature review: Pollinator habitat enhancement and best management practice in highway rights-of-way. Fed. Highway Admin. https://www.environment.fhwa.dot.gov/ecosystems/documents/pollinators_BMPs_in_highway_ROW.pdf

Hutchings, J., J.P. Rutan, J. Gollen, K. Mankle, and L. Baldwin. 2015. Whatcom County Integrated Vegetation Management Plan. http://www.co.whatcom.wa.us/DocumentCenter/Home/View/11074

Kitsap County Noxious Control Weed Board. 2015. City of Bremerton Integrated Vegetation Management Plan. 75 pg. http://www.ci.bremerton.wa.us/DocumentCenter/View/2277

Miller, T. W., C. Lucero. 2014. Meadow knapweed *(Centauria debeauxii)* Response to Herbicide and Mechanical Control. Invasive Plant Science and Management 2014 7:503-510.Monaco, T.J., S.C. Weller and F.M. Ashton. 2002. Weed Science Principles and Practices, 4th Edition. John Wiley & Sons, Inc., New York. 671 pg.

National Archive and Records Administration: Federal Register Volume 78, No 192, Thursday October 3, 2013/ Rules and Regulations. Endangered and Threatened Wildlife and Plants ; Designation of Critical Habitat for Taylor's Checkerspot butterfly and Streaked Horned Lark.

Panter, K.E., M.H. Ralphs et.al. 2011. Plants poisonous to livestock in the western states. USDA, Agri. Bull. No. 415. 107 pp.

Pimentel, P, S. McNair et al. 2001. Economic and environmental threats of alien plant, animal, and microbe invasions. Agriculture, Ecosystems and Environment 84 (2001) 1–20

Prather, T. 2015. Section V. Non-cropland and right-of-way. In: Peachey, Ed (editor). Pacific Northwest Weed Management Handbook. Oregon State University, Corvallis. p. V-1-V-10.

Prather, T., T. Miller, and A. Hulting. 2015. Section W: Control of problem weeds. In: Peachey, Ed (editor). Pacific Northwest Weed Management Handbook. Oregon State University, Corvallis. p. W-1-W-44.

Shaner, D.L., I. Burke et al. (editors). 2014. Herbicide Handbook, 10th Edition. Weed Science Society of America, Lawrence, KS. 513 pg.

Tu, M, C. Hurd and J.M. Randall. 2001. Weed Control Methods Handbook. The Nature Conservancy. (http://www.invasive.org/gist/products/handbook/methods-handbook.pdf)

USDA Forest Service. 2005. Pacific Northwest Region Invasive Plant Program, Final Impact Statement Vol. I 173 pp, Vol. III Appendix B-S.

USDA Forest Service. 2015. Pacific Northwest Research Station, Herbicides an unexpected alley for native plants in the war against invasive species. Science Findings: Issue 176: 1-2.

USDA Pesticide-Use Risk Assessments - http://www.fs.fed.us/foresthealth/pesticide/risk.shtml

USDA Risk Assessment Worksheets - http://www.fs.fed.us/foresthealth/pesticide/worksheets.shtml

USDI BLM. 2007. Final Vegetation Treatments Using Herbicides Programmatic Environmental Impact Statement. BLM PEIS 2007: http://www.blm.gov/wo/st/en/prog/more/veg_eis.html

USDI BLM. 2015. Draft programmatic environmental impact statement for vegetation treatments using aminopyralid, fluroxypyr, and rimsulfuron on Bureau of Land Management lands in 17 western states.http://www.blm.gov/style/medialib/blm/wo/Planning_and_Renewable_Resources/vegeis.Par.79259.File.dat/Report%20Cover%20Biological%20Assessment%20for%20Vegetation%20using%20Three%20Herbicides.pdf

USDT Federal Highway Administration. 2005. The Nature of Roadsides and the Tools to Work with It. FHWA Pub. No. FHWA-EP-03-005.

USDT Federal Highway Administration. 2016. Pollinators and Roadsides:Best Management Practices for Managers and Decision Makers. Available: https://www.environment.fhwa.dot.gov/ecosystems/Pollinators_Roadsides/BMPs_pollinators_roadsides.asp

Washington Natural Heritage Program. Geographic information system. Rare plants and high quality ecosystems. Wnhp data set July 2015.

Washington State Department of Transportation. Undated. Aminopyralid, Roadside Vegetation Management Herbicide Fact Sheet. 4 pg. http://www.wsdot.wa.gov/NR/rdonlyres/CD6D91AC-D382-4E5D-AF1E-50C52C34484F/0/Aminopyralid.pdf

Washington State Department of Transportation. 2003. 2,4-D, Roadside Vegetation Management Herbicide Fact Sheet. 4 pg. http://www.wsdot.wa.gov/NR/rdonlyres/C6CBCC5B-64F8-4017-A209-9C6116EB36DB/0/2_4D.pdf

Washington State Department of Transportation. 2006. Clopyralid, Roadside Vegetation Management Herbicide Fact Sheet. 4 pg. http://www.wsdot.wa.gov/NR/rdonlyres/C3ECE3F9-BFCF-432D-ACB2-6C716BB8FADC/0/Clopyralid.pdf

Washington State Department of Transportation. 2006. Glyphosate, Roadside Vegetation Management Herbicide Fact Sheet. 4 pg. http://www.wsdot.wa.gov/NR/rdonlyres/A72C98BF-88CD-4BAA-9B0F-5BB709A0C564/0/glyphosate.pdf

Washington State Department of Transportation. 2006. Imazapyr, Roadside Vegetation Management Herbicide Fact Sheet. 4 pg. http://www.wsdot.wa.gov/NR/rdonlyres/C8EB1611-2699-48FB-B5B8-161D1223BC92/0/imazapyr.pdf

Washington State Department of Transportation. 2006. Triclopyr, Roadside Vegetation Management Herbicide Fact Sheet. 4 pg. http://www.wsdot.wa.gov/NR/rdonlyres/DC50D1A8-3711-4B5F-BF12-05912616A486/0/triclopyr.pdf

Washington State Department of Transportation. 2013. Chapter 6, Roadside Management. Washington State Department of Transportation Maintenance Manual M 51-01.05. 34 pg. http://www.wsdot.wa.gov/publications/manuals/fulltext/M51-01/Chapter6.pdf

Washington State Department of Transportation. 2014. Northwest Region, Area 1 Integrated Roadside Vegetation Management Plan. http://www.wsdot.wa.gov/NR/rdonlyres/586B5B84-EB29-45E1-AA6E-EC620BB3CD55/0/NWarea1_2014combined.pdf

Washington State Department of Transportation. 2014. Olympic Region, Area 3 Integrated Roadside Vegetation Management Plan. http://www.wsdot.wa.gov/NR/rdonlyres/315D3EA0-A71F-44D5-92F4-8F494182BD68/0/OLarea3_IVMplan2014combined.pdf

Washington State Department of Transportation. 2014. Southwest Region, Area 3 Integrated Roadside Vegetation Management Plan. http://www.wsdot.wa.gov/NR/rdonlyres/28AD03A3-7994-4A84-8602-1B14AC68264F/0/SWarea3_2014combined.pdf

Westbrook, R.G. 1998. Invasive plants, changing the landscape of America: Fact book. Federal Interagency Committee for the Management of Noxious and Exotic Weeds (FICMNEW), Washington, DC. 109 pp.

Whitson, T.D., L.C. Burrill et al. 2006. Weeds of the West. 9th ed. Western Society of Weed Science, Las Cruces, NM. 628 pp.

Xerces Society. Pollinator-Conservation-Roadsides http://www.xerces.org/pollinator-conservation-roadsides/

Yahner, R.H. and R.J. Hutnik. 2005. Plant species richness on an electric transmission right-of-way using integrated vegetation management. Jour. Arboriculture 31(3):124-130.