

# **WILDFIRE HAZARD REDUCTION PLAN FOR PORT ORFORD'S DRINKING WATER SOURCE AREA**

## **Gorse Infestation Management**



**Prepared for:  
City of Port Orford**

**Prepared by:  
Erin Minster  
Curry Soil and Water Conservation District  
January, 2023**



# TABLE OF CONTENTS

<b>EXECUTIVE SUMMARY .....</b>	<b>5</b>
KEY RECOMMENDATIONS.....	5
<b>PURPOSE .....</b>	<b>5</b>
<b>BACKGROUND.....</b>	<b>5</b>
Introduction .....	7
<b>OBJECTIVES .....</b>	<b>11</b>
Reduce Nonpoint Source Contaminants.....	11
Reduce Wildfire Risk .....	11
Reduce Gorse Density.....	11
Prevent Gorse Spread.....	11
Restore Native Forest .....	12
<b>STRATEGIES .....</b>	<b>12</b>
Active Strategic Control of gorse .....	12
Education and Outreach to DWSA Landowners.....	12
Management Capacity and Funding .....	13
Land Acquisition.....	14
<b>ACTIONS .....</b>	<b>14</b>
Shade.....	16
Prevention.....	16
Treatment Tools.....	16
City .....	21
Sorenson Parcel: 134 acres.....	22

Wilson Parcel: 153 acres.....	24
Other City Ownership .....	24
Monitoring City Ownership .....	24
Private .....	25
Non-herbicide approach.....	25
Herbicide approach .....	26

<b>REFERENCES.....</b>	<b>28</b>
------------------------	-----------

<b>APPENDIX A .....</b>	<b>30</b>
-------------------------	-----------

Grant Opportunities.....	30
Oregon Health Authority (OHA) .....	30
Department of Environmental Quality (DEQ) .....	30
United States Department of Agriculture.....	30
Oregon Department of Agriculture .....	31
Private Foundations .....	31

## Acknowledgements

This plan was written for the City of Port Orford with funding from the Oregon Health Authority and Business Oregon. Additionally, support was provided by the Port Orford Watershed Council.

Special Thanks goes to;

City of Port Orford: Jessica Ginsburg and former staff David Johnson and Terri Richards

Port Orford Watershed Council: Linda Tarr and former chair Jeff Smith

Port Orford Rural Fire Protection District: Gary Anderson and Mari Lochhaas

Wild Rivers Land Trust: Max Beeken

Business Oregon: Tawni Bean and Heather Stevens

Oregon DEQ: Julie Harvey, Laura Johnson, and former staff Jacqueline Fern

# EXECUTIVE SUMMARY

Port Orford's municipal drinking water is sourced from a small reservoir in the nearby North Fork Hubbard Creek watershed. Owing to the past history of logging and subsequent infestation of invasive gorse, active management of gorse on a portion of lands in this drinking water source area (DWSA) is critical to reduce wildfire related risks that could impair the city's capacity to supply high quality drinking water by compounding the existing sediment and turbidity issues.

## KEY RECOMMENDATIONS

To reduce the risk of wildfire that could impair Port Orford's drinking water supply, it's recommended that the city:

- *Actively reduce gorse density and spread on city-owned DWSA lands and restore to shaded forest cover.*
- *Provide education and outreach to private landowners in the DWSA about the importance of reducing gorse plus viable approaches to control it.*
- *Develop capacity to carry out ongoing, active gorse and forest management.*
- *Acquire lands to better control management of gorse and healthy forest cover.*

More detailed background and recommendations about gorse control management strategies and techniques are contained within the following plan.

## PURPOSE

The purpose of this document is to present a strategic approach that directly addresses nonpoint source water quality issues described in [Oregon's Nonpoint Source Pollution Management Program Plan](#) including soil erosion, sediment, excess nutrients and turbidity by reducing the risk of high-intensity fire through treatment and control of gorse infestation within the City of Port Orford's Hubbard Creek Drinking Water Source Area.

## BACKGROUND

The City of Port Orford's drinking water is supplied by an intake on the North Fork of Hubbard Creek. The drinking water source area covers 629 acres starting at the intake ~1 mile upstream of Highway 101 and extending north to the watershed divide with Elk River and coastal streams to the west. Almost the entire DWSA is outside of the City's municipal jurisdiction with a little less than half being within the Urban Growth Boundary where parcels are zoned 2-acre rural residential. The remainder is split between rural residential 5 to 10-acre and forestry-grazing. A Source Water Assessment was conducted in 2000 by the Oregon Department of Environmental Quality (DEQ) with an update prepared in 2016 and a revision to the

Drinking Water Source Area Erosion Potential map conducted in 2019. Following the 2000 assessment the City worked proactively to acquire land within the DWSA. As of this the writing of this plan the City owns 5 parcels covering 250 acres in the heart of the DWSA with plans to acquire an additional 154 acres that was previously slated for logging.

Fire, especially high-intensity fire, quickly strips the land of vegetation exposing soils thus increasing the potential not only for high erosion rates but also for establishment of noxious weeds that bring about a different set of management and resource challenges. The 2019 soil erosion potential was calculated using three methods that incorporated soil survey data and other environmental factors like rainfall and slope. Those analyses show that all of the lands within the DWSA are at risk of increased erosion due to soil surface disturbance. For lands with less than 30% slope and site conditions of greater than 75% exposed soil lacking both plant roots and conservation practices to reduce or control erosion, the erosion potential is moderate to very high. On forested lands subjected to extensive ground disturbance (50%-75% soil surface disturbance), the erosion potential is moderate to severe. The North Fork Hubbard Creek drainage is also subject to moderate to high landslide susceptibility with numerous mapped earth and rock flows. The reservoir at the DWSA intake has been plagued by high sedimentation and turbidity issues. With increased soil erosion, there is the potential for increased non-point source contaminate loading in surface waters.

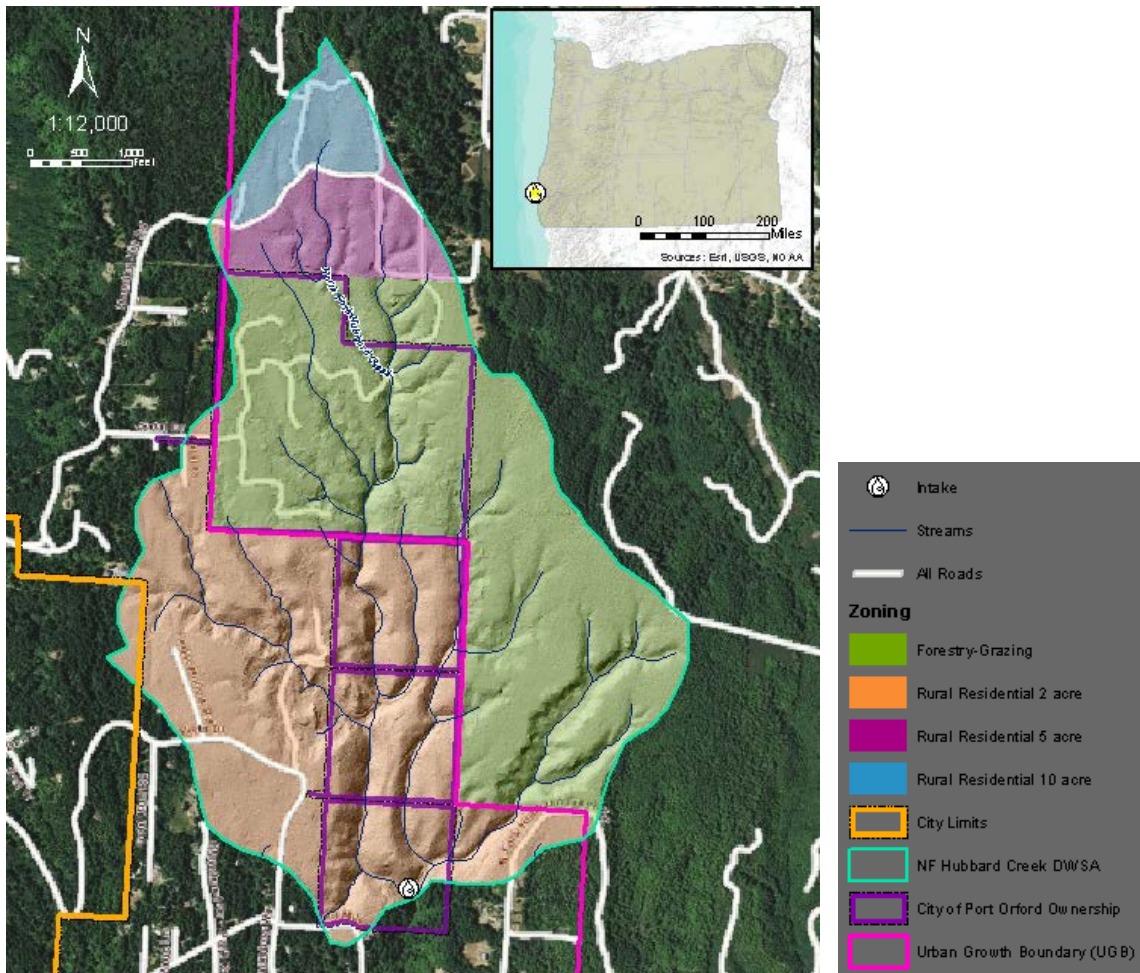


Figure 1: DWSA showing zoning and City ownership. Base map is 2021 LIDAR derived hillshade model and 2014 Gorse Action Group imagery.

## INTRODUCTION

Gorse (*Ulex europaeus*) is a highly invasive, non-native shrub that aggressively colonizes disturbed ground. It is listed as an Oregon State Class B Noxious weed and is a top priority for control by the Curry County Weed Control District. Gorse was intentionally introduced on the southern Oregon coast in the late 1800s and is now rated one of the top 100 worst invasive species worldwide and is estimate to have infested 28,000 acres in Oregon with the bulk being in Northern Curry and Southern Coos Counties. The presence of gorse has negatively impacted the regional economy and, due to its flammable nature, has created a serious public safety concern. In 1936, gorse played a key role in the complete burning of the town of Bandon, OR.

Gorse has been found to have a high level of volatile oils making it highly flammable when green, and it produces large amounts of duff and biomass that once ignited create a fast moving, high-intensity flame front that can be difficult control. Additionally, gorse seeds are known to last 30-70 years in the soil and can remain dormant until disturbed such as by fire or ground disturbance. If gorse infestation is

left unchecked, these two characteristics taken together present a long-term hazard with the risk of increased erosion within the DWSA following a gorse fueled fire that can strip the land bare.



*Figure 2: Gorse seeds are a long-term consideration as seed banking in the soil contributes greatly to the continued infestation of resource lands.*

Gorse infestation as it relates to wildfire risk is identified in both the current Curry County Community Wildfire Protection Plan (CWPP) and the draft Curry County Multi-Jurisdictional Natural Hazards Mitigation Plan. Through the course of creating the 2008 CWPP members of the Curry Wildfire Preparation Team (CWPT) realized the shared responsibility of addressing gorse on the landscape and the need to collaborate so they formed what is now known as the Gorse Action Group.

The Gorse Action Group (GAG) is an informal group of participants including federal and state agencies, non-profit organizations, private industry, and landowners. The GAG is working to control and reduce the spread of gorse, minimize the impact of gorse on our economy and natural resources, and provide a successful process to share with others facing gorse infestations. Members of the GAG have created containment zones where gorse infestation is heavy within the core containment areas. Control of gorse in these areas tends to be done only when there are strategic reasons along with financial willingness to take on the task. Outside of those areas,

gorse infestation is more sporadic with a higher degree of success likely relative to the cost of management. EDRR (Early Detection and Rapid Response) and prevention are key strategies outside of the containment areas.

The Port Orford DWSA lies within a core containment area where large areas are heavily infested and drawing a line around populations is difficult as the plant is nearly ubiquitous within the containment area. However, at the site-specific level there are breaks in the infestation and strategic control is possible especially near the margins of the containment. Much of the lower Elk River watershed which bounds the DWSA to the north is heavily infested with gorse. Beginning in 2020, the Curry Watersheds Partnership began landscape scale efforts to manage gorse on private lands in the heavily infested areas of Elk River. Additionally, private lands in the northern portions of the DWSA were and continue to be included in the efforts. It is this connection to large mature gorse stands adjacent to and within the DWSA that present the risk of a high-intensity fire impacting the vegetation in the DWSA, subsequently exposing soils and increasing the likelihood of non-point source impacts to water quality.

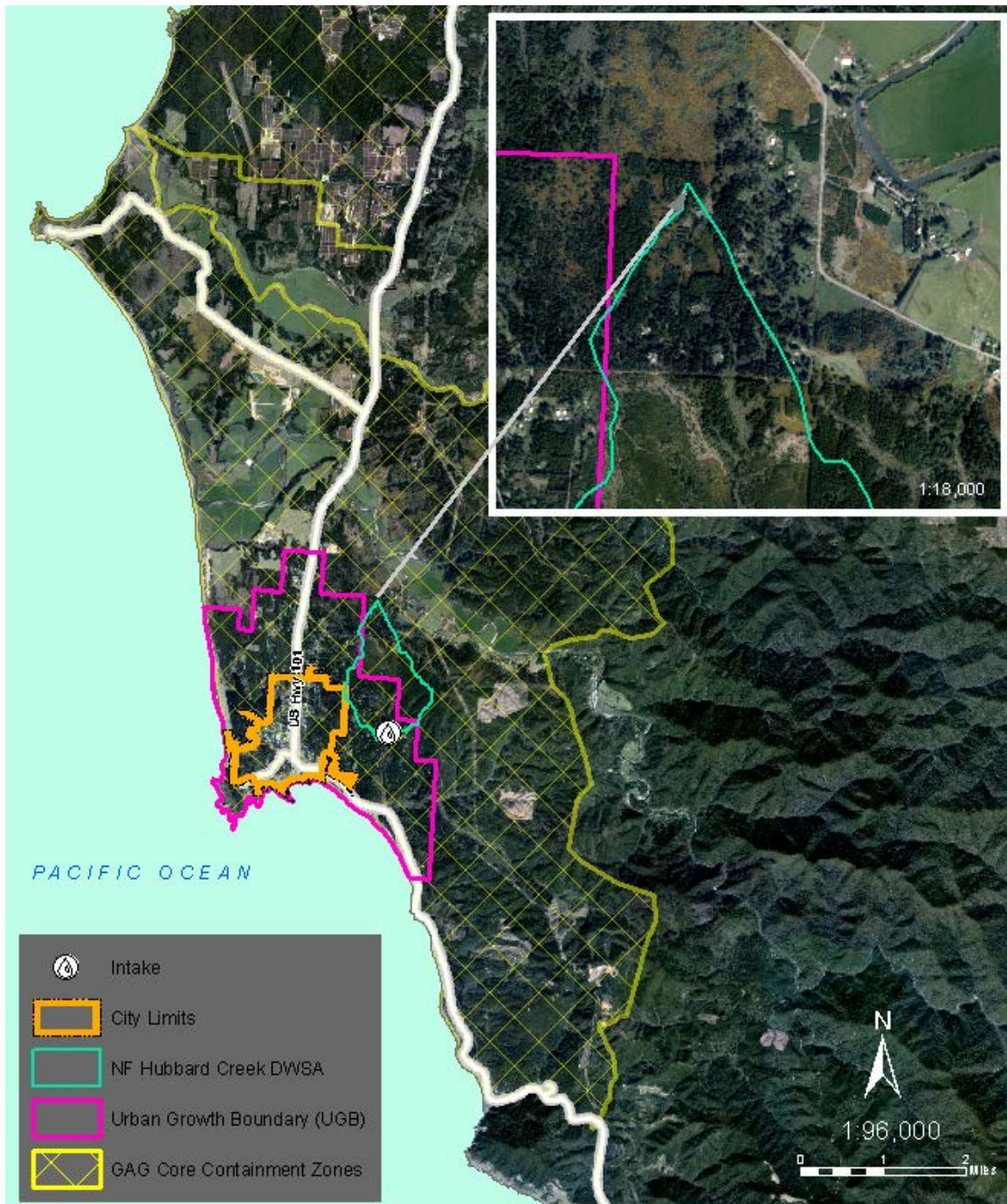


Figure 3: DWSA relative to GAG Elk-Sixes Core Containment zone. Base map is 2014 GAG imagery taken during gorse bloom. Note the large yellow patches to the north of the DWSA within the Elk River watershed.

One other potential source of drinking water contamination that could come from allowing gorse to colonize the entire watershed is excess nitrate in the drinking water supply due to nitrogen loss through leaching into the groundwater table. Nitrate is a soil nutrient, is water soluble, and moves through the soil following rainfall or irrigation. In general, leaching is higher in sandy or well drained soils, like those

found across the DWSA. Excess nitrogen not used by existing vegetation can leach into groundwater. Drinking water standards set the acceptable limit for nitrate at 10 ppm. Nitrate in slowing moving waters such as the reservoir at the DWSA intake can also drive aquatic vegetation growth leading to a cascade of outcomes related to eutrophication such as harmful algal blooms (HAB's) and dead zones.

Study of eutrophic lakes in New Zealand have shown that mature gorse stands have a much higher nitrogen loss signature than pine forests and undifferentiated native scrub cover. Gorse is a legume that has a nitrogen fixing rhizobium creating nitrate in the soil. This suggests that monocultures of mature gorse are fixing more nitrate than native forest cover. While nitrate hasn't been a big concern in the DWSA, likely due to the existing tree and riparian cover, allowing gorse to remain, spread, or to be destroyed all at once in a high-intensity fire would substantially increase the likelihood of excess nitrate in the watershed. The higher the rainfall, the more likely leaching will occur. Death of many acres of gorse via fire, leaving no remaining vegetation, would likely cause a spike in nitrogen loss over a short duration with potential to accumulate in the groundwater table.

## OBJECTIVES

### REDUCE NONPOINT SOURCE CONTAMINANTS

- *Manage vegetation to protect soils shown to have an elevated potential for soil erosion due to land use activities.*
- *Reduce potential for nitrogen loss from mature gorse stands.*

### REDUCE WILDFIRE RISK

- *Reduce gorse biomass and replace with native fire-tolerant species.*
- *Minimize wildfire ignition sources within the DWSA.*

### REDUCE GORSE DENSITY

- *Control gorse monoculture.*
- *Stop seed banking in the soil.*
- *Eradicate individual and shade weakened gorse.*
- *Convert acres to forest or productive land use.*

### PREVENT GORSE SPREAD

- *Control mature gorse to prevent spread.*
- *Raise awareness for effective EDRR.*

## RESTORE NATIVE FOREST

- *Protect the DWSA by converting gorse into native forest.*

## STRATEGIES

The following are strategies the City can use to take a broad approach to reducing gorse infestation within the DWSA. These strategies describe City driven actions as well as ways for the City to encourage and support private landowners in the DWSA to consider adopting integrated gorse control methods that result in protection of the shared drinking water source.

### ACTIVE STRATEGIC CONTROL OF GORSE

If left unchecked gorse will spread on its own and through human activity. Successful gorse control is achieved through long-term treatment that is adaptive and strategic. In general, prevention of new infestation should be the priority when it comes to treatment resources. EDRR of new plants outside of previously infested areas is a key practice of invasive species management. EDRR is particularly important as new gorse seedlings can start producing seeds after only 2 years of growth. Once seeds drop, the task and cost of controlling the site increases exponentially.

Priority for gorse control should be given to small outlier patches, generally less than  $\frac{1}{4}$  acre, found outside the larger heavily infested areas. The key to successful long-term gorse control is to only manage what you have the resources to manage. Treatment without follow up can exacerbate the situation. That's why having a plan and the monetary resources to follow through is important.

### EDUCATION AND OUTREACH TO DWSA LANDOWNERS

The City doesn't have jurisdiction to regulate actions private landowners within the DWSA take on their land, but they can reach out as a neighbor and provide education to the private landowners on the importance of gorse control, including how to use Integrated Pest Management (IPM) practices to reduce as much as practical the amount and times herbicide is used.

Herbicide application is a nuanced endeavor and when possible, landowners should hire licensed pesticide applicators. There are numerous laws in addition to the herbicide label, which is considered law, regarding herbicide use in Oregon. Landowners should be encouraged to seek technical assistance from the following sources prior to beginning gorse control.

- **Gorse Action Group**
- **Oregon Department of Agriculture**
- **Curry Watersheds Partnership**
  - **Curry County Weed Control District**
  - **Curry Soil and Water Conservation District (SWCD)**
- **National Pesticide Information Center**
- **Oregon Department of Forestry**

The Gorse Action Group maintains a website with continually updated information specific to understanding gorse control in our local area. Partners can assist landowners with technical assistance.

Other actions that the City can take to assist their neighbor landowners with understanding effective gorse control and the safe use of herbicides include the following:

- *Host or participate in an herbicide cost share program . This would be a program where the City or other host offers specific herbicides to treat specific noxious weeds at a reduced cost to the landowner. This type of program usually is accompanied by a safety and BMP class as a requirement of participation. This is an opportunity to ensure landowners know how to safely use the least amount of the proper herbicide at the right time to get the job done*
- *Encourage Integrated Pest Management practices for gorse control.*
- *Host educational workshops to help landowners in the DWSA and surrounding areas understand all of the tools available and how to integrate them into a workable gorse control plan.*
- *Provide copies of this plan to landowners to educate them on the connection between gorse control, non-point source risk reduction and drinking water quality.*
- *Attend GAG meetings to ensure working knowledge of gorse management along with partnership and funding opportunities.*

## **MANAGEMENT CAPACITY AND FUNDING**

One of the biggest challenges to addressing gorse infestation is the long-term nature of control efforts. Capacity and funding to implement on-going control to reduce the risk of non-point source pollution over the long term takes commitment and often partnership with other entities. The City can use the following instruments to increase capacity for success: each has a utility that used strategically can reduce administrative effort, expand financial constraints, and create a “culture” of programmatic approach to gorse control.

- ***Intergovernmental Agreements (IGA)***

These can be a useful way to leverage local capacity and expertise to assist the City with management activities. IGA's are agreements between two or more public agencies that seek to foster efficiency and economy by promoting the use of existing resources. This type of agreement can be utilized with local governments such as Curry SWCD or local fire districts to leverage expertise and implementation.

- ***Master Service Agreements***

This is a procurement approach common to vegetation management that the City could use to retain the workforce needed to manage gorse. The idea is to look at all the vegetation management services needed and structure contracts in a way that creates a foundation for future work. They are a way to layout in a master contract all of the basic tenets of that work or service, but allow for modifications as circumstances of specific work orders change.

- ***Fuels Reduction Funding***

Recent large fires have brought an increase in Federal and State funding for fuels reduction work. Numerous grants exist and new avenues are actively forming to bring this funding to Curry County.

- ***Capacity and Implementation Grants***

Other grant funds can be used to bring capacity to the City for gorse control. Appendix A is a list of current and established grants that could be utilized.

## **LAND ACQUISITION**

Acquiring lands within the DWSA and managing them for healthy forests is the best way to minimize non-point source pollution from soil erosion. The City has made numerous efforts in this regard, and continuing to look for those opportunities is smart. City ownership with proper stewardship can take the unknown out of future land use and help ensure protection of mature forest that does the work of protecting water quality and preventing the establishment of gorse.

## **ACTIONS**

This section is dedicated to outlining several ways that Integrated Pest Management (IPM) practices can help the City and private DWSA landowners both manage gorse and reduce the risk of herbicide contamination in the DWSA. While avoiding herbicide use would be the preferred approach within the DWSA its use in gorse control is far more cost-effective, efficient, and successful than non-herbicide approaches. That

said, no matter the tools used, the goal should be establishing vegetation that can out compete gorse seedlings either through shade or competition, and to prevent disturbance once established. At a minimum cutting mature plants to prevent seed set should be a high priority. Below are presented several paths that can be taken to address gorse on the various landownerships and uses that exist in the DWSA.

The first step to a successful gorse treatment plan is to identify what you are trying to reclaim. This will help with adaptive management decisions and will inform which treatment actions to use.

### SELECTING THE RIGHT METHODS FOR YOUR CIRCUMSTANCE AND VISION

- Small lot, around home or vacant
- Pasture or range ground
- Wooded area
- Productive timber ground
- Right-of-Way
- Native habitat
- Dunes
- Bluffs or slopes
- Marginal lands



The city has already identified in its Forest Management Plan (FMP), Hubbard Creek Watershed Forest Resources Stewardship Plan, that its final vision for this land is to grow mature forest to help ensure high water quality. Private landowners in the watershed may have different goals for their land use.

Once it is determined what the final land use will be in an area the first action will depend on the type and degree of infestation. In general, sites with mature, contiguous gorse will need to have the biomass reduced prior to taking additional actions. Once the mature plants are managed, a second round of focus should be on seed sprouts, which will begin to emerge 1-2 years following removal of mature plants. Seedlings can be expected to be heavy for the first 3-5 years following initial action, but low-level sprouting can persist for many years.

The following tools and techniques are explained for their utility along with any associated considerations or challenges their use presents. With any activity involving ground disturbance, even minor, cultural resources should be considered and the appropriate entity consulted. In general, the more intense the treatment caused disturbance, the greater likelihood of encountering and possible damage to cultural resources.

## SHADE

Shade should always be considered regardless of the other treatment methods integrated in the control plan. Maximizing shade from desirable species (even grass and forage) will both help prevent gorse growth and complements the need for vegetative cover to prevent non-point source impacts from soil erosion, especially in DWSA's with elevated soil erosion potential.

## PREVENTION

Prevention is the best approach for controlling gorse spread. Regardless of the approach or tools used good hygiene is paramount. Insist that contractors bring clean equipment to work areas especially when they are not already infested. Work in areas with least infestation towards areas with the heaviest infestation when practical, and always wash equipment on site after working in infested areas. Always monitor disturbed areas for sprouts 1-2 years after disturbance, and treat immediately to prevent additional seed banking in the soil.

In the case that resources or time is limited an effort to cut flowers to prevent seed set is a helpful action to prevent seed banking thus reducing the long-term potential of re-infestation.

## TREATMENT TOOLS



Figure 4: Skidsteer with mulching forestry head mower.

***Mow/Mulching:*** Mowing with a forestry mulching head is a good way to reduce mature gorse stands. A mulching head is needed rather than a flail or blade type head. Requesting that the operator increase the number of passes such that the material is reduced to small pieces greatly increases the effectiveness of this treatment. Ideally, the majority of the mulch is reduced to pieces smaller than 3 inches thus creating both a workable surface and a more even spread such that seed sprout is suppressed. The mulch also protects the soil from increased erosion preventing non-point source contamination.

***Manual:*** Mulching or cutting individual small plants with hand tools, weed eaters, and lawn equipment can be useful to reduce biomass and to prevent seeding. However, gorse will adapt its growth to grow prostrate if repeated mowing occurs at short intervals. If trying to exhaust the plant to death, leaving time between mastication treatments keeps the plant growing vertical and helps use up the energy stored in the root system. As with most plants continued, sustained removal of the green portions can over time kill the plant via exhaustion. This method is best used where there are scattered gorse plants within a matrix of native or desired species.

***Dozing/Scalping/Scrapping:*** Using heavy equipment to push gorse into piles along with topsoil and all existing vegetation is not advised. Exposing the soil in this manner increases the likelihood of non-point source impact from soil erosion, eliminates any natural competition to gorse seed sprout, and in general reduces soil productivity. Additionally, this produces piles mixed with soil and gorse stems. There is anecdotal evidence that cut gorse stems can resprout under the right conditions. This has been seen with large diameter stems left in wet, heavy shade microclimates. Burial in a slash pile could provide the same opportunity to re-root and continue to grow.

***Plucking/Pulling:*** This treatment type comes in two varieties, manual and mechanical. Manual would be hand pulling, digging with shovels, and/or using a tool such as a weed wrench. Mechanical would be accomplished with heavy equipment using a hydraulic thumb or other similar mechanism to pull the plants up. This can produce large piles of biomass which then require burning or other means of treatment to reduce. Leaving piles is also an option, however care should be taken: if piles are too big or left in wet, heavy shade, there is potential for the pieces to re-sprout.

***Mechanical:*** This form of this treatment is not advised for some of the same reasons as indicated above for scalping. The amount of soil disturbance and resulting extreme seed sprout makes this method counterproductive in many cases.

***Manual:*** Hand pulling is best used where the infestation is only a few plants, for small seedlings, or generally where there is more than 65% cover of native or

desired species relative to the gorse plants. Care should be taken to replace any disturbed duff to further suppress seed sprout. The Bradley Method of Eliminating Exotic Plants from Natural Reserves outlines a deliberate approach that is shown to be successful under the appropriate conditions. It can be very difficult to pull gorse plants, even seedlings, and to get all of the roots, which will resprout if left in the ground. This method is recommended where appropriate especially when it can be sustained by determined individuals.

#### Basic Concepts of Bradley Method

- *Prevent Deterioration of Good Areas*
- *Improve the Next Best*
- *Hold the Advantage Gained*
- *Cautiously Move into the Really Bad Areas*



Figure 5: Gorse sprout showing first leaves (cotyledon)

**Herbicide:** Proper herbicide use is both required by law and essential for successful treatment. Using the right herbicide at the right time with the appropriate technique can help reduce or eliminate off-site impacts. This is especially important within a DWSA. The brand of herbicide used will determine appropriate setbacks from waterways both for drinking water and aquatic species protection. Always consult the label before application.

Products containing the active ingredient triclopyr have been shown locally to be the best treatment option. It is recommended that any herbicide application be done by a licensed applicator with the applicable license type. The GAG has several handouts that address general prescriptions for herbicide application on gorse. The following is an overview of the methods of application.

**Foliar spot spraying:** This is a targeted method where a low concentration mix is used and applied only to the target species, gorse. Equipment consists of backpack sprayers or truck/ATV mounted sprayers with a hand-held wand. The key to successful application is to cover all portions of the stems and branches. Gorse plants have an ability to shut off portions of their vascular system such that a complete kill is only achieved if the entire surface is covered with the herbicide. It should be wet but not dripping. Additionally, a surfactant should be used to allow the herbicide mix

to penetrate the waxy modified leaves, spikes, and the crevices inherent in the plants physiology.

*Cut-stump*: This method is highly targeted and highly effective when done properly. A concentrated herbicide mix is applied to the stump of the plant immediately following the cutting. Depending on the herbicide used and location the mix can be up to 100% concentrated, but the overall volume is low as it is only applied to the cut gorse stump. As shown in the photo below the herbicide need not be applied to the whole surface either. Instead, only the outer portions where the cambium layer is needs to be treated.



*Figure 6: Blue dye shows where herbicide has been properly applied to the cambium on the stump surface.*

This method is best where the plants are old and haven't been repeatedly mowed previously. A hand crew uses saws to cut and pile the gorse while simultaneously spraying herbicide on the stump. Application needs to occur within a minute of cutting for maximum effectiveness as the plant will exude resins to seal off the wound preventing uptake of the herbicide.

*Broadcast/aerial application*: This type of application is the least targeted and may not give good results especially considering the potential for surface water contamination. It is not recommended within the DWSA. This application method is usually conducted with a large truck mounted boom or aerial mounted boom. Drift, or off-target application, is high with boom sprayers. Additional setback from the drinking water intake is also needed with this method.

**Grass seed:** Grass seed is a valuable tool for reducing seed sprout and density following other treatment actions. Seeding following the mulching of mature stands is highly recommended in the fall when rainfall is enough to sustain germination and establishment of the grass. If sowing on gorse mulch, rates of 30-40lbs per/acre are recommended due to the uneven surface. If herbicide will be used on the site, using just triclopyr based herbicides will not injure the grass allowing for a degree of shade competition as the grass gets taller in addition to the space competition.

**Tillage:** Disking is a tillage practice that has been used on agricultural lands following mowing that breaks up the roots and soil surface. Local practice has shown this very effective at killing mature gorse roots without the use of herbicide. It seems that it can also bury the seed bank enough that seed sprout is reduced. This does however, expose the entire soil surface and follow up seeding will be necessary to negate the erosion potential. This treatment should only be considered on small areas not adjacent to streams and where pasture is the desired land condition.

**Grazing:** Intensive grazing with livestock such as goats and sheep can help control gorse seedlings in a non-herbicide management plan. However, the grazing needs to be intensive as normal set stock rotations tend to lead to prostrate gorse growth interspersed with manicured gorse 'trees'. The plants are only palatable for a limited time before the modified leaves become stiff enough that most animals stop browsing. Care needs to be taken that overgrazing and soil damage doesn't occur as well.

**Urea:** Urea is a source of nitrogen in fertilizers and has use as a weed control compound. Gorse is a legume that fixes nitrogen in the soil. Local experience suggests that the addition of urea around established gorse plants has little to no effect. While seedlings may become burnt, the use of nitrogen-based products is not recommended within the DWSA as it can contribute to non-point source nitrogen contamination in the drinking water supply.

**Tree/shrub planting:** Shade is the main natural enemy of gorse. However, the shade needs to be almost complete, 100% coverage, for the plants to die. When planning for restoration, it is recommended to wait until year 2-3 of the gorse control effort before planting desirable species. Few species can out-grow gorse without maintenance to keep the gorse in check. If the intention is not to integrate plantings with herbicide treatments then plan to space trees such that mowing and mulching activities can continue to be done in a cost-effective manner.

**Biocontrol:** The Oregon Department of Agriculture maintains a biocontrol program that has produced three approved agents to date. The most recent, Gorse thrip, was first released in 2020 and has been found to be at least surviving at release locations. The previous two agents, seed weevil and spider mite, are widespread at times, but both are preyed on by other native predatory insects. Even when populations increase neither has been considered very effective although the seed weevil can reduce seed production by up to 50%. A fourth unapproved agent, gorse tip moth, has been observed in southern Coos County, and its damage to new growth appears to have stifled bloom and subsequent seed set.

Biocontrol alone will not impede gorse but should be included as an integrated management method where the cost or other considerations make more aggressive treatment actions not feasible.


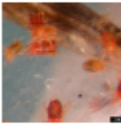


	<b>Gorse Seed Weevil</b> <i>Exapion ulicis</i> (= <i>Apion</i> ) <b>Target Weed(s):</b> Gorse	GORSE	<b>Gorse, Unapproved Agents</b>
	<b>Gorse Spider Mite</b> <i>Tetranychus lintearius</i> <b>Target Weed(s):</b> Gorse		<div style="display: flex; justify-content: space-between;"> <div data-bbox="841 772 1101 1037"> <p><i>Agonopterix nervosa</i> (Haworth) (Lepidoptera: Oecophoridae)</p> <p><b>DESCRIPTION AND LIFE CYCLE:</b>            Larvae emerge in early spring and feed on feed in lightly spun tubes of plant material on shoot tips of gorse and Scotch broom. Larvae vary in color from yellowish-gray to brown and can be up to 15 mm long. Adults are typically 10-15 mm long with variable coloring. Typical adults have white or yellowish wings with gray to brown small mottling, sometimes appearing as stripes on wing veins. Adults appear in early summer and are present throughout the growing season, sometimes overwintering. There is one generation per year.</p> </div> <div data-bbox="1110 785 1334 932"></div> </div> <p><small>© Donald Hobern, Canberra, Australia</small></p>
	<b>Gorse thrip</b> <i>Sericothrips staphylinus</i> <b>Target Weed(s):</b> Gorse		<p><b>HISTORY AND CURRENT STATUS:</b> Accidental introduction recorded on gorse in BC, Canada by 1915. Spread to the USA in the 1920s. Attacks both Scotch broom and gorse in CA, NV, OR, WA (USA), though is more effective on gorse. May stunt shoots and reduce seed production, but overall impact is limited. Populations are heavily parasitized. Abundance and impact on gorse in BC are unknown. <b>Not approved for redistribution in the USA.</b></p>

Figure 7: On left ODA approved agents, and on right the unapproved agent spread from Canada.

## CITY

The City of Port Orford owns or is expected to own over 60% of the land within the DWSA. Two of the parcels have a conservation easement that bans the use of herbicide for any reason. Livestock grazing is also prohibited under any circumstance. The small parcel is just 0.3 acres and is a narrow, forested strip with little to no gorse. The larger parcel, locally known as the Sorenson parcel, was tractor-logged in the early 2000's, and subsequently became heavily infested with gorse. It has been the subject of previous treatment work to reduce gorse fuel loading in the northern portion of the parcel with the aim of ultimately restoring native forest. Gorse infestation is heaviest on the uplands and flat areas most disturbed by the tractor logging. The riparian areas remain intact and have almost no gorse. Protecting the riparian areas from high intensity fire requires treatment and control of the adjacent mature stands of gorse. The remaining City owned parcels

have small outlier gorse populations within generally well forested areas that should also be managed to avoid spread.

**Sorenson Parcel: 134 acres**

Reclaiming: Healthy native forest, Conservation Easement restricted.

***Past Actions***

- 1999: Logged and replanted in following years.
- 2003: Conservation Easement recorded and deeded to the City.
- 2008: Curry Community Wildfire Protection Plan lists Port Orford Drinking Water Supply as a HIGH priority for fuels reduction targeting gorse infestation.
- 2013: Curry SWCD & Coos Forest Protective Association (FPA) mowed and mulched two project areas, NE corner and a fuel break along the N & W boundaries. 23 acres.
- 2014: Project areas were planted with Sitka spruce. 4 acres.
- 2015-2020: Hit and miss maintenance of the plantings. POWC volunteers hand clear around plantings and supplement plantings. 23 acres.
- 2019: Port Orford Watershed Council and Curry SWCD submit grant to OHA for Source Water Protection aimed at continuing and expanding gorse control within City owned parcels.
- 2021: Curry SWCD treated gorse to release trees in NE corner and mowed/mulched the most heavily infested portions of the firebreak. 10 acres.
- 2022: Curry SWCD mowed/mulched the access road and heavily infested portions of firebreak. Areas of scattered plants in the fuel break cut and mulched by hand crew. 27 acres.

***Future gorse control plan***

The following areas are planned for the continued active treatment of gorse within the Sorenson parcel.

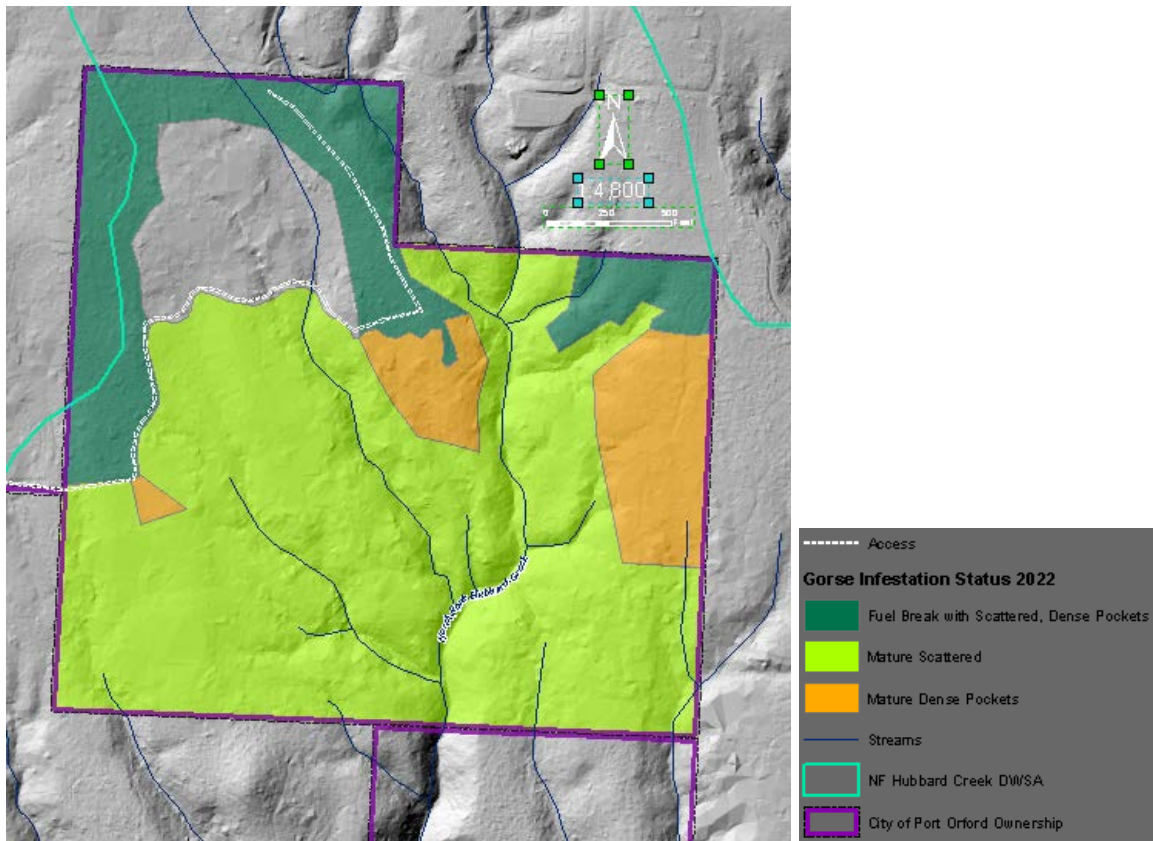


Figure 8: Map showing the general degree of infestation within the Sorenson parcel as it relates to ongoing and recommended gorse control.

**Fuel Break Scattered with Dense Pockets (dark green), 27 acres:** These areas have been previously treated and have several large open areas where gorse had been growing in mature, dense pockets with little to no tree or shrub retention. Tree planting on an open grid will occur in Winter 2022-23 in a manner that will allow for gorse maintenance around the trees. Spruce and Cedar are the main species as the spruce do well against gorse competition and animal browse, which is high in the unit. Additionally, grass seed will be spread, and tree interplanting in the more native shrub and conifer dominant areas will occur. This area will require annual to biennial treatment. Maintenance costs should decrease over time if kept up.

**Mature Scattered (light green), 82 acres:** This area has retained native species and post-logging plantings to a high degree. However, individual gorse plants have hitched a ride to the sun along with the native canopy growth. They are generally multi-stem, greater than 3" diameter and up to 6-8"+, and are 20-30' tall. They continue to set seed prolonging the persistence of the seed bank. Given the inability to use herbicide at this location, the prescription here is to hand cut and scatter or hand pile bushes in situ. It is expected that many of these spots have enough developed canopy to prevent a majority of the stump sprout. Recheck will be needed to prune any stump-sprout or nearby seed-sprout as the surrounding forest matures.

**Mature Dense pockets (orange), 14 acres:** These areas of mature gorse persist along the main logging access roads and former log processing areas. The gorse is mature and is a near monoculture. This area has not been previously managed. The easternmost area on the map currently has only foot access so it will require hand crews. Once the biomass is reduced, restoration of native species through interplanting similar to what is recommended for the Fuel Break areas should occur. If access from an adjacent owner becomes possible, mowing would become a more economic management option for about 40-50% of this area.

### **Wilson Parcel: 153 acres**

#### **Prevention: EDRR and outlier control**

The Wilson Parcel is currently owned by the Conservation Fund and they are working with the City and its partners to facilitate the acquisition. The parcel is well forested and is the subject of the Hubbard Creek Watershed FMP. Small areas on the south and east boundaries do have gorse that should be addressed using the elements of this plan. An uncontrolled wildfire, the result of slash burning on the ownership to the north, affected about 10 acres. That area should be targeted for EDRR of gorse for 1-3 years. Otherwise the FMP should be consulted for other forestry management objectives.

### **Other City Ownership**

#### **Prevention: EDRR and outlier control**

The remaining City-owned parcels are in similar condition as the Wilson parcel in terms of forest cover and gorse infestation. Gorse outliers exist on the access roads and some management by volunteers has occurred. Existing plants should be controlled and monitoring of any areas that are disturbed in the future should be a priority.

### **Monitoring City Ownership**

#### **Prevention: EDRR and outlier control**

The best way to reduce costs and effort in the long term is to prevent new establishment in uninfested areas. Some areas may even have residual seed bank where the forest was able to out compete and shade out gorse plants. Disturbance and sun are gorses best friends. Area where gorse is not currently found, is adjacent to large uncontrolled stands, or where disturbance occurs should be the monitored annually for gorse sprouts. If an area experiences a known disturbance like fire or landslide it should be checked in the late spring early summer for sprouts. This

should be repeated annually for 2-3 years following the disturbance. Otherwise annual surveys during the peak bloom, which is generally temperature dependent and generally occurs in March, should occur where spread is a concern. It only takes 2 years for gorse to bloom, and if caught during the first bloom seed banking can be prevented. This activity should be a priority.

## PRIVATE

Gorse infestation on private lands within and adjacent to the DWSA range from no gorse to heavily infested. The following approaches demonstrate treatment methods that can be used to control gorse while reducing herbicide use and soil disturbance within areas with different land uses in the DWSA. Additionally, financial and technical assistance may be available to private landowners from local technical assistance providers such as NRCS, Curry Watersheds Partnership, and other GAG partners.

### Non-herbicide approach

A non-herbicide control plan requires frequent treatments. Ultimate control will rely on long-term consistency, adaptation as conditions change, and should aim for full shade. As mentioned above, integrating grazing will require intensive management and frequent seeding for forage. Success and the duration of effort will depend greatly on the degree of infestation.

One local example of long-term, non-herbicide gorse control focused on shading out an overgrown field by planting Leland Cypress trees on a 12' spacing. For the past 20 years, the landowner has been mowing under the trees repeatedly. Lower branches were trimmed after several years growth to allow for mower access and to force the trees to grow vertically. Even after 20 years, gorse seed sprout still occurs in the outer 30' as just enough sunlight reaches the ground to prompt the seeds to sprout.



*Figure 9: Leland Cypress grove with up close look at ground showing seed sprout.*

## ***Reclaiming: Healthy native forest***

Year 1: Reduce biomass of gorse. Start by either mowing, mulching with weed eaters, or hand cutting. In fall, plant grass seed.

Year 2: Continue to cut stump-sprouts or dig stumps. If conditions are right, also hand pull or rake seedlings just after the cotyledon's (first leaves) erupt. Fall grass seed.

Year 3: Begin planting trees on a spacing that will facilitate mowing or hand clearing around plantings. It may be necessary to do small areas first as working around the trees increases treatment time. Marking trees with a tall, <4', stake is useful for protecting the trees during maintenance. Starting your plantings on the south edge of the infestation when possible will help with shading in the long-term

Year 4+: Continue routine cutting or hand pulling of the gorse. Cutting should be done about once a month or more if gorse is growing fast. Encourage native vegetation cover where it volunteers and proceed with additional plantings once gorse is controlled in a manageable way. Only move into new areas of control when the resources are sufficient to manage more area. As time goes on one should be able to spread out treatment activities as competition by desirable plants weakens the gorse.

### **Herbicide approach**

Use of herbicide in an integrated plan greatly reduces the number of treatment activities and shortens the duration of intensive control. Off-the-shelf or hardware grade herbicides are not necessarily the best or only options. They often contain more chemicals than is necessary to control gorse and not enough concentration of the chemical that is needed. The Curry SWCD serves as the Weed Control Advisory Board and staff are available to consult with landowners looking to control invasive plants through Integrated Pest Management. The Gorse Action Group maintains a website, [gorseactiongroup.org](http://gorseactiongroup.org), that has numerous resources related to gorse control methods.

The table below shows a standard integrated approach to gorse control with timing windows for mastication, herbicide spray, grass seeding, and plantings. Note the need to avoid spraying during gorse blossoming to prevent impacts to bees and birds. Actual implementation will depend on specific site conditions, desired outcome, and seasonal variables. The Treatment Tools section of this plan further explains the nuances of herbicide use for gorse control. However, when using herbicide it's important to remember that the label is the law. Always read and follow the label for safe and appropriate use.

Mow/mulch with spray timeline												
	January	February	March	April	May	June	July	August	September	October	November	December
Year 1												
Year 2												
Year 3												
Year 4												
Year 5												
Spring spray												
Fall spray												
mow/mulch												
grass seed												
trees and shrubs												

Notes: The above schedule shows the potential times for each activity. Application will depend on degree of infestation. Mow/mulching timing will depend on fire season restrictions. If mowing is delayed until fall/winter of Year 1 the first spray will likely not occur until Fall of Year 2 to allow for enough stump sprout to make spraying effective. Spring spraying is usually timed to avoid the peak bloom and adverse affects to bees and migratory hummingbirds. If the gorse is sprayed in the Spring followup spray is likely not needed until the following Spring or Fall. Grass seed should be applied at first fall rains following treatment or early spring when sufficient moisture is still possible. Depending on level of infestation and resprout after initial treatments planting of native shrubs and/or trees should be postponed until at least years 4-5. Continued monitoring and treatment for additional sprouts is likely needed beyond 5 years. Once control is begun yearly treatment is needed, and missing a treatment cycle can set back timelines considerably.

Figure 10: Showing the general approach to mature gorse control integrating mastication, herbicide, and vegetation competition.

# REFERENCES

- 100 of the World's Worst Invasive Alien Species*. (2022, 11 17). Retrieved from Global Invasive Species Database (2022): [http://www.iucngisd.org/gisd/100\\_worst.php](http://www.iucngisd.org/gisd/100_worst.php)
- Anderson, S. A. (2010). Ignition and fire spread thresholds in gorse (*Ulex europaeus*). *International Journal of Wildland Fire*.
- Bradley, J. (1971). *Bush Regeneration*. Spit Junction, N.S.W: The Mosman Parklands and Ashton Park Association.
- DOGAMI and FEMA. (2022, Nov. 11). *Regional Landslide Susceptibility*. Retrieved from SLIDO: Statewide Landslide Information Layer for Oregon: <https://gis.dogami.oregon.gov/maps/slido/>
- Elk River Coho Partnership. (2015). *Strategic Action Plan for Coho Salmon Recovery: The Elk River*. Wild Salmon Center.
- Environment Bay of Plenty. (2010). *Quantification of nitrogen leaching from Gorse in Lake Rotorua Catchment*. Whakatane, New Zealand: Environment Bay of Plenty.
- Fuller, T. C., & Barbe, G. D. (2014). *The Bradley Method of Eliminating Exotic Plants from Natural Reserves*. Retrieved from <https://s3.wp.wsu.edu/uploads/sites/2062/2014/04/bradleytechnique.pdf?x96359>
- Gorse Action Group. (n.d.). *Control and Treatment*. Retrieved from Gorse Action Group: <https://gorseactiongroup.org/>
- Harvey, J. (2019). Revised Figure 2 – Erosion Potential. *Memorandum*. ODEQ.
- IUCN SSC Invasive Species Specialist Group. (2022, November 17). *Species profile: Ulex europaeus*. Retrieved from Global Invasive Species Database 2022: <http://www.iucngisd.org/gisd/species.php?sc=69>
- Oregon Department of Agriculture. (2022, December). *Weed Biological Control*. Retrieved from Oregon Department of Agriculture Programs: <https://www.oregon.gov/oda/programs/weeds/pages/biologicalcontrol.aspx#gorse-thrip>
- Oregon Department of Environmental Quality. (2016). *Updated Source Water Assessment City of Port Orford PWS #4100670*. Portland: ODEQ.

- Oregon Department of Environmental Quality, Oregon Department of Human Services. (2000). *Source Water Assessment Report City of Port Orford, Oregon PWS #4100670*. Portland, Oregon: Oregon Department of Environmental Quality.
- Resource Innovations Institute for a Sustainable Environment. (2008). *Curry County Community Wildfire Protection Plan*. Eugene, Oregon: University of Oregon.
- South Coast Watershed Council. (2001). *Port Orford Watershed Assessment*. Gold Beach: SCWC.
- Springboard Forestry. (2022). *Hubbard Creek Watershed Forest Resources Stewardship Plan*. Port Orford: City of Port Orford.
- Winston, R., Randall, C. B., De Clerck-Floate, R., McClay, A., Andreas, J., & Schwarzländer, M. (2014). *Field Guide for the Biological Control of Weeds*. Forest Health Technology Enterprise Team.

# APPENDIX A

## GRANT OPPORTUNITIES

### Oregon Health Authority (OHA)

OHA Source Water Protection Grants: Public water systems are eligible and it is either a grant up to \$50K for technical support in the SWP area including delineation and assessment, wellhead protection programs and implementation of protection strategies to reduce risk to the water supply, or a low interest loan up to \$100k designed for source water protection implementation activities, including land acquisition (loans only) and other types of incentive-based source water quality protection measures.

### Department of Environmental Quality (DEQ)

DEQ Clean Water State Revolving Funds: (CWSRF) This is a low interest loan, but eligible borrowers can receive significant principal forgiveness (up to 50% of total loan cost). There are many different loan type options under this program, but the Non-Point Source loan...be a good fit for communities that do not want to use herbicides for invasive management in their Drinking Water Source Areas

DEQ 319 Nonpoint Source Implementation Grants: Currently up to \$30,000 available for projects that reduce and mitigate the effects of nonpoint source pollutants into waters of the state. This grant requires an area have a Watershed Based Plan in place for before these funds can be used for implementing projects in that area.

### United States Department of Agriculture

US Department of Agriculture, Rural Development: National Resource Conservation Service (NRCS) Emergency Watershed Protection: This funding source could be utilized AFTER a natural disaster, like a fire or severe storm, creates imminent hazards that could damage property or life. Grants are available for a myriad of things like vegetation establishment to reduce the risk of erosion.

Landscape Scale Restoration Competitive Grant Program: This funding opportunity is "intended to support high impact projects that promote collaborative, science-based restoration of priority forest landscapes, leverage public and private resources, and advance priorities identified in a State Forest Action Plan or other restoration strategy."

## **Oregon Department of Agriculture**

[Oregon State Weed Board Grant Program](#): Projects for on-the-ground weed control of Oregon state listed noxious weeds that protect water quality and overall watershed health are encouraged. Must be for the management of state listed noxious weeds. Must demonstrate sound principles of integrated weed management to both protect and enhance watershed health. Demonstrate specific site management objectives. Have on-the-ground control as a focus and a majority of OSWB funds should be used toward the control elements of the project. Herbicide cost-share funding is an option here.

## **Private Foundations**

There are many private foundations that may be interested in assisting with the elements of this plan. Not all will grant to municipalities. Successful foundation grants usually start with some type of introduction and subsequent working relationship with the applicant entity. Starting locally can help build awareness of the City's needs with the non-profit community.