Himalayan blackberry (*Rubus armeniacus,* Focke)

Family: Rosaceae

Synonyms: *Rubus discolor* Weihe & Nees
Rubus procerus auct. Non P. Muell. Ex Genev
Rubus macrostemon (Focke) Sampaio
Rubus fruticosus L.
Rubus thyrsanthus (Focke) Foerster.
Rubus grabowskii, Weihe ex Gunther et al.
Rubus praecox, Bertol.

Description and Variation:

Himalayan blackberry is a rambling evergreen, perennial, woody shrub with trailing, stout stems that possess sharp, stiff spines. The shrub may reach up to 4 meters tall (Francis).

The stems, referred to as canes, can reach six to just over twelve meters (20-40 feet) and are capable of rooting at the tips (Soll 2004). The canes can attain impassable, dense thickets with up to 525 thick woody canes per square meter (Soll 2004).

The leaves are compound, leaflets 3-5, sharply toothed (The Jepson Herbarium 2008) typically "five foliolate, glabrous above when mature and canopubescent to cano-tomentose beneath" (Hoshovsky 2000).

The inflorescences are perfect, "flat-topped panicles, 5-20 flowered" with 5 petals per flower (Knoke, 2008), and range from white to rose, transversely 2-2.5 cm. (Hoshovsky 2000). Flowering typically takes place between June through August (Francis) after which the fruit continues through September (Hoshovsky 2000).

The fruit are aggregate, shiny, large, black drupelets from 12 up to 20 mm (Francis) which ripen beginning in mid-summer until fall (Hoshovsky 2000). Each drupe includes one seed (Francis).

Seedlings require exposure to high sunlight for survival and usually do not survive well close to the parental thicket. As few as 0.4 seedlings per square meter have been noted, keeping the recruitment from seed relatively low when compared to daughter plants (Hoshovsky 2000).

Among the many native blackberries and raspberries, one can differentiate Himalayan blackberry by the five leaflets and curved spines with wide bases. This blackberry species also has furrowed, angled stems while others are typically round (Alaska Natural Heritage Program 2005).

Habitat:
Himalayan blackberry has become naturalized in the Pacific Northwest from California north into British Columbia and along the middle sections of the east coast from Delaware to Virginia. This species is especially problematic within western hardwood, Hemlock-Sitka spruce, Maple-beech-birch and oak, loblolly and shortleaf pine and white, red and jack pine ecosystems.

Generally, this species is found on disturbed sites such as road sides, railroad tracks, logged over areas, along field margins and disturbed riparian sites (Francis, Tirmenstein 1989). The blackberry shrubs grow well in a wide range of soil pH and textures, even infertile soils, yet do require adequate soil moisture (Tirmenstein 1989). This blackberry tolerates periodic episodes of floodwaters, but, does not do well under dense canopies (Francis).

History and Distribution

Rubus armeniacus was introduced intentionally into North America on the east coast in 1885 by Luther Burbank (Francis) for its tasty blackberries. This species then became established on the west coast by 1945 (Soll 2004). It has also escaped cultivated areas spreading into wildlands in Hawaii, Europe, Australia, New Zealand, and South Africa (Francis). Himalayan blackberry is native to the Caucasus region in Eurasia (Caplan and Yeakley 2006).

After being introduced into Australia over 150 years ago for cultivation, blackberry is noted as one of the country's worst weeds in the southern part of the country (Groves 1998) and is ranked as the fourth most serious weed in New Zealand costing over 20 million NZ dollars annually (Pennycrook et al. 1998).

Biology:

Growth and Development

The long stems produced by this species are biennial (Tirmenstein 1989) and usually live only 2 to 3 years (Soll 2004). The stems are sterile for the first year and are referred to as primocanes. These develop at the surface from buds and do not bear fruit, only leaves. Second year canes, or floricanes, arise from within the axils of primocanes producing fruit and leaves (Tirmenstein 1989). Inflorescences form on the floricances within the lower axils in large terminal clusters (Starr et al. 2003). Second year canes can be produced by the rooting stem tip events of first year canes and adventitious shoots are capable of forming on roots from as deep as 45cm (Soll 2004).

The aggressive nature of this species is primarily explained by the daughter plants, or the floricanes' ability to reproduce by tip-rooting annually contributing to the rapid spread of the clone. Also playing a factor in the spread is the rapid growth of the primocanes, which are capable of growing five to eight cm per day (Davies 1998).

Root crowns can reach 20 cm in diameter and roots growing directly from each crown can attain a depth of 1.5 meters into the soil. Lateral roots can reach outward 30 to 60 cm (Francis).

Reproduction

Himalayan blackberry reproduces by means of extensive asexual reproduction via numerous methods and less so by sexual reproduction. The asexual means include: 1) apomixis with segregation, 2) apomixis without segregation, 3) haploid parthenogenesis, and 4) non-reduction at meiosis (Tirmenstein 1989).

Vegetative regeneration means include: 1) re-growth from the perennial rootstalk; 2) rooting stem tips (Tirmenstein 1989) and 3) root and cane fragments (Alaska Natural Heritage Program 2005).

The extensive asexual reproduction was proven when genetic testing in Australia indicated that a majority of the population in southern Australia was from a single clone. The DNA fingerprinting did not show any genetic variation from the 29 sampled locations (Evans et al. 1998).

Sexual reproduction occurs with high production rates of up to 7 – 13,000 seeds per square meter or up to 720 fruits per cane (Caplan and Yeakley 2006), which can be viable for several years (Alaska Natural Heritage Program 2005). The seed coat is impermeable and the embryo is dormant causing slow germination. The dormancy period consist of ~ 90 days of warmth (68° – 86° F) followed by a long cold period (36° – 41° F) of ~ 90 days (Tirmenstein 1989). Germination has been reported to increase by 30% after passing through the guts of birds and mammals (Francis). Seed dispersal is usually via birds, small mammals and water (Soll 2004) as well as through cultivation by humans (Alaska Natural Heritage Program 2005).

Himalayan blackberry has been reported to hybridize with numerous other *Rubus* species, for example, *R. thyrsiger, R. calvatus,* and *R. schlechtendalii* (Tirmenstein 1989).

Control:

Response to Herbicides

Certain herbicides such as Garlon 3A and Roundup have been successful at controlling blackberry after fall application on mature and new canes (Soll 2004). The herbicide, Picloram has been noted as repressing the re-growth of the canes yet stimulates adventitious shoots (Hoshovsky 2000).

Spraying the foliage tends to be more effective during the summer months (Hoshovsky 2000) and spot application on the cut canes, injection into the canes and spraying newly emergent plants tends to be more effective in the fall (Soll 2004).

Please refer to herbicide labels for site specific control information. For more information, please refer to the PNW Weed Management Handbook.

Response to Cultural Methods

There are no known cultural methods at this time.

Response to Mechanical Methods

Mechanical methods include: 1) excavating the root crowns and large roots; 2) repeated removal of the aboveground vegetation with a string trimmer or mower and densely planting native vegetation which would shade the Himalayan blackberry (Soll 2004). In more mature infestations, the above ground vegetation would need to be removed with tools before removing the below ground root crown and roots with shovels or a claw/ Pulaski mattock (Soll 2004).

All of these methods can be effective, yet very labor intensive and therefore, can be expensive (Soll 2004). All three would include repeated maintenance, aboveground cutting would need to be re-done several times a year for several years and the below ground removal would need additional removal of new sprouts for the same time frame. Generally speaking, 300-1000 hours of labor would be required to remove one acre of densely infested Himalayan blackberry (Soll 2004).

Burning may be effective at removing the dead above ground debris, but will not kill the plant completely as the plant will re-sprout again (Tirmenstein 1989).

Biocontrol Potentials

There is a risk of impacting commercially significant *Rubus* spp. with the introduction of an insect and therefore, this option is not supported. Researchers from New Zealand report similar results as many of the invertebrate pests for this species could cause collateral damage to their commercial crops and those that have been tested have not been successful (Pennycook 1998).

Several researchers have noted successful control from grazing, especially by goats, yet sheep, cattle and horses may also be effective (Hoshovsky 2000). This method seems to control the population from spreading and becoming larger rather than eradicating the plants from the site.

Economic Importance:

Beneficial

The fruit of Himalayan blackberry is eaten by many birds and small mammals such as red fox, squirrels, coyote and black bear. Larger mammals such as deer, elk, beaver and rabbits feed on the buds and leaves (Alaska Natural Heritage Program 2005). Honey bees also use this species for nectar (Francis). The fruits of this wild blackberry are frequently harvested, especially in western Washington and Oregon, although it is considered to be less flavorful than the native trailing blackberry, *Rubus ursinus*. Various medicinal properties exist within the fruit, roots and stems (Tirmenstein 1989).

Detrimental

As an effective competitor, this species typically outcompetes native species on the site. Research comparing this non-native *Rubus* with a native *Rubus* spp. reveal that *Rubus discolor* (*R. armeniacus*) attains higher photosynthetic rates based on the resource investment made. This allows for augmented growth of both canes and sexual reproduction without the typical tradeoff of greater resource allocations to one or the other (Lambrecht-McDowell and Radosevich 2005). This ability to outcompete the native biota allows this species to establish dense thickets which create large areas of unusable habitat for livestock and wildlife. In addition to the density, the thorns impact usage of the site by livestock, the young may even become stuck in the canes and die. Access to water for the animals is hindered as well as access for humans for recreation and maintenance.

These thickets are also considered a fire hazard when close to buildings (Hoshovsky 2000) and can be a vector for diseases (Caplan and Yeakley 2006). Hill and Purcell (1995) determined that blackberry is a significant host of a bacterial pathogen (*Xylella fastidiosa*) that causes Pierce's disease of grapevines and other economically important plants. A study looking at the impact of Himalayan blackberry on valley and blue oak populations within savanna ecosystems indicated increased survival of seedlings at the edges of the thickets yet, within the thickets, seedling establishment was absent (Williams et al. 2006).

This species is listed as a species of concern in Oregon and California (Caplan and Yeakley 2006). A Plant Assessment based on "Criteria for categorizing invasive non-native plants that threaten wildlands" by the California Exotic Pest Plant Council and the SW Vegetation Management Association ranks Himalayan blackberry with an invasive score of "High" (Warner 2004).

Rationale for listing:

Himalayan blackberry is a notorious invasive species in many countries around the world in urban, rural and wildland settings costing millions of dollars for both control and in estimated impacts. This species spreads aggressively via numerous asexual means and is successfully dispersed by birds and mammals. The negative impacts of this species can be severe to both native plants on the site as well as livestock and wildlife. Knowledge of the harmful consequences of Himalayan blackberry can assist with control by the public and reduce the spread of this invasive plant. Because this species is already widespread throughout much of the state, a Class C listing is appropriate. This will allow counties to provide education and technical consultation or enforce control if locally desired and feasible.

References:

Alaska Natural Heritage Program. 2005. Himalayan blackberry. Environment and Natural Resources Institute, University of Alaska Anchorage.
http://akweeds.uaa.alaska.edu/pdfs/potential_species/bios/Species_bios_RUDI.pdf

Caplan, J.S. and Yeakley J.A. 2006. *Rubus armeniacus* (Himalayan blackberry) Occurrence and Growth in Relation to Soil and Light Conditions in Western Oregon. Northwest Science, V 80:1 9-17.

Davies, R.J.P. 1998. Regeneration of blackberry-infested native vegetation. In: Towards an integrated management system for blackberry (*Rubus fruticosus* L. agg.). Proceedings of a workshop held at Charles Sturt University, Albury, New South Wales on December 15-16 1997. Editors: Richard H. Groves, Jann Williams and Sharon Corey.

Evans, K.J., Symon, D.E. and R.T. Roush. 1998. Taxonomy and genotypes of the *Rubus fruticosus* L. aggregate in Australia. In: Towards an integrated management system for blackberry (*Rubus fruticosus* L. agg.). Proceedings of a workshop held at Charles Sturt University, Albury, New South Wales on December 15-16 1997. Editors: Richard H. Groves, Jann Williams and Sharon Corey.

Francis, J.K. Himalayan blackberry. U.S. Department of Agriculture, Forest Service, International Institute of Tropical Forestry, Jardín Botánico Sur, 1201 Calle Ceiba, San Juan PR 00926-1119, in cooperation with the University of Puerto Rico, Río Piedras, PR 00936-4984.
www.fs.fed.us/global/iitf/pdf/shrubs/**Rubus**%20**discolor**.pdf

Groves, R.H. 1998. Towards an integrated management system for blackberry (*Rubus fruticosus* L. agg.). Proceedings of a workshop held at Charles Sturt University, Albury, New South Wales on December 15-16 1997. Editors: Richard H. Groves, Jann Williams and Sharon Corey.

Hoshovsky, M.C. 2000. *Rubus discolor*. University of California.
http://ucce.ucdavis.edu/datastore/datareport.cfm?searcher=home&surveynumber=182&reportnumber=42

The Jepson Herbarium
http://ucjeps.berkeley.edu/jepson_flora_project.html

Knoke, D. 2008. *Rubus discolor*, Himalayan blackberry. The Burke Museum of Natural History and Culture.
http://biology.burke.washington.edu:80/herbarium/imagecollection.php?Genus=Rubus&Species=discolor

Lambrecht-McDowell, S and S. Radosevich. 2005. Population demographics and trade-offs to reproduction of an invasive and noninvasive species of Rubus. Biological Invasions 7: 281-295.

Pennycook, S.R. 1998. Blackberry in New Zealand. In: Towards an integrated management system for blackberry (*Rubus fruticosus* L. agg.). Proceedings of a workshop held at Charles Sturt University, Albury, New South Wales on December 15-16 1997. Editors: Richard H. Groves, Jann Williams and Sharon Corey.

Soll, J. 2004. Controlling Himalayan Blackberry in the Pacific Northwest (*Rubus armeniacus (R. discolor, R. procerus*)). Edited by Brian Lipinski. The Nature Conservancy.
tncweeds.ucdavis.edu/moredocs/rubarm01.pdf

Starr, F., Starr, K. and L. Loope. 2003. *Rubus discolor*, Himalayan blackberry, Rosaceae. United States Geological Survey—Biological Resources Division, Haleakala Field Station, Maui, Hawai'i.

USDA, NRCS. 2008. The PLANTS Database (http://plants.usda.gov, 24 April 2008). National Plant Data Center, Baton Rouge, LA 70874-4490 USA.

Tirmenstein, D. 1989. *Rubus discolor*. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: http://www.fs.fed.us/database/feis/ [2008, April 27].

Warner, P.J. 2004. *Rubus armeniacus* (Focke). Plant Assessment Form. sbsc.wr.usgs.gov/research/projects/swepic/SWVMA/**PLANT**PDF/**Rubus**_armeniacus_AZ_PAF.pdf