

Part IV. Plant Assessment Form

For use with “Criteria for Categorizing Invasive Non-Native Plants that Threaten Colorado’s Wildlands and Agriculture”
By the Colorado Noxious Weed Advisory Committee

Electronic version: December 4, 2008

Table 1. Species and Evaluator Information

Species name (Latin binomial):	Cyperus esculentus
Synonyms:	Yellow nutgrass, chufa, chufa flatsedge
Common names:	Yellow nutsedge, yellow nutgrass, chufa
Evaluation date (mm/dd/yy):	1-25-10
Evaluator #1 Name/Title:	Michael Ostlie, Graduate Research Assistant
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Section below for list committee use—please leave blank

List committee members:	enter text here
Committee review date:	enter text here
List date:	enter text here
Re-evaluation date(s):	enter text here

General comments on this assessment:

enter text here

Table 2. Criteria, Section, and Overall Scores

1.1	Impact on abiotic ecosystem processes	C	Rev'd, Sci. Pub'n	<p>Impact</p> <p><i>Enter four characters from Q1.1-1.4 below:</i></p> <p>CBDD</p> <p><i>Using matrix, determine score and enter below:</i></p> <p>B</p>	<p>Wildlands Plant Score</p> <p><i>Using matrix, determine Overall Score and Alert Status from the first, second, and third section scores and enter below:</i></p> <p>Moderate</p> <p>No Alert</p>
1.2	Impact on plant community	B	Rev'd, Sci. Pub'n		
1.3	Impact on higher trophic levels	D	Other Pub. Mat'l		
1.4	Impact on genetic integrity	D	Rev'd, Sci. Pub'n		
2.1	Role of anthropogenic and natural disturbance	A (3 pts)	Rev'd, Sci. Pub'n	<p>Invasiveness</p> <p><i>Enter the sum total of all points for Q2.1-2.7 below:</i></p> <p>15</p> <p><i>Use matrix to determine score and enter below:</i></p> <p>B</p>	
2.2	Local rate of spread with no management	A (3 pts)	Rev'd, Sci. Pub'n		
2.3	Recent trend in total area infested within state	B (2 pts)	Observational		
2.4	Innate reproductive potential Wksht A	A (3 pts)	Rev'd, Sci. Pub'n		
2.5	Potential for human-caused dispersal	B (2 pts)	Anecdotal		
2.6	Potential for natural long-distance dispersal	C (1 pt)	Rev'd, Sci. Pub'n		
2.7	Other regions invaded	C (1 pt)	Other Pub. Mat'l		
3.1	Ecological amplitude/Range	A	Rev'd, Sci. Pub'n	<p>Distribution</p> <p><i>Using matrix, determine score and enter below:</i></p> <p>B</p>	
3.2	Distribution/Peak frequency Wrksht B	D	Anecdotal		

4.1	Poisonous to livestock	D (0 pts)	Observational
4.2	Detrimental to economic crops	A (3 pts)	Rev'd, Sci. Pub'n
4.3	Detrimental to management of agricultural system, rangeland and pasture	C (1 pt)	Rev'd, Sci. Pub'n
4.4	Human impacts Wrksht C	A (3 pts)	Other Pub. Mat'l

Agricultural / Human Impact

Enter the sum total of all points for Q4.1-4.4 below:

7

Use matrix to determine score and enter below:

B

Agricultural Plant Score

Using matrix, determine Overall Score and Alert Status from the second, third and fourth section scores and enter below:

Moderate

No Alert

Table 3. Documentation

Question 1.1 Impact on abiotic ecosystem processes	C Rev'd, Sci. Pub'n back
Identify ecosystem processes impacted: Nitrogen reduction in areas surrounding root masses	
Rationale: The plant does not use any unusual amount of nitrogen, however it has been shown that bacteria associated with the roots of yellow nutsedge are involved in denitrification of NO ₃ to N ₂ ; potentially causing less available nutrients for the surrounding community (1).	
Sources of information: Volz, M.G. 1976. Infestations of yellow nutsedge in cropped soil: effects on soil nitrogen availability to the crop and on associated N transforming bacterial populations. <i>Agro-Ecosystems</i> . 3:313-323.	
Question 1.2 Impact on plant community composition, structure, and interactions	B Rev'd, Sci. Pub'n back
Identify type of impact or alteration: Prolific tuber development can out-compete other species. Species also exudes allelopathic compounds	
Rationale: Individual plants can produce hundreds to thousands of tubers via rhizomes, each capable of propagating a new shoot (1,2). The plant has been shown to contain allelopathic properties, however, in field settings this impact is usually not too severe (1).	
Sources of information: Stoller, E.W. and R.D. Sweet. 1987. Biology and life cycle of purple and yellow nutsedge (<i>Cyperus rotundus</i> and <i>C. esculentus</i>). <i>Weed Technology</i> . 1:66-73. 2. Ransom, C.V., C.A. Rice, C.C.Shock. 2009. Yellow nutsedge (<i>Cyperus esculentus</i>) growth and reproduction in response to nitrogen and irrigation. <i>Weed Science</i> . 57:21-25.	
Question 1.3 Impact on higher trophic levels	D Other Pub. Mat'l back
Identify type of impact or alteration: Young plants, seeds, and tubers provide food for waterfowl and rodents.	
Rationale: No higher trophic issues noted	
Sources of information: Stubbendieck, J., M.J. Coffin, L.M. Landholt. 2003. Weeds of the Great Plains. pp 284-285. Nebraska Department of Agriculture. Lincoln, NE.	
Question 1.4 Impact on genetic integrity	D Rev'd, Sci. Pub'n back
Identify impacts: No impacts on native species	
Rationale: Primarily reproduces via tubers/rhizomes. It also tends to retain its identity even growing with weedy close relatives like purple nutsedge (1, 2, 3).	
Sources of information: 1. Stoller, E.W. and R.D. Sweet. 1987. Biology and life cycle of purple and yellow	

<p>nutsedge (<i>Cyperus rotundus</i> and <i>C. esculentus</i>). <i>Weed Technology</i>. 1:66-73.</p> <p>2. Stubbendieck, J., M.J. Coffin, L.M. Landholt. 2003. <i>Weeds of the Great Plains</i>. pp 284-285. Nebraska Department of Agriculture. Lincoln, NE.</p> <p>3. Tayyar, R.I., J.H.T. Nguyen, and J.S. Holt. 2003. Genetic and morphological analysis of two novel nutsedge biotypes from California. <i>Weed Science</i>. 51:731-739.</p>	
Question 2.1	Role of anthropogenic and natural disturbance in establishment A Rev'd, Sci. Pub'n back
Describe role of disturbance: Does not invade well in continually disturbed areas.	
Rationale: Poor seedling vigor limits emmigration to new areas, however, once established, tuber production can easily proliferate the species and the plant survives well after mowing or other removal of top growth.	
Sources of information: 1. Stoller, E.W. and R.D. Sweet. 1987. Biology and life cycle of purple and yellow nutsedge (<i>Cyperus rotundus</i> and <i>C. esculentus</i>). <i>Weed Technology</i> . 1:66-73.	
2. Stubbendieck, J., M.J. Coffin, L.M. Landholt. 2003. <i>Weeds of the Great Plains</i> . pp 284-285. Nebraska Department of Agriculture. Lincoln, NE.	
Question 2.2	Local rate of spread with no management A Rev'd, Sci. Pub'n back
Describe rate of spread: Potentially very prolific	
Rationale: In a single season, plants can produce thousands of tubers, on top of the very limited success that seed dispersal could have. However, competitive effects of other species can significantly reduce this production	
Sources of information: 1. Stoller, E.W. and R.D. Sweet. 1987. Biology and life cycle of purple and yellow nutsedge (<i>Cyperus rotundus</i> and <i>C. esculentus</i>). <i>Weed Technology</i> . 1:66-73.	
2. Ransom, C.V., C.A. Rice, C.C. Shock. 2009. Yellow nutsedge (<i>Cyperus esculentus</i>) growth and reproduction in response to nitrogen and irrigation. <i>Weed Science</i> . 57:21-25.	
Question 2.3	Recent trend in total area infested within state B Observational back
Describe trend: Fairly steady presence along the Front Range and near Grand Valley	
Rationale: Yellow nutsedge in agricultural areas may be slightly increasing in abundance.	
Sources of information: Dr. Scott Nissen, Colorado State University, personal communication	
Question 2.4	Innate reproductive potential A Rev'd, Sci. Pub'n back
Describe key reproductive characteristics: Prolific tuber and rhizome production and very limited seed dispersal	
Rationale: Tubers and rhizomes represent the vast majority of spread. Seedlings are not vigorous enough to survive well under competition or disturbance. Dormancy of tubers can lead to management issues for years.	

Sources of information: 1. Stoller, E.W. and R.D. Sweet. 1987. Biology and life cycle of purple and yellow nutsedge (<i>Cyperus rotundus</i> and <i>C. esculentus</i>). Weed Technology. 1:66-73.	
Question 2.5 Potential for human-caused dispersal	B Anecdotal back
Identify dispersal mechanisms: Could be grown as a crop called chufa in some areas. Tubers could spread on implements used for tillage	
Rationale: Chufa is used as a forage in some parts of the United States, although this practice is not recommended in Colorado.	
Sources of information:	
Question 2.6 Potential for natural long-distance dispersal	C Rev'd, Sci. Pub'n back
Identify dispersal mechanisms: Rhizomes are the primary dispersal mechanism, growing up to several meters in length. Birds and feral pigs also may dig up and transport tubers.	
Rationale: Seeds do not represent a major dispersal mechanism, although it is the only long distance mechanism available (1) other than animal transport, to which the extent is not known. Under uncompetitive environments, such as after a tillage event, plants can potentially become established via seed.	
Sources of information: 1. Stoller, E.W. and R.D. Sweet. 1987. Biology and life cycle of purple and yellow nutsedge (<i>Cyperus rotundus</i> and <i>C. esculentus</i>). Weed Technology. 1:66-73.	
Question 2.7 Other regions invaded	C Other Pub. Mat'l back
Identify other regions: Exists in much of the world. Has a B List noxious rating in California, Hawaii, Washington, Oregon, as well as in Colorado	
Rationale:	
Sources of information: United States Department of Agriculture Plant Profile. 1-25-10. http://plants.usda.gov/	
Question 3.1 Ecological amplitude/Range	A Rev'd, Sci. Pub'n back
Describe ecological amplitude, identifying date of source information and approximate date of introduction to the state, if known: Plant can infest many agricultural systems, especially irrigated land, as well as a few wetter grassland/rangeland types	
Rationale: Prefers high fertility, high moisture areas, and once established can thrive in non-disturbed areas.	
Sources of information: 1. Stoller, E.W. and R.D. Sweet. 1987. Biology and life cycle of purple and yellow	

<p>nutsedge (<i>Cyperus rotundus</i> and <i>C. esculentus</i>). <i>Weed Technology</i>. 1:66-73.</p> <p>2. Stubbendieck, J., M.J. Coffin, L.M. Landholt. 2003. <i>Weeds of the Great Plains</i>. pp 284-285. Nebraska Department of Agriculture. Lincoln, NE.</p> <p>3. Dr. Scott Nissen, Colorado State University, personal communication.</p>	
Question 3.2 Distribution/Peak frequency	D Anecdotal back
<p>Describe distribution: Yellow Nutsedge can be a major problem in some irrigated cropping systems, as annual tillage cannot penetrate deep enough to eliminate all tubers, or can fragment existing tubers, spreading them. It is often less prolific in range/grassland areas</p>	
<p>Rationale: Grasslands may provide enough competition of light and other resources to limit invasiveness, however, individual plants will still survive and reproduce there.</p>	
<p>Sources of information: 1. Stoller, E.W. and R.D. Sweet. 1987. <i>Biology and life cycle of purple and yellow nutsedge (<i>Cyperus rotundus</i> and <i>C. esculentus</i>)</i>. <i>Weed Technology</i>. 1:66-73.</p>	
Question 4.1 Poisonous to Livestock	D Observational back
<p>Describe impacts in terms of high probability of death, long-term health impacts, or short-term health impacts: Low probability of health effects</p>	
<p>Rationale: Plant can be used as a forage in some areas, and is eaten by many wildlife species.</p>	
<p>Sources of information:</p>	
Question 4.2 Detrimental to Economic Crops	A Rev'd, Sci. Pub'n back
<p>Describe impacts to all aspects of cropping systems (see guidelines): This species can be especially detrimental to irrigated row crops, where it can compete for light and resources (1). The plant also exudes allelochemicals which may also affect crop yields (2). Nitrogen may also become less available (3).</p>	
<p>Rationale: It is difficult to destroy tubers with many agricultural practices, tubers also may penetrate and grow inside tubers of crops like potato and onion (1).</p>	
<p>Sources of information: 1. Washington State Noxious Weed Control Board. 1-25-10. http://www.nwcb.wa.gov/weed_info/Written_findings/Cyperus_esculentus.html</p> <p>2.1. Stoller, E.W. and R.D. Sweet. 1987. <i>Biology and life cycle of purple and yellow nutsedge (<i>Cyperus rotundus</i> and <i>C. esculentus</i>)</i>. <i>Weed Technology</i>. 1:66-73.</p> <p>3. Volz, M.G. 1976. Infestations of yellow nutsedge in cropped soil: effects on soil nitrogen availability to the crop and on associated N transforming bacterial populations. <i>Agro-Ecosystems</i>. 3:313-323.</p>	
Question 4.3 Detrimental to Mgmt of Agricultural System, Rangeland and Pasture	C Rev'd, Sci. Pub'n back

Describe impacts to water diversion systems, increased water use, reduced forage for livestock: Does not consume much more resources than native species, however, nitrogen may be less available for other crops. However, if unchecked the amount of tubers produced could produce large masses of plants that use large amounts of resources. (1)	
Rationale: Bacteria associated with the roots may convert nitrogen to an unavailable form (2).	
Sources of information: 1. Ransom, C.V., C.A. Rice, C.C.Shock. 2009. Yellow nutsedge (<i>Cyperus esculentus</i>) growth and reproduction in response to nitrogen and irrigation. <i>Weed Science</i> . 57:21-25. 2. Volz, M.G. 1976. Infestations of yellow nutsedge in cropped soil: effects on soil nitrogen availability to the crop and on associated N transforming bacterial populations. <i>Agro-Ecosystems</i> . 3:313-323.	
Question 4.4 Human Health Impacts	A Other Pub. Mat'l back
Describe key human impacts such as; irritants, property values, recreational values, and industry impacts: Control of the plant is difficult and could become costly to control, decreasing property values and increasing agricultural costs. Although the tubers are edible and present no harm to our health.	
Rationale:	
Sources of information: 1. Washington State Noxious Weed Control Board. 1-25-10. http://www.nwcb.wa.gov/weed_info/Written_findings/Cyperus_esculentus.html . 2. Stubbendieck, J., M.J. Coffin, L.M. Landholt. 2003. Weeds of the Great Plains. pp 284-285. Nebraska Department of Agriculture. Lincoln, NE.	

Worksheet A

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Reaches reproductive maturity in 2 years or less	Yes: 1 pt
Dense infestations produce >1,000 viable seed per square meter	Yes: 2 pts
Populations of this species produce seeds every year.	Yes: 1 pt
Seed production sustained over 3 or more months within a population annually	Yes: 1 pt
Seeds remain viable in soil for three or more years	Yes: 2 pts
Viable seed produced with <i>both</i> self-pollination and cross-pollination	No: 0 pt
Has quickly spreading vegetative structures (rhizomes, roots, etc.) that may root at nodes	Yes: 1 pt
Fragments easily and fragments can become established elsewhere	No: 0 pts
Resprouts readily when cut, grazed, or burned	Yes: 1 pt
	9 pts
	Total Unknowns
	A (6+ pts)
Note any related traits: enter text here	

Worksheet B - Colorado Ecological Types and Land Use

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Major Ecological and Land Use Types	Minor Ecological and Land Use Types	Code*
Freshwater and Aquatic Systems	lakes, ponds, reservoirs	score
	rivers, streams, canals	score
Riparian and wetlands	Riparian forest	score
	Riparian shrublands	score
	Wet meadows	D. present
Grasslands	Shortgrass prairie	D. present
	Tallgrass prairie	D. present
	Sandsage prairie	score
	Montane meadows	score
Irrigated Agriculture	Hay meadows	D. present
	Irrigated crops (alfalfa, corn, sugar beets)	D. present
Dryland Agriculture	Dryland crops (wheat, corn, millet, dryland grass hay, sunflowers, mustard for biodiesel)	score
Developed Lands	Urban, exurban, industrial	D. present
Arid Shrublands	Sagebrush shrublands	score
	Foothills shrublands	score
	Gambel oak shrublands	score
Woodlands	Pinyon - juniper	score
	Ponderosa pine	score
	Limber pine	score
Forest	Lodgepole pine	score
	Spruce-fir	score
Alpine	Boulder and rock fields	score
	Dwarf shrublands	score
	Tundra	score
Barrens (lower elevation)	Dunes	score
	Rock outcrops	score
	Canyonlands	score

* A. means >50% of type occurrences are invaded; B means >20% to 50%; C. means >5% to 20%; D. means present but ≤5%; U. means unknown (unable to estimate percentage of occurrences invaded).

Worksheet C – Human Impacts

Human health impacts; irritants (sap), spines, poisonous, and/or smoke impacts	No: 0 pt
Property values are decreased due to increased risk of fire	No: 0 pts
Decreased property value due to moderate to heavy infestations	Yes: 2 pts
Decreased land value for recreational use; boating, fishing, camping, etc.	No: 0 pts
Impact of listing detrimental to industry; agriculture, horticulture, nursery, and/or seed	Yes: 2 pt
	2 pts 5 unknowns
	A (4+ pts)
Note any related traits: enter text here	