Washington Invasive Ranking System

Washington Natural Heritage Program

Bellardia viscosa (Yellow Glandweed)

Assessed by
Molly S. Wiebush (Washington Natural Heritage Program)
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Ecological Impact Rank: **Low** (35)	Confidence: **Moderate** (58)
Management Difficulty Rank: Insignificant (30)	Confidence: Moderate (60)
Biological Characteristics of Invasiveness: High (75)	Confidence: Moderate (54)
Concern Related to Distribution and Abundance: Moderate (64)	Confidence: High (80)

Photo Credit: Gabriel Campbell 2024, used under Creative Commons license (CalPhotos, 2024).

Ranking Notes

Some sources still use the name *Parentucellia viscosa* for this species.

Legal Listings

Washington State Weed Board: No

Washington Invasive Species Council: No

Section 1: Distribution and Abundance

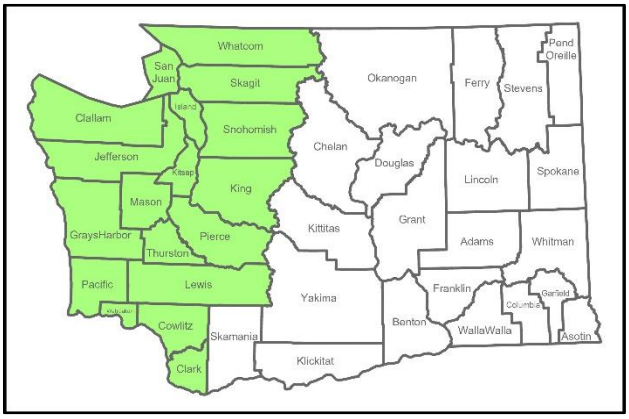

Figure 1. Distribution of counties where *Bellardia viscosa* has been documented in Washington State (CPNWH, 2024; EDDMapS, 2024; iNaturalist Community, 2024).

WASHINGTON STATE DEPARTMENT OF NATURAL RESOURCES

Q1: Current Range Size in Washington

Rating: Moderate

Confidence: High

Bellardia viscosa is found in 18 of 39 (46%) of counties in Washington State (CPNWH, 2024; EDDMapS, 2024; iNaturalist Community, 2024).

Source: Herbarium records and other observations

Q2: Current Trend in Total Range

Rating: Moderate

Confidence: Moderate

Bellardia viscosa has expanded into the northern Olympic Peninsula within the last 20 years. This species has not apparently expanded its range in the rest of the state in the last 20 years (CPNWH, 2024; iNaturalist Community, 2024).

Source: Herbarium records and other observations

Q3: Proportion of Potential Range Currently Unoccupied

Rating: Low

Confidence: High

Bellardia viscosa is currently occupies 46% of counties in Washington, all on the western side of the state (CPNWH, 2024; EDDMapS, 2024; iNaturalist Community, 2024) However, this species has potential to spread to the rest of the state (EDDMapS, 2024).

Source: Herbarium records and other observations, Model predictions

Q4: Local Range Expansion or Change in Abundance

Rating: Moderate

Confidence: Moderate

iNaturalist records suggest a rapid increase in local abundance and local range for *Bellardia viscosa* over the last 20 years (iNaturalist Community, 2024). However, herbarium records from the same timespan suggest a more moderate expansion mostly limited to southwestern Washington (CPNWH, 2024). The abundance of iNaturalist observations could partially be an artifact of an increase in the number of observers in the last 20 years as well as an increase in abundance of this species.

Source: Professional expertise, Herbarium records and other observations

Q5: Diversity of Ecosystems Invaded

Ecosystem types: Grassland & Shrubland, Marine Coastal Shore, Emergent Open Wetland

Rating: Moderate

Confidence: High

Bellardia viscosa is found in naturally and anthropogenically disturbed areas. This species appears to prefer moist, open habitats and is frequently found in wet prairies, swales and other areas of low ground, wet meadows, low wet areas near dunes and beaches, disturbed wetlands and marshes, lake edges, and roadside ditches. It can also be found in old fields, upland prairies, clearcuts and other logged areas, under powerlines, along roadsides and in parking lots and other disturbed areas. *Bellardia viscosa* tolerates a wide variety of soils, including sand, loam, clay, and glacial outwash. While this species usually occurs in open places, it is also found along edges and roadsides in forested areas, and in tall grass or shrubs. It occurs with both introduced and native species (CPNWH, 2024).

Source: Professional expertise, Herbarium records

Section 2: Biological Characteristics

Q6: Aggressive Mode of Reproduction

Rating: Yes

Confidence: High

Bellardia viscosa is a self-compatible annual and only reproduces by seed. A study at a dune site in northern California estimated seed production by plant size, with an average plant estimated to produce approximately 12,000 seeds. Plants parasitizing *Acmispon americanus* resulted in larger inflorescences than plants that parasitized other species or had no host (Pickart & Wear, 1999)

However, *B. viscosa* can flower and reproduce without a host plant (Pate & Bell, 2000).

Source: Published research, Informal publication, Professional expertise

Q7: Innate Potential for Long-Distance Dispersal

Rating: Yes

Confidence: Moderate

Sticky heads allow *Bellardia viscosa* fruits to attach to animals or clothing. Seeds are also wind-dispersed (Brusati & Corelli, 2005).

Source: Informal Publication

Q8: Potential to be Spread by Human Activities

Rating: Yes

Confidence: Moderate

The presence of *Bellardia viscosa* in Washington appears to follow roads and areas of human activity (CPNWH, 2024; iNaturalist Community, 2024). A study from northern California also suggested a grazed pasture as the source population for invasion of *B. viscosa* in a dune wetland in Humboldt County (Pickart & Wear, 1999).

Source: Informal publication, Professional expertise, Herbarium records and other observations

Q9: Allelopathy

Rating: Unknown

Confidence: Not Rated

Information on allelopathy was not available for this species. However, *Bellaridia viscosa* produces defensive chemicals that deter *Spodoptera* larvae from feeding on them (Azab, 2021). The related species *Bellardia trixago* is known to produce secondary chemicals and has demonstrated allelopathic effects on some species (Soriano et al., 2022).

Source: Published research

Q10: Competitive for Limiting Abiotic Factors

Rating: Yes

Confidence: Moderate

Like many species in the Orobanchaceae family, *Bellardia viscosa* is a generalist hemiparasite. A study in interdunal wetlands in northern California found no effects of *Bellardia viscosa* on co-occurring species, suggesting that this species generally does not outcompete or otherwise harm native plants. Ecosystem changes over the course of the experiment tracked expected successional changes in these habitats (Pickart & Wear, 1999). However, more recent research in Japan did find an effect of parasitism by *B. viscosa* on infected plants, with plants infected by *B. viscosa* producing less biomass than plants that were not infected. Some plant species are better able to defend themselves against parasitic plants than others (Suetsugu et al., 2012). Studies in Australia suggest *B. viscosa* is less competitive for water than other plant species. However, this species is very competitive for nitrogen uptake via host plants (Pate & Bell, 2000).

Source: Published research, Informal publication, Professional expertise

Q11: Growth Form

Rating: No

Confidence: Moderate

While *Bellardia viscosa* can be abundant where found, it does not form smothering or tall monocultural stands. It usually grows in mixed communities of other plants (Brusati & Corelli, 2005).

Source: Informal publication, Professional expertise

Q12: Germination Requirements

Rating: Yes

Confidence: Low

Bellardia viscosa is hemiparastic, but it can germinate and grow without available hosts (Brusati & Corelli, 2005). This species usually germinates in moist conditions and requires rainfall to germinate (Pickart & Wear, 1999). This species is mostly found in areas of natural or anthropogenic disturbance, and likely

requires bare ground or disturbance to establish, but information was limited.

Source: Informal publication, Professional expertise

Q13: Invasiveness of Other Plants in Genus

Rating: Yes

Confidence: High

Bellardia trixago is known from California and Texas and is tracked by the University of Georgia's Center for Invasive Species and Ecosystem Health (EDDMapS, 2024). *Bellardia viscosa* is currently not regarded as invasive in North America, but its potential for invasiveness is of concern in Japan (Suetsugu et al., 2012).

Source: Published research, Informal publication

Q14: Shade Tolerance

Rating: Moderate

Confidence: Moderate

In the Pacific Northwest, *Bellardia viscosa* is usually found in open areas, meadows and disturbed areas. However this species also occurs in edge habitats, disturbed forests, brush, and tall grass (CPNWH, 2024). Studies in northern California and New Zealand both suggest that *B. viscosa* will eventually be shaded out during succession (Gibb, 1994; Pickart & Wear, 1999).

Source: Published research, Informal publication, Professional expertise, Herbarium records

Q15: Disturbance Tolerance

Rating: Yes

Confidence: High

Bellardia viscosa is usually found in disturbed areas and habitats maintained by natural disturbance. This species has been observed to increase after fire, including in wet prairies (Brusati & Corelli, 2005; Anzinger & Radosevich, 2008).

Source: Informal publication, Professional expertise

Q16: Propagule Persistence

Rating: <5 years

Confidence: High

Bellardia viscosa does not appear to have long-lived seeds. Experiments in seed storage at the Royal Botanical Gardens, Kew, found that seeds dried and frozen for storage had only 26% viability after 2.8 years (SID, 2024).

Source: Seed Information Database

Q17: Palatability

Rating: Unknown

Confidence: Not Rated

This species produces defensive chemicals that deter *Spodoptera* larvae from feeding on them (Azab, 2021). No information was found on whether it was palatable to grazers.

Source: Published research

Section 3: Ecological Impact

Q18: Impact on Ecosystem Abiotic Processes

Abiotic Processes: Geomorphology, Nutrient dynamics, Light availability

Rating: Low

Confidence: Moderate

Studies in Japan suggest that *Bellardia viscosa* can reduce the growth of their host plants (Suetsugu et al., 2012). In Japan and California, this species has been shown to prefer plants in the Fabaceae and Poaceae families (Pickart & Wear, 1999; Suetsugu et al., 2012). Coupled with its ability to be competitive for nitrogen (Pate & Bell, 2000), this suggests that *B. viscosa* could reduce nitrogen availability where it is found. Significant decreases in the biomass of plants in the Fabaceae and Poaceae families could also potentially increase light availability and possibly bare ground where this species is found, although this was not discussed in the available literature.

One reason invasive plants are of concern in coastal dunes is the potential for stabilizing dune habitats and converting them from open sand to grasslands or forests. However, *B. viscosa*'s annual habit and

apparently relatively localized invasions mean that it is unlikely to contribute significantly to dune stabilization.

Sources from California suggest this species has very little effect on the ecosystems in which it occurs (Pickart & Wear, 1999; Brusati & Corelli, 2005).

Source: Published research, Informal publication, Professional expertise

Q19: Impact on Ecosystem Structure

Rating: Low

Confidence: Moderate

Bellardia viscosa can reduce biomass production in its host plants (Suetsugu et al., 2012).

Source: Published research

Q20: Impact on Ecosystem Composition

Rating: Low

Confidence: Moderate

Hemiparasitic plants, in general, may be able to change vegetation community composition or change the distribution of species in a community. A study in Japan found that *B. viscosa* was most likely to parasitize plants from the Fabaceae and Poaceae families (Suetsugu et al., 2012). In a study in Australia, *B. viscosa* preferred to parasitize annual species (Pate & Bell, 2000). *Bellarida viscosa*'s preferred host in northern California, *Acmispon americanus*, is also an annual (Pickart & Wear, 1999).

A study in Japan found that removing *B. viscosa* from the community increased aboveground biomass, particularly for grass and legume species, suggesting that *B. viscosa* can have a significant effect on the growth of their host plants. Compositional impacts were also attributed to the presence of *B. viscosa* (Suetsugu et al., 2012). However, in northern Californian dunes, this species occurred in low numbers and had only minor effects on co-occurring species (on par with natural succession) (Brusati & Corelli, 2005). The related species *Parentucellia latifolia* does not apparently cause obvious harm to its host plants (Pickart & Wear, 1999)

This species is likely able to change the composition of vegetation communities at least somewhat, given the potential for negative effects on host plants. However, there is little evidence that this species has a significant effect on community diversity or composition in North America.

Source: Published research, Informal publication, Professional expertise

Q21: Impact on Particular Native Species

Rating: Insignificant

Confidence: Moderate

This species does not appear capable of outcompeting co-occurring native species on its own. However, increases in the abundance of annual species can degrade habitat for perennial hemiparasites like *Castilleja levisecta*, by reducing the number of suitable host species available in a community.

Invasive plant species on dunes can potentially be a threat to plant species that require open, shifting sand for habitat. However, *Bellardia viscosa* does not contribute to dune stabilization.

Parasitic plant species have been implicated in declines of plant species in some cases (Pickart & Wear, 1999), but there is no evidence suggesting that *B. viscosa* has caused declines of other plant species in North America.

Source: Informal publication, Professional expertise

Q22: Observed Ability to Invade Undisturbed Ecosystems

Rating: Low

Confidence: Moderate

Research suggests that *Bellardia viscosa* has been able to invade relatively undisturbed habitats in Australia (Pate & Bell, 2000), but the type of disturbance discussed in this study was unclear (anthropogenic or all types of disturbance). In the Pacific Northwest, this species is primarily found in areas receiving natural or human disturbance.

Source: Published research, Professional expertise

Q23: Observed Ability to Invade Naturally Disturbed Ecosystems

Rating: Yes

Confidence: High

Bellardia viscosa occurs in naturally disturbed habitats like prairies and interdunal wetlands, and does not require human disturbance to establish (Brusati & Corelli, 2005). This species may be somewhat sensitive to habitat conditions (Pickart & Wear, 1999).

Source: Informal publication, Professional expertise

Section 4: Management Difficulty

Q24: General Management Difficulty

Rating: Low

Confidence: Moderate

Control of *Bellardia viscosa* likely requires both seed bank exhaustion and removing recolonization sources. However, this species is not very aggressive and invasions may be short-lived—treatment may not be required (Pickart & Wear, 1999). Radiant heat treatments were extremely effective in killing *B. viscosa* in experimental plots on dunes in northern California (Emerzian, 2007), but otherwise little research has been done on weed management of *B. viscosa*. As an annual species, preventing reproduction by mowing or other techniques may be more effective than with many perennial species.

Source: Informal publication, Professional expertise, Thesis

Q25: Minimum Time Commitment

Score: Low

Confidence: Moderate

Monitoring and treatment of *Bellardia viscosa* should likely continue until seed bank is exhausted. Given the relatively short span of seed viability for this species, populations without an outside seed source could be treated in less than five years. As with other species, restoration of native community is likely important along with removal of *B. viscosa*.

Source: Professional expertise

Q26: Impacts of Management on Native Species

Rating: Low

Confidence: Moderate

Targeted manual treatments are suggested for managing *Bellardia viscosa* populations. These treatments are more likely to be low impact on co-occurring native species (Pickart & Wear, 1999). Another set of experiments in northern California suggest that radiant heat treatments are effective against *B. viscosa* and can be focused on target species, reducing damage to neighboring native plants. Treatments are most effective coupled with restoration of native plant communities or other techniques to prevent other invasive species from moving in to the open space (Emerzian, 2007).

Source: Informal publication, Professional expertise, Thesis

Q27: Inaccessibility of Invaded Areas

Rating: Low

Confidence: High

In Washington, populations of *Bellardia viscosa* usually occur along roadsides or other relatively accessible places (CPNWH, 2024; iNaturalist Community, 2024).

Source: Professional expertise, Herbarium records and other observations

Q28: Sociopolitical Implications of Management

Rating: Insignificant

Confidence: Moderate

Bellardia viscosa is not used in agriculture or as an ornamental species, and it seems unlikely that public comments would extend beyond general objections to herbicide use.

Source: Professional expertise

Additional Comments

None

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