NEW YORK
NON-NATIVE PLANT INVASIVENESS RANKING FORM

Scientific name:	Ranunculus repens L.	USDA Plants Code: RARE3
Common names:	Creeping Butter-cup	
Native distribution:	Eurasia	
Date assessed:	May 8 2009	
Assessors:	Steve Glenn, Gerry Moore	
Reviewers:	LIISMA SRC	
Date Approved:	May 20, 2009	Form version date: 3 March 2009

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

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

Invasiveness Ranking Summary (see details under appropriate sub-section)		Total (Total Answered*) Possible	Total
1	Ecological impact	40 (30)	9
2	Biological characteristic and dispersal ability	25 (22)	20
3	Ecological amplitude and distribution	25 (25)	19
4	Difficulty of control	10 (10)	7
	Outcome score	100 (87)[b]	55[a]
	Relative maximum score †		63.22
	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

A1.1. Has this species been documented to persist without cultivation in NY? (reliable source; voucher not required)	
☒	Yes – continue to A1.2
☐	No – continue to A2.1
A1.2. In which PRISMs is it known (see inset map)?	
☒	Adirondack Park Invasive Program
☒	Capital/Mohawk
☒	Catskill Regional Invasive Species Partnership
☒	Finger Lakes
☒	Long Island Invasive Species Management Area
☒	Lower Hudson
☒	Saint Lawrence/Eastern Lake Ontario
☒	Western New York

Documentation:
Sources of information:
Brooklyn Botanic Garden, 2009; Weldy & Werier, 2009.

A2.1. What is the likelihood that this species will occur and persist outside of cultivation, 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):
Documented from the PRISM since the 1880s; suitability of habitats.

Lovett-Doust et al., 1990; Brooklyn Botanic Garden, 2009.

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	Common
Lower Hudson	Not Assessed
Saint Lawrence/Eastern Lake Ontario	Not Assessed
Western New York	Not Assessed

Documentation:
Sources of information:
Brooklyn Botanic Garden, 2009.

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.

Aquatic Habitats
- ☐ Salt/brackish waters
- ☐ Freshwater tidal
- ☐ Rivers/streams
- ☐ Natural lakes and ponds
- ☐ Vernal pools
- ☐ Reservoirs/impoundments*

Wetland Habitats
- ☒ Salt/brackish marshes
- ☒ Freshwater marshes
- ☐ Peatlands
- ☒ Shrub swamps
- ☒ Forested wetlands/riparian
- ☒ Ditches*
- ☒ Beaches and/or coastal dunes

Upland Habitats
- ☒ Cultivated*
- ☒ Grasslands/old fields
- ☒ Shrublands
- ☒ Forests/woodlands
- ☐ Alpine
- ☒ Roadsides*

Other potential or known suitable habitats within New York:
Lawns; marsh, pond and stream margins; wood margins and clearings.

Documentation:
Sources of information:
Author's personal observations; Lovett-Doust et al., 1990; Flora of North America Editorial Committee, 1997; He et al., 1999; Oliver, 2004; Brooklyn Botanic Garden, 2009.

B. INVASIVENESS RANKING

Questions apply to areas similar in climate and habitats to New York unless specified otherwise.

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: 3

Documentation:

Identify ecosystem processes impacted (or if applicable, justify choosing answer A in the absence of impact information)

Reported to seriously deplete soil of potassium and other elements.

Sources of information:

Lovett-Doust et al., 1990.

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:

Can form dense monocultural patches, changing the density of the low herb layer. Significant or major alterations not reported.

Sources of information:

Oliver, 2004.

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	7

population size of one or more native species in the community)

D. Causes major alteration in community composition (e.g., results in the extirpation of one or several native species, reducing biodiversity or change the community composition towards species exotic to the natural community) 10

U. Unknown

Score 3

Documentation:
Identify type of impact or alteration:
Can form dense patches, reducing numbers of native species. No evidence of significant or major alteration in composition.
Sources of information:
Oliver, 2004.

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:
No studies on the impact on other species located.
Sources of information:
Oliver, 2004.

Total Possible 30
Section One Total 9

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

Documentation:
Describe key reproductive characteristics (including seeds per plant):

Can develop large spreading clonal mats via creeping stolons. European studies found have found up to 12,000 viable seeds per square meter.
Sources of information:
Lovett-Doust et al., 1990.

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 4

Documentation:
Identify dispersal mechanisms:
Anemochory (wind dispersal), endozoochory (animal), epizoochory (animal), and hydrochory (water).
Sources of information:
Lovett-Doust et al., 1990; Oliver, 2004; Vogt et al., 2006.

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 1

Documentation:
Identify dispersal mechanisms:
Reportely dispersed by humans and their vehicles. A handful of cultivars available on the internet.
Sources of information:
Author's personal observations; Lovett-Doust et al., 1990

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:
Evidence of competitive ability:

Perennial; well adapted to a variety of substrate moisture regimes (including prolonged waterlogging and submergence- He et al., 1999), textures, and pH (Lovett-Doust et al., 1990; Silvertown et al., 2001; Lynn & Waldren, 2003).

Exhibits high vegetative plasticity seasonally (Hintikka, 1975) and in response to varing environmental conditions (Perovova & Gershunina, 1975; Lovett-Doust et al., 1990; Waite, 1994; He et al., 1999; van Kleunen & Fischer, 2001; Lynn & Waldren, 2001).

Also exhibits reproductive plasticity- one study found stands within less competative environments invested more into sexual reproduction (measured as proportion of ramets that flowered), whereas stands in more competative environments invested more into vegetative reproduction (Prtia & Schmid, 2000).

Possibly allelopathic (Lovett-Doust et al., 1990).
Sources of information:
Hintikka, 1975; Perovova & Gershunina, 1975; Lovett-Doust et al., 1990; Waite, 1994;He et al., 1999; Prati & Schmid, 2000; Lynn & Waldren, 2001; Silvertown et al., 2001; van Kleunen & Fischer, 2001; Lynn & Waldren, 2003.

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:
While R. repens can develop large spreading clonal mats via creeping stolons; it does not form a smothering or climbing habit.
Sources of information:
author's personal observations; Lovett-Doust et al., 1990

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: U

Documentation:
Describe germination requirements:
Germination enhanced by higher light and moisture, and temperature fluctuation regimes. One controlled study found germination rates approaching 90% (Thompson & Grime, 1983), but germination in the context of disturbance or vegetative competition was not addressed .
Sources of information:
Thompson & Grime, 1983; Lovett-Doust et al., 1990; Harris et al., 1998.

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

A.	No	0
B.	Yes	3
U.	Unknown	

Score: 3

Documentation:
Species:
Ranunculus ficaria is listed as invasive in New England. Ranunculus acris and R. bulbosus

reported from northeastrn North America and classified as "weedy"; but their true invasive status undetermined.

Flora of North America Editorial Committee, 1997; Mehrhoff et al., 2003; U.S.D.A., 2009; Weldy & Werier, 2009.

Total Possible 22
Section Two Total 20

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 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 0

Documentation:
Identify reason for selection, or evidence of weedy history:
While moderate-sized stands have been observed in the area; no large stands have been observed or reported.
Sources of information:
Author's personal observations; Oliver, 2004.

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 6

Documentation:
Identify type of habitats where it occurs and degree/type of impacts:
See A2.3.
Sources of information:
Brooklyn Botanic Garden, 2009.

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 2

Documentation:
Identify type of disturbance:
Usually found in disturbed habitats, recruitment of R. repens in established grassland or woodland communities is reportely rare. One European study of old field succession found that R. repens accelerating in early succession, then peaking at mid succession (about 10-12 years), then declining in frequency as succession maturized (Huisman et al., 1993). Not known to require anthropogenic disturbance.
Sources of information:
Lovett-Doust et al., 1990; Huisman et al., 1993.

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 3

Documentation:
Describe what part of the native range is similar in climate to New York:
Europe, as far north as Norway.
Sources of information:
Lovett-Doust et al., 1990

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:
Reported from all northeastern states and provinces.
Sources of information: See known introduced range in plants.usda.gov, and update with information from states and Canadian provinces.
Flora of North America Editorial Committee, 1997; U.S.D.A., 2009.

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:
All PRISMs; see A1.1.
Sources of information:
Brooklyn Botanic Garden, 2009; Weldy & Werier, 2009.

Total Possible: 25
Section Three Total: 19

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	

Score: 2

Documentation:
Identify longevity of seed bank:
Demonstrated to seed bank- one study (Roberts & Boddrell, 1985) found a viable seed bank for at least 5 years. No evidence for more than 10 years.
Sources of information:
Roberts & Boddrell, 1985; Jensen, 1998.

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:
Readily regenerates from roots and root fragments.
Sources of information:
Lovett-Doust et al., 1990.

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	4

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).

U. Unknown

Score	3

Documentation:

Identify types of control methods and time-term required:
No studies addressing time commitment located. While species is not reported to grow in large patches (over 0.25 acre), it can form monoculture patches that may warrant control. Species occurs in wetlands where managament would be more difficult. Specific protocols given below.

Chemical: 2,4-D, MCPA, Dicambra, Napropamide, Napropamide/pendimethalin mixture, Tramat (ethofumesate), propyzamide, MCPA-salt, Mecoprop, mecoprop salt, and dichlor-prop-salt reported to work in controling R. repens (Lovett-Doust et al., 1990; Dixon & Clay, 2004.; Dixon et al., 2006).

Mechanical: Ineffective- one study found cutting two times annually increased frequency of R. repens (Parr & Way, 1988).

Biocontrol: Various natural insect and microorganismic enemies of R. repens have been identified, but no biocontrol have yet been developed (Lovett-Doust et al., 1990) .

Sources of information:
Parr & Way, 1988; Lovett-Doust et al., 1990; Dixon & Clay, 2004.; Dixon et al., 2006.

Total Possible	10
Section Four Total	7

Total for 4 sections Possible	87
Total for 4 sections	55

C. STATUS OF CULTIVARS AND HYBRIDS:

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.

Some cultivars of the species known to be available: 'Buttered Popcorn', 'Flore Pleno' ('Pleniflorus'), 'Timothy Clark'

References for species assessment:

Brooklyn Botanic Garden. 2009. AILANTHUS database. [Accessed on 8 May 2009].

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Flora of North America Editorial Committee. 1997. Flora of North America, Volume 3. Magnoliophyta: Magnoliidae and Hamamelidae. Oxford University Press, New York. 590 pp.

Harris, S. M., D. J. Doohan, R. J. Gordon, & K. I. N. Jensen. 1998. The effect of thermal time and soil water on emergence of Ranunculus repens. Weed Research. 38(6):405-412.

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Hintikka, V. 1975. Heterophylly in Ranunculus repens (Ranuculaceae). Memoranda Societatis pro Fauna et Flora Fennica. 51:3-10.

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Lynn, D. E. & S. Waldren. 2001. Morphological variation in populations of Ranunculus repens from the temporary limestone lakes (Turloughs) in the West of Ireland. Annals of Botany (London). 87(1):9-17.

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Mehrhoff, L. J., J. A. Silander, Jr., S. A. Leicht, E. S. Mosher and N. M. Tabak. 2003. IPANE: Invasive Plant Atlas of New England. Department of Ecology & Evolutionary Biology, University of Connecticut, Storrs, CT, USA. <http://www.ipane.org> [Accessed on 8 May 2009].

Oliver, L. 2004. Ranunculus repens. U.S. Invasive Species Impact Rank (I-Rank). NatureServe Explorer. <www.natureserve.org>. [Accessed on 8 May 2009].

Parr, T. W. & J. M. Way. 1988. Management of roadside vegetation: the long-term effects of cutting. J. Applied Ecology. 25(3):1073-1087.

Perovova, Y. A. & L. M. Gershunina. 1975. Intraspecifc variability in Ranunculus repens. Byulleten' Moskovskogo Obshchestva Ispytatelei Prirody Otdel Biologicheskii. 81(4):64-74.

Prati, D. & B. Schmid. 2000. Genetic differentiation of life-history traits within populations of the clonal plant Ranunculus reptans. Oikos. 90(3):442-456.

Roberts, H. A. & J. E. Boddrell. 1985. Seed survival and seasonal emergence in some species of Geranium, Ranunculus and Rumex. Annals Applied Biology. 107(2):231-238.

Silvertown, J., M. Dodd & D. Gowing. 2001. Phylogeny and the niche structure of meadow plant communities. J. Ecology. 89(3):428-435.

Thompson, K. & J. P. Grime. 1983. A comparative study of germination responses to diurnally-fluctuating temperatures. J. Applied Ecology. 20(1):141-156.

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Waite, S. 1994. Field evidence of plastic growth responses to habitat heterogenity in the clonal herb Ranunculus repens. Ecological Research. 9(3):311-316.

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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.

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