

# Pest Risk Assessment for Rock Snot (Didymo) in Oregon

## IDENTITY

Name: *Didymosphenia geminata*

Taxonomic Position: kingdom: Plantae, division: Bacillariophyta, order: Cymbellales

Common Names: Didymo, rock snot

## RISK RATING SUMMARY

**Relative Risk Rating: HIGH**

**Numerical Score: 6 (on a 1-9 scale)**

**Uncertainty: MODERATE\***

\* Status of this species in Oregon is uncertain – no official EPA record exists but anecdotal claims are present. Uncertainty exists as to whether or not North American blooms are caused by native diatoms under anthropomorphic stressors or by a new strain of didymo. Triggers for nuisance blooms are unknown and its impacts at low densities are unknown as are long-term impacts to fish communities in high bloom areas.

## What is Rock Snot?

Rock Snot or didymo (*Didymosphenia geminata*) is a freshwater microscopic diatom (a type of singled-celled algae with silica cell walls) garnering attention for its ability to form massive nuisance “blooms” that carpet stream beds, altering biological and physical conditions. Under nuisance bloom conditions didymo produce copious extracellular stalks, used to attach to rocks and plants, which form dense mats 1 to 5 inches thick and trail downstream. Nuisance blooms are defined by the EPA as **masses of cells and stalks that extend for greater than 1 km and persist for several months of the year** (Spaulding and Elwell 2007). Didymo mats are frequently described as looking like shag carpeting or sewage spills with trailing fronds of toilet paper ranging. Although its colorful common name suggests otherwise, didymo is not slimy and, in fact, can be differentiated from native algal species by feel. Native species feel wet and are slippery to the touch while didymo feels rough like wet cotton wool or felt.

Recommended photos:

<http://www.biosecurity.govt.nz/pests/didymo/photos>

## CONCLUSION

Heightened awareness of didymo was spurred in 2004 by high-profile blooms in New Zealand rivers and streams. Although didymo itself may be a native to parts of North America, nuisance blooms have been increasing in frequency and duration and show increased tolerance of habitat types. The lack of confirmed presence of didymo in the state along with potentially high economic impacts to Oregon rivers and streams make this nuisance species a species of concern for managers in the state. It is recommended that managers continue to consider this a high profile species to prevent the introduction and establishment of this species and/or trigger the reporting of any nuisance blooms that might be in the state. Anglers, boaters and the general public need to be aware of this potential threat and take appropriate measures (cleaning gear, draining water from live wells, etc.) to reduce the introduction and spread of this species because there are no control or eradication options once established.

## RISK RATING DETAILS

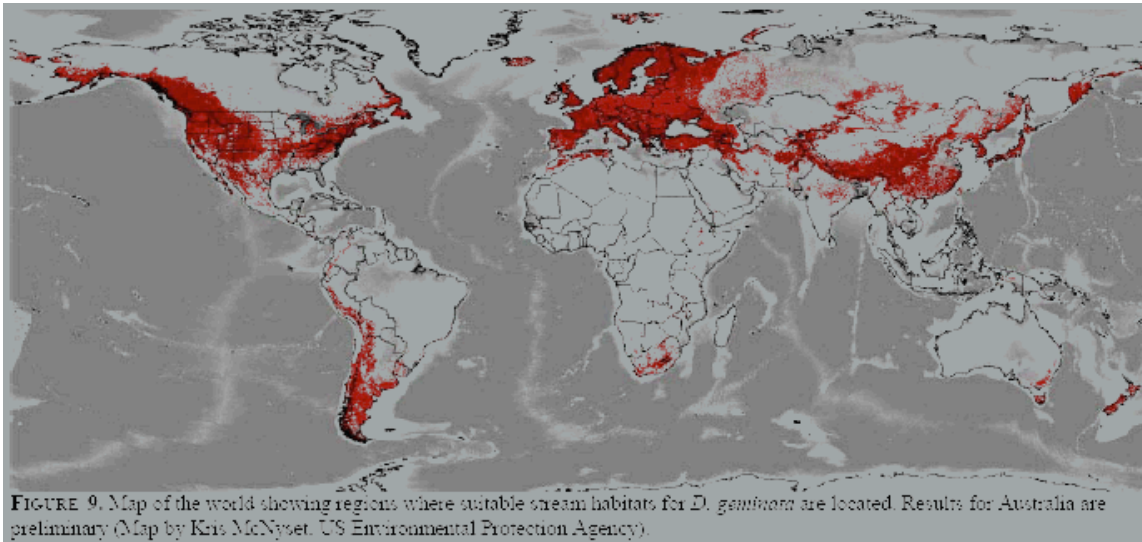
### Establishment Potential is HIGH

**Justification:** Didymo has not been officially confirmed by the EPA from any locations in the state of Oregon and no nuisance blooms have been reported here (Spaulding and Elwell 2007). Didymo is described as circumboreal in the Northern Hemisphere but records of didymo from North America are sparse and distribution estimates are debatable. Genetic analyses are underway to determine if nuisance blooms (and the New Zealand invasion) are the result of a new strain of didymo rather than by a native species that has become a nuisance due to habitat alteration or other anthropogenic effect.

Although, historically, didymo was considered to have a narrow environmental tolerance (preferring cold, low-nutrient waters), recent observations of didymo, both in its native and introduced ranges, indicates that it has greatly expanded its tolerance of both physical and chemical water quality parameters (Spaulding and Elwell 2007). Didymo thrives in a wide range of hydraulic conditions, from slow-moving, shallow waters to fast moving and/or deeper waters (Kilroy et al. 2005). Spaulding and Elwell (2007) report didymo presence in Western US waters ranging from 4 to 27 °C and in both high and low nitrate and phosphorus conditions. Common characteristics of rivers that have been affected by didymo blooms in North America include (Scientific Advisory Committee on *Didymosphenia geminata* 2007):

- Stable rocky substrate
- High light exposure
- Clear, low nutrient water
- Significant fishing pressure

Rivers, streams and lakes throughout Oregon could provide suitable habitat for both didymo and nuisance blooms of Didymo (See map of suitable stream habitat developed by the EPA from Spaulding and Elwell 2007)). Triggers for nuisance blooms remain unknown (Spaulding and Elwell 2007, Kilroy et al. 2005) but conditions that may favor blooms include flooding, increased nutrient loading, water flow and temperature changes caused by impoundments. However, blooms have also been found in unregulated, low nutrient, cold and fast flowing streams.



No control or eradication methods are currently available for this species. Preventing the introduction of this species is the only available management tool. Cleaning gear before traveling between bodies of water is the only way to prevent the spread and subsequent introduction of didymo into new water bodies. Drying gear for a minimum of 48 hours between uses is recommended.

### Spread Potential is HIGH

**Justification:** Research by Kilroy et al. (2005, 2006) found that individual didymo cells are able to “survive and remain viable in cool, damp, dark conditions for at least 40 days” and that fishing equipment, especially felt soled wading boots, are particularly suitable vectors for the spread of this species. Any vector that transports water from location to location (from ballast water to live well water) could also be implicated in the transport and introduction of this species. Although no reports of nuisance didymo blooms have been reported in Oregon, neighboring states of Washington, Idaho and California have all had multiple reports of nuisance didymo populations. The high risk of didymo introduction and spread is due to several factors: it can be transported readily by anglers and other recreationists from system to system (as well as via flowing water); it is present in neighboring states; suitable habitat is plentiful and, lastly, several other aquatic invasive species have been introduced into Oregon waters via similar vectors in the past decade (ex. New Zealand mudsnail).

### Environmental Impact Potential is LOW (with some uncertainty)

**Justification:** Although didymo can occur in both lentic and lotic systems, nuisance blooms have only been reported in rivers and streams (Spaulding and Elwell 2007). These nuisance blooms can cause temporal (and spatial) changes in water chemistry, hydrology (flow), dissolved oxygen, invertebrate abundance and diversity in areas where blooms occur (Spaulding and Elwell 2007). In New Zealand Kilroy et al. (2005) found a higher abundance of invertebrates in areas affected by didymo blooms but found that these invertebrate populations were both more homogenous than neighboring communities and contained more species considered tolerant of or indicative of polluted or degraded habitat. Researchers in New Zealand found no evidence of long-term didymo impacts to trout population growth parameters (Shearer 2007) but cautioned that a longer study period may be needed to determine impacts on fish

populations. To date no impacts have been observed on adult or juvenile salmonid species in North America or Europe (Scientific Advisory Committee on *Didymosphenia geminata* 2007) although some have postulated that the sloughing of the silica rich cells could be an irritant to the gills of fish species and cause movement of some species away from infested areas (Kilroy 2004). The presence of listed threatened and endangered salmon and trout stocks in Oregon rivers and streams is cause for concern should longer-term studies find negative effects of didymo blooms.

Unlike other algal mats, blooms of didymo are not oxygen poor but rather supersaturated compared to surrounding water possibly due to a unique co-existing bacterial community (Spaulding and Elwell 2007). More research on this phenomenon is needed.

### **Economic Impact Potential is MODERATE to HIGH**

**Justification:** Although didymo may have limited impact to recreationally important fish populations nuisance didymo blooms can still have a significant impact on recreational fishing. Extensive mats of didymo or rock snot on stream beds are aesthetically displeasing causing them to appear polluted and degraded and can make wading based angling more challenging (rocks covered with didymo mats are slippery and mats make it difficult to determine the topography of a stream bed). Impacts of these blooms are likely to be highly localized driving away users during the months when these blooms persist. Fishing lures, anchors and other boating and fishing equipment may become fouled with didymo and require additional gear cleaning time. Other recreationists such as rafters may also react adversely to the presence of blooms. Bloom timing and even presence/absence is unpredictable from year to year and thus the popularity of these locations may plummet and impacts of the blooms may last longer than the blooms themselves if these destinations become known as rock snot infested areas and avoided by both locals and tourists. Didymo infestations in the state may also be an additional blow to the already declining number of fishing licenses purchased annually.

Other economic impacts of didymo include increased fouling of screens on water intake infrastructure such as irrigation pipes, municipal water users and hydropower facilities (Branson 2006). Self-cleaning screens are more expensive than conventional screens, didymo may decrease the overall life of screen by two years and may still require increased maintenance in areas where blooms are common (Branson 2006).

### **Human Health Impact Potential is LOW**

**Justification:** Didymo is not considered a significant human health risk (EPA 2007) although people swimming in waters downstream of areas with high concentrations of didymo have complained of eye irritation (possibly due to the silica cell walls) (Scientific Advisory Committee on *Didymosphenia geminata* 2007). Didymo mats may also be responsible for increased injuries caused by slippery rocks and other areas of poor footing for wading based fishing (Branson 2006)

## **BIBLIOGRAPHY**

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## **FORMAT**

This pest risk assessment (PRA) is based on the format used by the Exotic Forest Pest Information System for North America. For a description of the evaluation process used, see Step 3 – Pest Risk Assessment under Guidelines at:  
<<http://spfnic.fs.fed.us/exfor/download.cfm>>

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**DATE:** January 15, 2009