

NEW YORK

NON-NATIVE PLANT INVASIVENESS RANKING FORM

Scientific name:	Rumex acetosella	USDA Plants Code: RUAC3
Common names:	Sheep sorrel	
Native distribution:	Europe, Asia, North Africa	
Date assessed:	June 9, 2008	
Assessors:	Steve Clemants, Gerry Moore	
Reviewers:	LIISMA SRC	
Date Approved:	10-08-2008	Form version date: 25 August 2008

New York Invasiveness Rank: Moderate (Relative Maximum Score 50.00-69.99)

Distribution and Invasiveness Rank (<i>Obtain from PRISM invasiveness ranking form</i>)		
	Status of this species in each PRISM:	PRISM Invasiveness Rank
1	Adirondack Park Invasive Program	Not Assessed
2	Capital/Mohawk	Not Assessed
3	Catskill Regional Invasive Species Partnership	Not Assessed
4	Finger Lakes	Not Assessed
5	Long Island Invasive Species Management Area	Widespread
6	Lower Hudson	Not Assessed
7	Saint Lawrence/Eastern Lake Ontario	Not Assessed
8	Western New York	Not Assessed


Invasiveness Ranking Summary (see details under appropriate sub-section)		Total (Total Answered*) Possible	Total
1	Ecological impact	40 (<u>20</u>)	6
2	Biological characteristic and dispersal ability	25 (<u>25</u>)	16
3	Ecological amplitude and distribution	25 (<u>25</u>)	23
4	Difficulty of control	10 (<u>10</u>)	8
	Outcome score	100 (<u>80</u>) ^b	53 ^a
	Relative maximum score †		66.25
	New York Invasiveness Rank §	Moderate (Relative Maximum Score 50.00-69.99)	

* For questions answered “unknown” do not include point value in “Total Answered Points Possible.” If “Total Answered Points Possible” is less than 70.00 points, then the overall invasive rank should be listed as “Unknown.”

† Calculated as 100(a/b) to two decimal places.

§ Very High >80.00; High 70.00–80.00; Moderate 50.00–69.99; Low 40.00–49.99; Insignificant <40.00

A. DISTRIBUTION (KNOWN/POTENTIAL): Summarized from individual PRISM forms

<p>A1.1. Has this species been documented to persist without cultivation in NY? (reliable source; voucher not required)</p> <p><input checked="" type="checkbox"/> Yes – continue to A1.2</p> <p><input type="checkbox"/> No – continue to A2.1</p> <p>A1.2. In which PRISMs is it known (see inset map)?</p> <p><input checked="" type="checkbox"/> Adirondack Park Invasive Program</p> <p><input checked="" type="checkbox"/> Capital/Mohawk</p> <p><input checked="" type="checkbox"/> Catskill Regional Invasive Species Partnership</p> <p><input checked="" type="checkbox"/> Finger Lakes</p> <p><input checked="" type="checkbox"/> Long Island Invasive Species Management Area</p> <p><input checked="" type="checkbox"/> Lower Hudson</p> <p><input checked="" type="checkbox"/> Saint Lawrence/Eastern Lake Ontario</p> <p><input checked="" type="checkbox"/> Western New York</p>	 <p style="font-size: small;">Partnerships for Regional Invasive Species Management 2008</p>
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NEW YORK

NON-NATIVE PLANT INVASIVENESS RANKING FORM

Documentation:

Sources of information:

Weldy & Werier, 2005; Brooklyn Botanic Garden, 2008.

A2.1. What is the likelihood that this species will occur and persist given the climate in the following PRISMs? (obtain from PRISM invasiveness ranking form)

Not Assessed	Adirondack Park Invasive Program
Not Assessed	Capital/Mohawk
Not Assessed	Catskill Regional Invasive Species Partnership
Not Assessed	Finger Lakes
Very Likely	Long Island Invasive Species Management Area
Not Assessed	Lower Hudson
Not Assessed	Saint Lawrence/Eastern Lake Ontario
Not Assessed	Western New York

Documentation:

Sources of information (e.g.: distribution models, literature, expert opinions):

Weldy & Werier, 2005; Brooklyn Botanic Garden, 2008.

If the species does not occur and is not likely to occur with any of the PRISMs, then stop here as there is no need to assess the species.

A2.2. What is the current distribution of the species in each PRISM? (obtain rank from PRISM invasiveness ranking forms)

	Distribution
Adirondack Park Invasive Program	Not Assessed
Capital/Mohawk	Not Assessed
Catskill Regional Invasive Species Partnership	Not Assessed
Finger Lakes	Not Assessed
Long Island Invasive Species Management Area	Widespread
Lower Hudson	Not Assessed
Saint Lawrence/Eastern Lake Ontario	Not Assessed
Western New York	Not Assessed

Documentation:

Sources of information:

Weldy & Werier, 2005; Brooklyn Botanic Garden, 2008.

A2.3. Describe the potential or known suitable habitats within New York. Natural habitats include all habitats not under active human management. Managed habitats are indicated with an asterisk.

<p>Aquatic Habitats</p> <p><input type="checkbox"/> Salt/brackish waters</p> <p><input type="checkbox"/> Freshwater tidal</p> <p><input type="checkbox"/> Rivers/streams</p> <p><input type="checkbox"/> Natural lakes and ponds</p> <p><input type="checkbox"/> Vernal pools</p> <p><input type="checkbox"/> Reservoirs/impoundments*</p>	<p>Wetland Habitats</p> <p><input type="checkbox"/> Salt/brackish marshes</p> <p><input checked="" type="checkbox"/> Freshwater marshes</p> <p><input type="checkbox"/> Peatlands</p> <p><input type="checkbox"/> Shrub swamps</p> <p><input checked="" type="checkbox"/> Forested wetlands/riparian</p> <p><input checked="" type="checkbox"/> Ditches*</p> <p><input checked="" type="checkbox"/> Beaches and/or coastal dunes</p>	<p>Upland Habitats</p> <p><input checked="" type="checkbox"/> Cultivated*</p> <p><input checked="" type="checkbox"/> Grasslands/old fields</p> <p><input type="checkbox"/> Shrublands</p> <p><input checked="" type="checkbox"/> Forests/woodlands</p> <p><input type="checkbox"/> Alpine</p> <p><input checked="" type="checkbox"/> Roadsides*</p>
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Other potential or known suitable habitats within New York:

Documentation:

Sources of information:

Weldy & Werier, 2005; Cordeiro, 2006; Brooklyn Botanic Garden, 2008.

**NEW YORK
NON-NATIVE PLANT INVASIVENESS RANKING FORM**

B. INVASIVENESS RANKING

1. ECOLOGICAL IMPACT

1.1. Impact on Natural Ecosystem Processes and System-Wide Parameters (e.g. fire regime, geomorphological changes (erosion, sedimentation rates), hydrologic regime, nutrient and mineral dynamics, light availability, salinity, pH)

- A. No perceivable impact on ecosystem processes based on research studies, or the absence of impact information if a species is widespread (>10 occurrences in minimally managed areas), has been well-studied (>10 reports/publications), and has been present in the northeast for >100 years. 0
- B. Influences ecosystem processes to a minor degree (e.g., has a perceivable but mild influence on soil nutrient availability) 3
- C. Significant alteration of ecosystem processes (e.g., increases sedimentation rates along streams or coastlines, reduces open water that are important to waterfowl) 7
- D. Major, possibly irreversible, alteration or disruption of ecosystem processes (e.g., the species alters geomorphology and/or hydrology, affects fire frequency, alters soil pH, or fixes substantial levels of nitrogen in the soil making soil unlikely to support certain native plants or more likely to favor non-native species) 10
- U. Unknown

Score

U

Documentation:
 Identify ecosystem processes impacted (or if applicable, justify choosing answer A in the absence of impact information)
 No perceived impacts, was a very early introduced species, but not well-studied. Cordeiro (2006) stated the following: "Little is known about the effect of this species on ecosystem processes, but considering it does have some significant effects on community structure and individual natives, it is likely the species may have limited negative effects on ecosystem processes."
 Sources of information:
 Grime et al., 1988; Mack & Erneberg, 2002; Cordeiro, 2006.

1.2. Impact on Natural Community Structure

- A. No perceived impact; establishes in an existing layer without influencing its structure 0
- B. Influences structure in one layer (e.g., changes the density of one layer) 3
- C. Significant impact in at least one layer (e.g., creation of a new layer or elimination of an existing layer) 7
- D. Major alteration of structure (e.g., covers canopy, eradicating most or all layers below) 10
- U. Unknown

Score

3

Documentation:
 Identify type of impact or alteration:
 Sometimes forms dense colonies in herb layer with deep root systems. No evidence that it creates a new layer or eliminates an old layer. In Fire Island it can dominate the herb layer in patches (Dowhan & Rozsa, 1989).
 Sources of information:
 Grime et al., 1988; Dowhan & Rozsa, 1989; Cordeiro, 2006.

1.3. Impact on Natural Community Composition

- A. No perceived impact; causes no apparent change in native populations 0
- B. Influences community composition (e.g., reduces the number of individuals in one or more native species in the community) 3
- C. Significantly alters community composition (e.g., produces a significant reduction in the population size of one or more native species in the community) 7
- D. Causes major alteration in community composition (e.g., results in the extirpation of one or

**NEW YORK
NON-NATIVE PLANT INVASIVENESS RANKING FORM**

several native species, reducing biodiversity or change the community composition towards species exotic to the natural community)

U. Unknown

Score

3

Documentation:

Identify type of impact or alteration:

Sometimes forms dense colonies crowding out native vegetation where it occurs.

Sources of information:

Hitchcock & Cronquist, 1973; Great Plain Flora Association, 1986; Dowhan & Rozsa, 1989; Cordeiro, 2006.

1.4. Impact on other species or species groups (cumulative impact of this species on the animals, fungi, microbes, and other organisms in the community it invades. Examples include reduction in nesting/foraging sites; reduction in habitat connectivity; injurious components such as spines, thorns, burrs, toxins; suppresses soil/sediment microflora; interferes with native pollinators and/or pollination of a native species; hybridizes with a native species; hosts a non-native disease which impacts a native species)

- A. Negligible perceived impact 0
- B. Minor impact 3
- C. Moderate impact 7
- D. Severe impact on other species or species groups 10
- U. Unknown

Score

U

Documentation:

Identify type of impact or alteration:

This species is known to poison livestock, and possibly native ungulates, if sufficient quantities are consumed (Czarapata, 2005; Uva et al., 1997; Esser, 1995). Mule deer are known to graze on sheep sorrel in California and Ohio (Krueger & Donart, 1974; Nixon et al., 1970), but effects have not been studied. No studies have been are known on its direct on native flora or fauna.

Sources of information:

Grime et al., 1988; Cordeiro, 2006.

Total Possible

20

Section One Total

6

2. BIOLOGICAL CHARACTERISTICS AND DISPERSAL ABILITY

2.1. Mode and rate of reproduction (provisional thresholds, more investigation needed)

- A. No reproduction by seeds or vegetative propagules (i.e. plant sterile with no sexual or asexual reproduction). 0
- B. Limited reproduction (fewer than 10 viable seeds per plant AND no vegetative reproduction; if viability is not known, then maximum seed production is less than 100 seeds per plant and no vegetative reproduction) 1
- C. Moderate reproduction (fewer than 100 viable seeds per plant - if viability is not known, then maximum seed production is less than 1000 seeds per plant - OR limited successful vegetative spread documented) 2
- D. Abundant reproduction with vegetative asexual spread documented as one of the plants prime reproductive means OR more than 100 viable seeds per plant (if viability is not known, then maximum seed production reported to be greater than 1000 seeds per plant.) 4
- U. Unknown

Score

4

**NEW YORK
NON-NATIVE PLANT INVASIVENESS RANKING FORM**

Documentation: Describe key reproductive characteristics (including seeds per plant): Dioecious but produces up to 1600 seeds per ramet, also reproduces by creeping roots. Sources of information: Escarre & Thompson, 1991; Grime et al., 1988; Esser, 1995; Uva et al., 1997; Czarapata, 2005; Cordeiro, 2006.	
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2.2. Innate potential for long-distance dispersal (e.g. bird dispersal, sticks to animal hair, buoyant fruits, pappus for wind-dispersal)

- | | |
|---|---|
| A. Does not occur (no long-distance dispersal mechanisms) | 0 |
| B. Infrequent or inefficient long-distance dispersal (occurs occasionally despite lack of adaptations) | 1 |
| C. Moderate opportunities for long-distance dispersal (adaptations exist for long-distance dispersal, but studies report that 95% of seeds land within 100 meters of the parent plant) | 2 |
| D. Numerous opportunities for long-distance dispersal (adaptations exist for long-distance dispersal and evidence that many seeds disperse greater than 100 meters from the parent plant) | 4 |
| U. Unknown | |

Score 2

Documentation: Identify dispersal mechanisms: Able to germinate after being eaten by birds, cattle, horses and pigs but no special adaptation for long distance dispersal. Sources of information: Ridley, 1930; Grime et al., 1988; Cordeiro, 2006.	
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2.3. Potential to be spread by human activities (both directly and indirectly – possible mechanisms include: commercial sales, use as forage/revegetation, spread along highways, transport on boats, contaminated compost, land and vegetation management equipment such as mowers and excavators, etc.)

- | | |
|--|---|
| A. Does not occur | 0 |
| B. Low (human dispersal to new areas occurs almost exclusively by direct means and is infrequent or inefficient) | 1 |
| C. Moderate (human dispersal to new areas occurs by direct and indirect means to a moderate extent) | 2 |
| D. High (opportunities for human dispersal to new areas by direct and indirect means are numerous, frequent, and successful) | 3 |
| U. Unknown | |

Score 2

Documentation: Identify dispersal mechanisms: Seeds contaminate in agricultural crops and peat. Also, possibly spread by mowers. Sources of information: Grime et al., 1988; Mack & Erneberg, 2002.	
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2.4. Characteristics that increase competitive advantage, such as shade tolerance, ability to grow on infertile soils, perennial habit, fast growth, nitrogen fixation, allelopathy, etc.

- | | |
|--|---|
| A. Possesses no characteristics that increase competitive advantage | 0 |
| B. Possesses one characteristic that increases competitive advantage | 3 |
| C. Possesses two or more characteristics that increase competitive advantage | 6 |
| U. Unknown | |

Score 6

Documentation:	
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**NEW YORK
NON-NATIVE PLANT INVASIVENESS RANKING FORM**

Evidence of competitive ability: Grows in relatively infertile soils, has unusually high potential relative growth rate, perennial.	
Sources of information: Grime et al., 1988; Cordeiro, 2006; authors' personal observations.	

2.5. Growth vigor

- | | |
|--|---|
| A. Does not form thickets or have a climbing or smothering growth habit | 0 |
| B. Has climbing or smothering growth habit, forms a dense layer above shorter vegetation, forms dense thickets, or forms a dense floating mat in aquatic systems where it smothers other vegetation or organisms | 2 |
| U. Unknown | |
| Score | 0 |

Documentation: Describe growth form: Low growing, not thicket forming.	
Sources of information: Cordeiro, 2006; authors' personal observations.	

2.6. Germination/Regeneration

- | | |
|--|---|
| A. Requires open soil or water and disturbance for seed germination, or regeneration from vegetative propagules. | 0 |
| B. Can germinate/regenerate in vegetated areas but in a narrow range or in special conditions | 2 |
| C. Can germinate/regenerate in existing vegetation in a wide range of conditions | 3 |
| U. Unknown (No studies have been completed) | |
| Score | 2 |

Documentation: Describe germination requirements: Germinates well between 16 and 36 degrees C but generally requires open soil for germination.	
Sources of information: Grime et al., 1988; Putwain et al., 1968.	

2.7. Other species in the genus invasive in New York or elsewhere

- | | |
|------------|---|
| A. No | 0 |
| B. Yes | 3 |
| U. Unknown | |
| Score | 0 |

Documentation: Species: Rumex acetosa, R. crispus but none currently classified as invasive.	
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Total Possible	25
Section Two Total	16

3. ECOLOGICAL AMPLITUDE AND DISTRIBUTION

3.1. Density of stands in natural areas in the northeastern USA and eastern Canada (use same definition as Gleason & Cronquist which is: "The part of the United States covered extends from the Atlantic Ocean west to the western boundaries of Minnesota, Iowa, northern Missouri, and southern Illinois, south to the southern boundaries of Virginia, Kentucky, and Illinois, and south to the Missouri River in Missouri. In Canada the area covered includes Nova Scotia, Prince Edward Island, New Brunswick, and parts of Quebec and Ontario lying south of the 47th parallel of

**NEW YORK
NON-NATIVE PLANT INVASIVENESS RANKING FORM**

latitude”)

- A. No large stands (no areas greater than 1/4 acre or 1000 square meters) 0
- B. Large dense stands present in areas with numerous invasive species already present or disturbed landscapes 2
- C. Large dense stands present in areas with few other invasive species present (i.e. ability to invade relatively pristine natural areas) 4
- U. Unknown

Score

Documentation:

Identify reason for selection, or evidence of weedy history:
On Fire Island, often forming dominant herbaceous layer exceeding 1/4 acre.
Sources of information:
Dowhan & Rozsa, 1989; author's (Moore's) personal observations.

3.2. Number of habitats the species may invade

- A. Not known to invade any natural habitats given at A2.3 0
- B. Known to occur in two or more of the habitats given at A2.3, with at least one a natural habitat. 1
- C. Known to occur in three or more of the habitats given at A2.3, with at least two a natural habitat. 2
- D. Known to occur in four or more of the habitats given at A2.3, with at least three a natural habitat. 4
- E. Known to occur in more than four of the habitats given at A2.3, with at least four a natural habitat. 6
- U. Unknown

Score

Documentation:

Identify type of habitats where it occurs and degree/type of impacts:
See A 2.3.
Sources of information:
Dowhan & Rozsa, 1989; Cordeiro, 2006; author's (Moore's) personal observations.

3.3. Role of disturbance in establishment

- A. Requires anthropogenic disturbances to establish. 0
- B. May occasionally establish in undisturbed areas but can readily establish in areas with natural or anthropogenic disturbances. 2
- C. Can establish independent of any known natural or anthropogenic disturbances. 4
- U. Unknown

Score

Documentation:

Identify type of disturbance:
Generally a weed of turf and gardens but can invade areas with natural disturbance.
Sources of information:
Dowhan & Rozsa, 1989; Cordeiro, 2006.

3.4. Climate in native range

- A. Native range does not include climates similar to New York 0
- B. Native range possibly includes climates similar to at least part of New York. 1
- C. Native range includes climates similar to those in New York 3
- U. Unknown

Score

Documentation:

Describe what part of the native range is similar in climate to New York:
Similar climates in Europe, growing as far north as Finland.

**NEW YORK
NON-NATIVE PLANT INVASIVENESS RANKING FORM**

Sources of information:

Brooklyn Botanic Garden, 2008.

3.5. Current introduced distribution in the northeastern USA and eastern Canada (see question 3.1 for definition of geographic scope)

- | | | |
|----|---|---|
| A. | Not known from the northeastern US and adjacent Canada | 0 |
| B. | Present as a non-native in one northeastern USA state and/or eastern Canadian province. | 1 |
| C. | Present as a non-native in 2 or 3 northeastern USA states and/or eastern Canadian provinces. | 2 |
| D. | Present as a non-native in 4–8 northeastern USA states and/or eastern Canadian provinces, and/or categorized as a problem weed (e.g., “Noxious” or “Invasive”) in 1 northeastern state or eastern Canadian province. | 3 |
| E. | Present as a non-native in >8 northeastern USA states and/or eastern Canadian provinces, and/or categorized as a problem weed (e.g., “Noxious” or “Invasive”) in 2 northeastern states or eastern Canadian provinces. | 4 |
| U. | Unknown | |

Score 4

Documentation:

Identify states and provinces invaded:

Throughout the U.S., including all of the Northeast.

Sources of information:

- See known introduced range in plants.usda.gov, and update with information from states and Canadian provinces.

U.S.D.A., 2008.

3.6. Current introduced distribution of the species in natural areas in the eight New York State PRISMs (Partnerships for Regional Invasive Species Management)

- | | | |
|----|--|---|
| A. | Present in none of the PRISMs | 0 |
| B. | Present in 1 PRISM | 1 |
| C. | Present in 2 PRISMs | 2 |
| D. | Present in 3 PRISMs | 3 |
| E. | Present in more than 3 PRISMs or on the Federal noxious weed lists | 4 |
| U. | Unknown | |

Score 4

Documentation:

Describe distribution:

Present in all PRISMs.

Sources of information:

Weldy & Werier, 2005; Brooklyn Botanic Garden, 2008.

Total Possible	25
Section Three Total	23

4. DIFFICULTY OF CONTROL

4.1. Seed banks

- | | | |
|----|--|---|
| A. | Seeds (or vegetative propagules) remain viable in soil for less than 1 year, or does not make viable seeds or persistent propagules. | 0 |
| B. | Seeds (or vegetative propagules) remain viable in soil for at least 1 to 10 years | 2 |
| C. | Seeds (or vegetative propagules) remain viable in soil for more than 10 years | 3 |
| U. | Unknown | |
-

**NEW YORK
NON-NATIVE PLANT INVASIVENESS RANKING FORM**

Score

3

Documentation:

Identify longevity of seed bank:

Creates a persistent seed bank; viable seed found in soil under 80 year forests with no apparent nearby sources.

Sources of information:

Chippindale & Milton, 1934; Grime et al., 1988; Livingston & Allesio, 1968.

4.2. Vegetative regeneration

- | | | |
|----|---|---|
| A. | No regrowth following removal of aboveground growth | 0 |
| B. | Regrowth from ground-level meristems | 1 |
| C. | Regrowth from extensive underground system | 2 |
| D. | Any plant part is a viable propagule | 3 |
| U. | Unknown | |

Score

2

Documentation:

Describe vegetative response:

Relatively deep root system, forming extensive patches by producing adventitious buds on horizontal roots, which can regrow upon cutting.

Sources of information:

Grime et al., 1988; Cordeiro, 2006.

4.3. Level of effort required

- | | | |
|----|---|---|
| A. | Management is not required: e.g., species does not persist without repeated anthropogenic disturbance. | 0 |
| B. | Management is relatively easy and inexpensive: e.g. 10 or fewer person-hours of manual effort (pulling, cutting and/or digging) can eradicate a 1 acre infestation in 1 year (infestation averages 50% cover or 1 plant/100 ft ²). | 2 |
| C. | Management requires a major short-term investment: e.g. 100 or fewer person-hours/year of manual effort, or up to 10 person-hours/year using mechanical equipment (chain saws, mowers, etc.) for 2-5 years to suppress a 1 acre infestation. Eradication is difficult, but possible (infestation as above). | 3 |
| D. | Management requires a major investment: e.g. more than 100 person-hours/year of manual effort, or more than 10 person hours/year using mechanical equipment, or the use of herbicide, grazing animals, fire, etc. for more than 5 years to suppress a 1 acre infestation. Eradication may be impossible (infestation as above). | 4 |
| U. | Unknown | |

Score

3

Documentation:

Identify types of control methods and time-term required:

Somewhat difficult to eradicate because of extensive root system and seed bank but infestations tend to be small. Chemical treatment (Dicamba) is generally effective. Species can survive fires.

Sources of information:

Agricultural Research Service, 1970; Fitzsimmons & Burrill, 1993; Esser, 1995; Czarapata 2005.

Total Possible	10
Section Four Total	8

Total for 4 sections Possible	80
Total for 4 sections	53

C. STATUS OF CULTIVARS AND HYBRIDS:

NEW YORK

NON-NATIVE PLANT INVASIVENESS RANKING FORM

At the present time (May 2008) there is no protocol or criteria for assessing the invasiveness of cultivars independent of the species to which they belong. Such a protocol is needed, and individuals with the appropriate expertise should address this issue in the future. Such a protocol will likely require data on cultivar fertility and identification in both experimental and natural settings.

Hybrids (crosses between different parent species) should be assessed individually and separately from the parent species wherever taxonomically possible, since their invasiveness may differ from that of the parent species. An exception should be made if the taxonomy of the species and hybrids are uncertain, and species and hybrids can not be clearly distinguished in the field. In such cases it is not feasible to distinguish species and hybrids, and they can only be assessed as a single unit.

1.1. Potential pathways of introduction into and within New York

Describe the potential pathways by which this species may be introduced into New York or may be spread within New York (e.g., natural migration, spread through canal system, movement of contaminated soil, etc):

Spread via contamination of seed and soil and by birds.

Sources of information:

Mack & Erneberg 2002, Grime et al., 1988

1.2. Likelihood of survival and spread within each pathways

Describe the likelihood of this species to survive and spread within the various pathways mentioned above, including any thoughts about whether multiple introductions may be required before species becomes establish or is a single introduction will likely be successful:

Very likely to continue to spread.

Sources of information:

2. KNOWN BENEFITS

2.1. Benefits this species provides

By definition, a non-native species must cause more harm than good before it is considered invasive. Even the worst species may provide some sort of ecosystem service (e.g., nesting habitat for common birds, erosion control, and landscape beautification). To ensure that all the benefits are weighed against the negative impacts, list the potential benefits this species provides. Weigh the benefits of this invasive species against the benefits provided by those native species that would typically be present in the habitat, in the absence of the invasive species:

Leaf extracts used in herbal medicine and leaves may be eaten (though potentially poisonous).

Sources of information:

3. ECONOMIC IMPACTS

3.1. Potential economic impacts (e.g., potential to reduce crop yields, lower commodity values, lower real estate value, limit recreational opportunities, cause loss of markets for US goods, etc)

- A. Negligible perceived impact
- B. Causes minor damage or requires minimal output to prevent economic impacts
- C. Damage significant but economic costs attributed to this species has been estimated at less than \$1 million annually or studies indicate that potential damage could result in impacts less than \$10 million

**NEW YORK
NON-NATIVE PLANT INVASIVENESS RANKING FORM**

- D. Damage attributed to this species has been estimated at more than \$1 million annually or studies indicate that the potential damage could result in impacts greater than \$10 million
- U. Unknown

Documentation:

Identify type of impact or alteration:

A

Sources of information:

4. HUMAN HEALTH IMPACTS

4.1. Potential human health impacts

- A. Negligible perceived impact
- B. Known to cause human health problems, but full recover
- C. Documented cases where this species has caused permanent bodily harm, health issues, or death.
- U. Unknown

Documentation:

Identify type of impact or alteration:

None known

Sources of information:

References for species assessment:

Agricultural Research Service. 1970. Common weeds of the United States. Agricultural Research Service, U.S. Department of Agriculture. Washington, D.C. 463 pp.

Brooklyn Botanic Garden. 2008. AILANTHUS database. [Accessed on June 4, 2008.]

Cordeiro, J. 2006. Rumex acetosella. U.S. Invasive Species Impact Rank (I-Rank). NatureServe Explorer. <www.natureserve.org>. [Accessed on September 4, 2008.]

Czarapata, E.J. 2005. Invasive plants of the Upper Midwest, an Illustrated Guide to their Identification and Control. p. 113-114.

Dowhan, J.J. and R. Rozsa. 1989. Flora of Fire Island, Suffolk County, New York. Bulletin of the Torrey Botanical Club 116(3): 265-282.

Escarre, H. and C. Houssard. 1988. Aptitudes germinatives comparées de graines de Rumex acetosella issues de populations correspondant à des stades distincts d'une succession postculturale = Comparative study of seed germinability in Rumex acetosella from different successional status of the populations. Canadian Journal of Botany 66: 1381-1390.

Escarre, J. and J.D. Thomson. 1991. The effects of successional habitat variation and time of flowering on seed production in Rumex acetosella. Journal of Ecology 79(4): 1099-1112.

NEW YORK
NON-NATIVE PLANT INVASIVENESS RANKING FORM

Esser, LL. 1995. *Rumex acetosella*. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). <www.fs.fed.us/database/feis>. [June 9, 2008]

Fitzsimmons, J.P. and L.C. Burrill. 1993. Red sorrel: *Rumex acetosella* L. Weeds, A Pacific Northwest Extension Publication, 446. [unpaginated]

Great Plains Flora Association (R.L. McGregor, coordinator; T.M. Barkley, ed., R.E. Brooks and E.K. Schofield, associate eds.). 1986. *Flora of the Great Plains*. University Press of Kansas: Lawrence, Kansas. 1392 pp.

Grime, J.P., J.G. Hodgson, R. Hunt. 1988. *Comparative Plant Ecology: A Functional Approach to Common British Species*. Unwin Hyman, Ltd., London.

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Citation: This NY ranking form may be cited as: Jordan, M.J., G. Moore and T.W. Weldy. 2008. Invasiveness ranking system for non-native plants of New York. Unpublished. The Nature Conservancy, Cold Spring Harbor, NY; Brooklyn Botanic Garden, Brooklyn, NY; The Nature Conservancy, Albany, NY. Note that the order of authorship is alphabetical; all three authors contributed substantially to the development of this protocol.

Acknowledgments: The NY form incorporates components and approaches used in several other systems, cited in the references below. Valuable contributions by members of the Long Island Invasive Species Management Area's Scientific Review Committee were incorporated in revisions of this form. Original members of the LIISMA SRC included representatives of the Brooklyn Botanic Garden; The Nature Conservancy; New York Natural Heritage Program, New York Sea Grant; New York State Office of Parks, Recreation and Historic Preservation; National Park Service; Brookhaven National Laboratory; New York State Department of Environmental Conservation Region 1; Cornell Cooperative Extension of Suffolk/Nassau Counties; Long Island Nursery and Landscape Association; Long Island Farm Bureau; SUNY Farmingdale Ornamental Horticulture Department; Queens College Biology Department; Long Island Botanical Society; Long Island Weed Information Management System database manager; Suffolk County Department of Parks, Recreation and Conservation; Nassau County Department of Parks, Recreation and Museums; Suffolk County Soil & Water Conservation District.

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NON-NATIVE PLANT INVASIVENESS RANKING FORM

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