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August 19, 2015XX | RESEARCH UPDATE | U2015-02

Guardrail Vegetation

INTRODUCTION

Safety is a number one priority when it comes to roadways, whether it's being in a vehicle, walking across the road or riding a bicycle. One factor of being safe on and near roadways is to know your surroundings. Guardrail vegetation is a major concern in many states because the guardrails and signs need to be visible at all times, but some vegetation makes the guardrails and signs sightless. This is a current issue in Vermont that VTrans seeks to proceed with more efficient and economical management.

MANAGEMENT METHODS

Currently, herbicides are the cheapest and most efficient method, even if applied twice every season. According to Washington State's Department of Transportation, "if managed properly, roadside vegetation can become self-sustaining over time and require less maintenance, which would help reduce both the cost and herbicide use." (Integrating Roadside Vegetation and Erosion Control, 2015) However, herbicides pose some risks for humans and the environment. When the application process occurs, those applying the herbicides are required to wear suits to be protected from the dangerous chemicals. While the herbicides treat the weeds, it also "increases the risk of erosion, resulting in an uneven line between bare ground and living vegetation." (Integrating Roadside Vegetation and Erosion Control, 2015) Herbicides can be a temporary solution, but if used for years, will result in a limited number of species able to continue growth. Of the surviving species, the most aggressive and undesirable will be favored. (Barton, 2015)

Other methods have been tested such as weed-control mats made of fiber or rubber, but there are concerns of joint sealing not being strong enough and vegetation possibly growing through the joints. Another concern is the molding on and around the guardrail posts can provide an opportunity for vegetation growth, this has been seen in Delaware. Another method is to place weed barriers on the roadsides. While this method seems to be the best solution, it requires a large amount of maintenance. The barriers must have the amount of organic and inorganic debris monitored to prevent build up, which can cause grass to grow. Even though maintenance is required to monitor and clean, this is a viable option where herbicides and any chemical use is restricted. (Barton, 2015)

Washington State's Department of Transportation uses vegetation management tools to mow and trim vegetation, to select the best herbicides for specific zones, to improve the soil, and release weed-eating insects, to re-established native plants in the landscape where they belong and to

return the beauty to the roadside. Due to the different environment and climate variations throughout the year, regional roadside vegetation management would be necessary (see Figure 1). (Integrating Roadside Vegetation and Erosion Control, 2015) According to Brian Wingfield and Miriam Marcus, "Washington and Vermont have synonymous environments of low carbon dioxide emissions (or "carbon footprints"), and strong policies to promote energy efficiency and high air quality, as indicated by the state's major metro areas that are low in smog (fog or haze combined with smoke and other atmospheric pollutants) and ozone pollution." (Marcus & Wingfield, 2015)

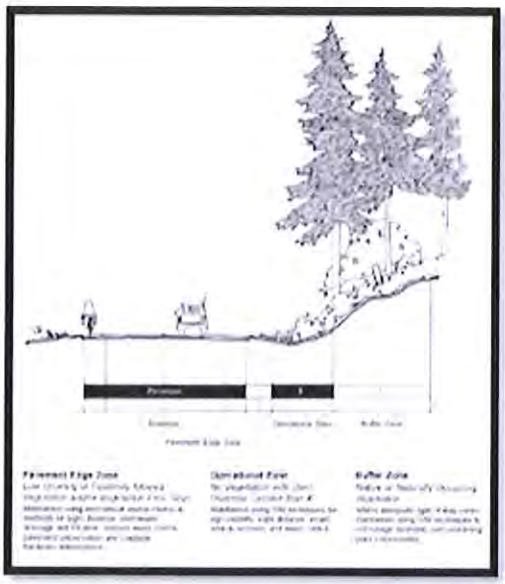


Figure 1: Washington State DOT - definition of different zones in the roadside, each with different management strategies

With Washington and Vermont having similar environments, thereupon the same strategies Washington State is using should work in Vermont. One possible strategy is to improve soils and release weed-eating insects in order to re-establish native grasses and plants. Vermont has varying temperatures throughout the year, therefore only specific types of native plants and grasses could be planted. If native plants and grasses are re-established in the landscape by roadways, the species known to stay short in height would be best. The U.S. Department of transportation has found, "not all zones are adequate for native plants, each zone would have to be analyzed and characterized in terms of environmental conditions to see what vegetation community can grow in that area. The characteristics to identify are soil type, moisture characteristics, solar orientation, existing vegetation, and adjacent land usage." (Morrison, 2015) Once the characteristics of each zone are finalized, it is important to find a healthy combination of dominant vegetation, prevalent vegetation, and "visual essence" vegetation to be in the plant community. (Morrison, 2015)

LAWS/ACTS

To help make re-establishing the landscape with proper species easier, the 1995 National Environmental Policy Act "mandates native species should be used in all federally funded landscaping projects to the maximum extent practicable." Later in 1999, the Executive Order 3112 prohibited invasive species, resulting in non-native vegetation to be restricted because it is considered to be an invasive species. (Effective Establishment of Native Grasses on Roadsides, 2015)

NATIVE SPECIES

Both native grasses and plants are easily established in the landscape. Native grasses, are a viable option for vegetation by means of controlling slope erosion, and the usage of native grasses averts the problem of introducing invasive species. However, native plants are known to reduce pest issues while maintaining regional bio-diversity. Once native species are established, they will begin to perform the job of preventing erosion and require less maintenance over time. (Effective Establishment of Native Grasses on Roadsides, 2015)

An example of a New England native species qualifying under Vermont's zones with a height of 3 feet or less to help keep guardrails and signs more visible is the Asclepias tuberosa. The Asclepias tuberosa, commonly known as the Butterfly milkweed, prefers to grow in dry open soils and in grassy areas beside the road. The Butterfly milkweed can bloom to be red, yellow or orange in color and grows from May to September (summertime). This plant is edible, and becomes poisonous when ingested in large quantities. This plant can grow anywhere in Vermont because it is characterized to grow in the USDA hardiness zones of 3 through 9. (Picture of the Asclepias tuberosa below.) (Asclepias tuberosa, 2015) The Asclepias tuberosa is a viable native species to keep guardrails and signs visible on Vermont's roadways.

INVASIVE SPECIES

While invasive species are prohibited, that doesn't mean all new species are prohibited. Not all new species become invasive. New species only become invasive when they become independent from humans for survival by winning the competition against native species for resources. These species also normally don't obtain any natural predators which allows for growth and reproductive success to go unchecked. (Brewer, 2015) Two invasive species that seem to be more and more common around Vermont roadsides lately are the Japanese Knotweed and the poison parsnips.

The Japanese Knotweed, scientifically known as the Polygonum cuspidatum, is a quickly-reproducing plant that forms dense thickets which causes the plant to easily exclude other vegetation in the same landscape site. It can grow to be 1-3 m (3-10 ft.), and appears wood-like visually, with flowers at the top. (Below is a photograph of knotweed stems growing.) (Japanese Knotweed, 2015) The Japanese Knotweed can take over the home of many native species because it is able to survive in varying environmental conditions, such as high temperatures, dry soil, salt, wetlands, roadsides, and any disturbed area. (Brewer, 2015) Japanese Knotweed is not only an invasive species to vegetation, but also to humans because they can cause structural damage to the roadways and block signs, guardrails, and walkways. The knotweed is so dense

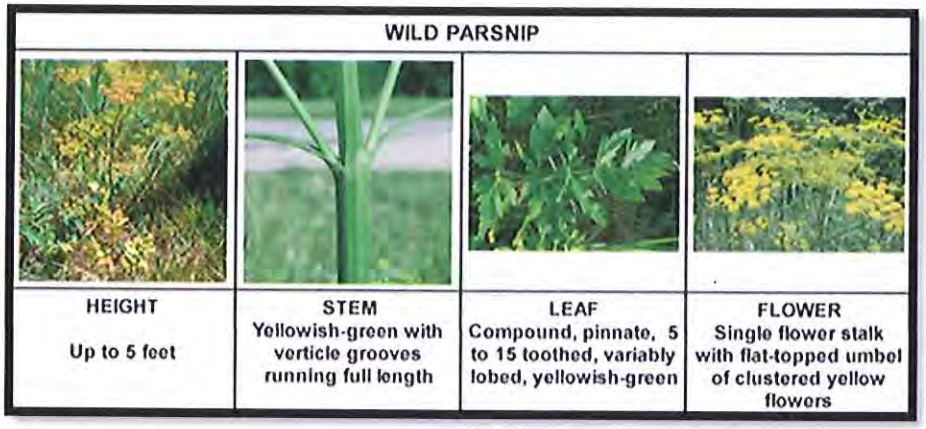
that it prevents groundcovers and mosses to grow beneath the canopy of the knotweed, which leaves riverbanks and roadsides near water susceptible to erosion. (Mitchell & Bartenstein, 2015) Knotweed only becomes more problematic as it grows because its roots become longer, allowing for re-sprouting from the rhizome fragments. According to Massachusetts' Department of Transportation and the Friends of Arlington's Great Meadows, the "successful efforts to control knotweed include: sustaining long-term management, staying within the limits of the resources available by focusing on small areas, and finally to incorporate restoration." (Mitchell & Bartenstein, 2015) There are different ways to try and control knotweed, but Massachusetts' DOT has found through their trials, a combination of gun injected glyphosate herbicide into the stems and glyphosate foliar spray on the flowers and stem is the best way to gain control of the knotweed growth and reproduction. Once the knotweed is under control, restoration is necessary in order to possibly eradicate the plant. During the restoration process, control management of pulling the roots of knotweed and spot-spraying where the plant was, is necessary, at least until the restoration species is dense enough to fend for itself and survive against the knotweed. (Mitchell & Bartenstein, 2015)

The other invasive plant is the Wild Parsnip, scientifically known as the Pastinaca sativa. It looks and smells like the cultivated parsnip for food. Wild parsnip can grow up to 4-5 ft. and are easily spotted by its characteristics; (Diagram below). (Wild Parsnip (Pastinaca sativa), 2015) Wild parsnip can survive under many environments, such as dry soils, and wet meadows, but the most common sites have rich, calcareous, alkaline, moist soils that have been disturbed. This is why it is found on paths, roadsides, and utility rights-of-way. While the roots are edible and the plant looks harmless, it "produces a compound in its leaves, stems, and flowers that causes an intense, localized burning, rash, severe blistering, and discoloration on contact with skin on sunny days." (Wild Parsnip (Pastinaca sativa), 2015) The poison is the result of the chemical in the plant sap called furanocoumarin reacting with human skin to cause phytophotodermatitis. (Parsons, 2015) Luckily, contact with the sap is the only cause of the burns and blisters, the foliage will not harm the skin. It is extremely important to keep in mind about the sap when removing wild Parsnip. Removal of wild Parsnip is best when the infestations are small, but it is not always easy to catch the small infestations. Depending on the quality of the area, the degree of the infestation, and the use of the infested area, there are three ways to go about removing and managing wild Parsnip. The different removal/ managing possibilities are as follows:

1. Manual control is most effective for small patches. Control measures of cutting the root 1" below the ground with a spaded shovel or removal by hand pulling should be undertaken before wild parsnip plants go to seed. If done after seeding, take steps to destroy the seeds. For small areas with set seeds, cut the tops with clippers, bag the seed heads in a clear plastic bag and allow to rot.

2. Mowing is the most effective when plants first produce flowers, but before seeds enlarge to prevent from spreading the seed heads. At this stage plants often die when cut due to the depleting of their root resources. Some plants might not die, therefore a follow-up mowing may be needed. When mowing, take precautions to prevent skin contact with the plant sap.
3. Chemicals – Glyphosate or triclopyr herbicides can be applied, according to state and label requirements, as spot treatments to basal rosettes. (Wild Parsnip (Pastinaca sativa), 2015)

After any removal method, establishing native plants and grasses will help choke out the parsnip. Long-term monitoring is necessary to ensure seedlings emerging from the seed bank don't become an infestation again. The seeds that go unnoticed can remain viable in the soil for four years. (Parsons, 2015)



CONCLUSION

Vegetation management methods have their advantages and disadvantages, but each method has at least one priority in common: maintenance. While the amount of maintenance varies between methods, they share a primary purpose: to keep drivers, pedestrians, and roadways safe. If normal vegetation maintenance is impeded, the result would be the three classes of roadside vegetation becoming more common and causing an increase in accidents. According to Washington State's DOT, the three classes are as follows:

1. Hazard vegetation – primary target material, including vegetation obstructing motorists' line of vision, growing over guardrails, threatening pedestrian safety, creating obstacles to signs, posing windfall hazards over vehicular and pedestrian ways, or creating winter shade leading to icing conditions.
2. Detrimental vegetation – grasses and woody plants that are destructive to, or compromise the function of, of highway structures, such as median barriers, grass in pavement and bridge joints, guard posts, drainage lines and waterways.
3. Nuisance/noxious vegetation – vegetation growing along state roadways that could potentially cause problems to the general public, highway employees or contractors, such as poison ivy. Other nuisance vegetation may be growing within 30 ft. of structure and appurtenances that require maintenance, within state highway rights-of-way, are considered target vegetation. (Integrating Roadside Vegetation and Erosion Control, 2015)

Guardrail vegetation control is essential to keep guardrails and traffic signs visible to all motorist

and pedestrian traffic. Without a new approach or the continuation of the current maintenance; hazardous, detrimental, and nuisance vegetation will occur and cause more problems that could have possibly been prevented. Guardrail vegetation consists of many maintenance strategies, each with benefits and problems. Any method above is a viable option for Vermont to try, but from the information found, the native grasses and plants would be the most beneficial and practical option as a long term strategy.

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