

<b>Taxon:</b> <i>Coreopsis tinctoria</i>	<b>Family:</b> Asteraceae
<b>Common Name(s):</b> annual coreopsis calliopsis golden tickseed plains coreopsis	<b>Synonym(s):</b> <i>Calliopsis cardaminifolia</i> DC. <i>Coreopsis cardaminifolia</i> (DC.) Nutt.

<b>Assessor:</b> No Assessor	<b>Status:</b> Assessor Approved	<b>End Date:</b> 2 Mar 2014
<b>WRA Score:</b> 4.5	<b>Designation:</b> H(HPWRA)	<b>Rating:</b> High Risk

**Keywords:** High Risk, Naturalized, Disturbance Weed, Annual Wildflower, Forms Monocultures

Qsn #	Question	Answer Option	Answer
101	Is the species highly domesticated?	y=-3, n=0	n
102	Has the species become naturalized where grown?		
103	Does the species have weedy races?		
201	Species suited to tropical or subtropical climate(s) - If island is primarily wet habitat, then substitute "wet tropical" for "tropical or subtropical"	(0-low; 1-intermediate; 2-high) (See Appendix 2)	Low
202	Quality of climate match data	(0-low; 1-intermediate; 2-high) (See Appendix 2)	High
203	Broad climate suitability (environmental versatility)	y=1, n=0	y
204	Native or naturalized in regions with tropical or subtropical climates	y=1, n=0	n
205	Does the species have a history of repeated introductions outside its natural range?	y=-2, ?=-1, n=0	y
301	Naturalized beyond native range	y = 1*multiplier (see Appendix 2), n= question 205	y
302	Garden/amenity/disturbance weed	n=0, y = 1*multiplier (see Appendix 2)	y
303	Agricultural/forestry/horticultural weed		
304	Environmental weed	n=0, y = 2*multiplier (see Appendix 2)	n
305	Congeneric weed	n=0, y = 1*multiplier (see Appendix 2)	y
401	Produces spines, thorns or burrs	y=1, n=0	n
402	Allelopathic	y=1, n=0	n
403	Parasitic	y=1, n=0	n
404	Unpalatable to grazing animals	y=1, n=-1	n
405	Toxic to animals	y=1, n=0	n
406	Host for recognized pests and pathogens	y=1, n=0	n
407	Causes allergies or is otherwise toxic to humans	y=1, n=0	n
408	Creates a fire hazard in natural ecosystems	y=1, n=0	n

Qsn #	Question	Answer Option	Answer
409	Is a shade tolerant plant at some stage of its life cycle	y=1, n=0	n
410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y=1, n=0	y
411	Climbing or smothering growth habit	y=1, n=0	n
412	Forms dense thickets	y=1, n=0	y
501	Aquatic	y=5, n=0	n
502	Grass	y=1, n=0	n
503	Nitrogen fixing woody plant	y=1, n=0	n
504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	y=1, n=0	n
601	Evidence of substantial reproductive failure in native habitat	y=1, n=0	n
602	Produces viable seed	y=1, n=-1	y
603	Hybridizes naturally	y=1, n=-1	y
604	Self-compatible or apomictic	y=1, n=-1	n
605	Requires specialist pollinators	y=-1, n=0	n
606	Reproduction by vegetative fragmentation	y=1, n=-1	n
607	Minimum generative time (years)	1 year = 1, 2 or 3 years = 0, 4+ years = -1	1
701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)		
702	Propagules dispersed intentionally by people	y=1, n=-1	y
703	Propagules likely to disperse as a produce contaminant		
704	Propagules adapted to wind dispersal		
705	Propagules water dispersed	y=1, n=-1	y
706	Propagules bird dispersed	y=1, n=-1	n
707	Propagules dispersed by other animals (externally)	y=1, n=-1	n
708	Propagules survive passage through the gut		
801	Prolific seed production (>1000/m <sup>2</sup> )	y=1, n=-1	y
802	Evidence that a persistent propagule bank is formed (>1 yr)		
803	Well controlled by herbicides	y=-1, n=1	y
804	Tolerates, or benefits from, mutilation, cultivation, or fire		
805	Effective natural enemies present locally (e.g. introduced biocontrol agents)		

**Supporting Data:**

Qsn #	Question	Answer
101	Is the species highly domesticated?	n
	<b>Source(s)</b>	<b>Notes</b>
	Bond, L. M. 2010. Seed Germination and Growth Requirements of Selected Wildflower Species PhD Dissertation, Auburn University, Auburn, Alabama	No evidence
	Webb, C. J., Sykes, W. R., & Garnock-Jones, P. J. 1988. Flora of New Zealand Volume IV. Botany Division, DSIR, Christchurch, New Zealand	No evidence
	Wu, Z. Y., Raven, P. H. & Hong, D. Y., (eds.). 2011. Flora of China Volume 20-21 (Asteraceae). Science Press, Beijing & Missouri Botanical Garden Press, St. Louis	No evidence

102	Has the species become naturalized where grown?	
	<b>Source(s)</b>	<b>Notes</b>
	WRA Specialist. 2014. Personal Communication	NA

103	Does the species have weedy races?	
	<b>Source(s)</b>	<b>Notes</b>
	WRA Specialist. 2014. Personal Communication	NA

Qsn #	Question	Answer
201	Species suited to tropical or subtropical climate(s) - If island is primarily wet habitat, then substitute "wet tropical" for "tropical or subtropical"	Low
	Source(s)	Notes
	<p>USDA, ARS, National Genetic Resources Program. Germplasm Resources Information Network - (GRIN) [Online Database]. National Germplasm Resources Laboratory, Beltsville, Maryland. URL: <a href="http://www.ars-grin.gov/">http://www.ars-grin.gov/</a>. [Accessed 26 Feb 2014]</p>	<p>"Native: (links to other web resources are provided for some distributions)                      NORTHERN AMERICA (Check conservation status in U.S. &amp; Canada in NatureServe Explorer database)                      Eastern Canada: Canada - Ontario, Quebec                      Western Canada: Canada - Alberta [s.], British Columbia [s.], Manitoba [s.], Saskatchewan [s.]                      Northeastern U.S.A.: United States - Connecticut, Indiana, Maine, Massachusetts, Michigan, New Hampshire, New Jersey, New York, Ohio, Pennsylvania, Rhode Island, Vermont, West Virginia                      North-Central U.S.A.: United States - Illinois, Iowa, Kansas, Minnesota [s.], Missouri, Nebraska, North Dakota, Oklahoma, South Dakota, Wisconsin                      Northwestern U.S.A.: United States - Colorado [e.], Idaho, Montana, Oregon, Washington, Wyoming [e.]                      Southeastern U.S.A.: United States - Alabama, Arkansas, Delaware, District of Columbia, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, South Carolina, Tennessee, Virginia                      South-Central U.S.A.: United States - New Mexico, Texas                      Southwestern U.S.A.: United States - Arizona, California                      Northern Mexico: Mexico - Coahuila, Nuevo Leon [n.], Tamaulipas [n.]"</p>

202	Quality of climate match data	High
	Source(s)	Notes
	<p>USDA, ARS, National Genetic Resources Program. Germplasm Resources Information Network - (GRIN) [Online Database]. National Germplasm Resources Laboratory, Beltsville, Maryland. URL: <a href="http://www.ars-grin.gov/">http://www.ars-grin.gov/</a>. [Accessed ]</p>	

203	Broad climate suitability (environmental versatility)	y
	Source(s)	Notes
	Gartin, P.J. 2007. Some Like It Hot: Flowers That Thrive in Hot Humid Weather. Gibbs Smith, Layton, Utah	"USDA Hardiness Zones 4-9" [Can grow in >5 hardiness zones]
	Gilman, E.F. & Howe, T. 1999. <i>Coreopsis tinctoria</i> . Fact Sheet FPS-144. University of Florida IFAS Extension, Gainesville, FL. <a href="http://edis.ifas.ufl.edu">http://edis.ifas.ufl.edu</a> . [Accessed ]	"USDA hardiness zones: all zones"

204	Native or naturalized in regions with tropical or subtropical climates	n
	Source(s)	Notes

Qsn #	Question	Answer
	<p>USDA, ARS, National Genetic Resources Program. Germplasm Resources Information Network - (GRIN) [Online Database]. National Germplasm Resources Laboratory, Beltsville, Maryland. URL: <a href="http://www.ars-grin.gov/">http://www.ars-grin.gov/</a>. [Accessed 26 Feb 2014]</p>	<p>"Naturalized:            ASIA-TEMPERATE            China: China            Eastern Asia: Japan - Honshu            AUSTRALASIA            New Zealand: New Zealand            EUROPE            Northern Europe: United Kingdom - England [s.]            Middle Europe: Austria            East Europe: Belarus; Moldova; Russian Federation - European part; Ukraine [incl. Krym]            Southeastern Europe: Romania            NORTHERN AMERICA (Check conservation status in U.S. &amp; Canada in NatureServe Explorer database)            Canada            United States            SOUTHERN AMERICA            Southern South America: Argentina - Misiones"</p>

205	Does the species have a history of repeated introductions outside its natural range?	y
	<b>Source(s)</b>	<b>Notes</b>
	Fosberg, F. R. & Sachet, M-H. 1980. Flora of Micronesia, 4: Caprifoliaceae-Compositae. Smithsonian Contributions to Botany 46: 1-71	"Native of central United States, frequently cultivated as an ornamental; in Micronesia planted in gardens on Guam."
	USDA, ARS, National Genetic Resources Program. Germplasm Resources Information Network - (GRIN) [Online Database]. National Germplasm Resources Laboratory, Beltsville, Maryland. URL: <a href="http://www.ars-grin.gov/">http://www.ars-grin.gov/</a> . [Accessed 27 Feb 2014]	Widely introduced and naturalized

301	Naturalized beyond native range	y
	<b>Source(s)</b>	<b>Notes</b>
	Williams, C. E. 1989. <i>Coreopsis tinctoria</i> : An unrecorded host plant of adult <i>Calligrapha californica coreopsivora</i> (Coleoptera: Chrysomelidae). Great Lakes Entomologist 22(2): 99-100	" <i>Coreopsis tinctoria</i> is an annual species primarily native to the central United States, usually occurring on roadside ditches, wet sandy soils and railroad embankments (Smith 1976). It is also widely naturalized in the U.S. (e.g., Jepson 1963, Harvill et al. 1986)."
	Given, D. R. 1984. Checklist of dicotyledons naturalised in New Zealand 16. Compositae—tribes Vernoniaeae, Eupatorieae, Astereae, Inuleae, Heliantheae, Tageteae, Calenduleae, and Arctoteae. New Zealand Journal of Botany, 22(2), 183-190	"DISTRIBUTION: Upper Hutt, Wellington; Christchurch; garden escape."
	Howell, C. J., & Sawyer, J. W. (2006). New Zealand naturalised vascular plant checklist. New Zealand Plant Conservation Network, Wellington, NZ	"Fully naturalized"
	Wu, Z. Y., Raven, P. H. & Hong, D. Y., (eds.). 2011. Flora of China Volume 20-21 (Asteraceae). Science Press, Beijing & Missouri Botanical Garden Press, St. Louis	"Moist sandy or clay soils, sometimes alkaline flats, prairies, ditches, disturbed sites. Widely cultivated and naturalized in China [native to North America]."

Qsn #	Question	Answer
	Kil, J. H., Shim, K. C., Park, S. H., Koh, K. S., Suh, M. H., Ku, Y. B., & Kong, H. Y. 2004. Distributions of Naturalized Alien Plants in South Korea. <i>Weed Technology</i> , 18: 1493-1495	"Table 1. List of alien plant species growing in South Korea" [Includes <i>Coreopsis tinctoria</i> ]
	Lowery, C. A. 1983. Wild flowers: An aesthetic way of conserving water and fuel in Florida. <i>Proceedings of the Florida State Horticultural Society</i> 96: 178-180	"Table 2. Flowers that will naturalize but are not native to Florida" [Includes <i>Coreopsis tinctoria</i> ]
	Liu, J., Dong, M., Miao, S. L., Li, Z. Y., Song, M. H., & Wang, R. Q. 2006. Invasive alien plants in China: role of clonality and geographical origin. <i>Biological Invasions</i> , 8(7): 1461-1470	"The third group (Group III) contains those species that occupied a relatively small area and/or had relatively small harmful impacts." ... "Appendix A Table A1. Checklist of 126 invasive plants in P.R. China and their clonality, life forms, geographic origins, and invasiveness." [ <i>Coreopsis tinctoria</i> - Invasiveness = Group III]
	Webb, C. J., Sykes, W. R., & Garnock-Jones, P. J. 1988. <i>Flora of New Zealand Volume IV. Botany Division, DSIR, Christchurch, New Zealand</i>	"This sp. has escaped from cultivation and established in this one area where Healy, A. J., <i>Trans. Proc. N.Z. Inst.</i> 85: 535 (1958), noted that it had persisted for some years. "
	Webb, C. J. (1987). Checklist of dicotyledons naturalised in New Zealand 18. Asteraceae (Compositae) subfamily Asteroideae. <i>New Zealand Journal of Botany</i> , 25(4), 489-501.	"Wellington; known from one area only, Hutt River near Upper Hutt."

302	Garden/amenity/disturbance weed	y
	Source(s)	Notes
	Desert Tropicals. 2005. <i>Calliopsis</i> , Annual <i>Coreopsis</i> , Plains <i>Coreopsis</i> . <a href="http://www.desert-tropicals.com/Plants/Asteraceae/Coreopsis_tinctorum.html">http://www.desert-tropicals.com/Plants/Asteraceae/Coreopsis_tinctorum.html</a> . [Accessed 2 Mar 2014]	" <i>Calliopsis</i> was introduced into Mississippi from the Western states, It is now considered a noxious weed in a few places."
	Everitt, J.H., Drawe, D.L. & Lonard, R.I. 1999. <i>Field Guide to the Broad-leaved Herbaceous Plants of South Texas: Used by Livestock and Wildlife</i> . Texas Tech University Press, Lubbock, TX	"Common in ditches, swales, and other low areas in the eastern portion of the Rio Grande Plains and Coastal Prairies." [Disturbed sites]
	Mohlenbrock, R.H. 2002. <i>Vascular flora of Illinois</i> . SIU Press, Carbondale, IL	"escaped from gardens into disturbed soil" [A disturbance adapted plant]
	Britton, N.L. & Brown, A. 1913. <i>An Illustrated Flora of the Northern United States, Canada and the British Possessions</i> . Vol. III. <i>Gentianaceae to Compositae</i> . Charles Scribner's Sons, New York, NY	"Escaped from gardens to roadsides and waste places eastward." [Disturbed sites]
	Haines, A. 2011. <i>New England Wild Flower Society's Flora Novae Angliae: A Manual for the Identification of Native and Naturalized Higher Vascular Plants of New England</i> . Yale University Press, Yale, CT	"Fields, roadsides, waste areas, dumps" [Occurs in disturbed habitats]
	WRA Specialist. 2014. Personal Communication	Often labeled as a weed, but generally regarded as a desirable component of the landscape. It's designation as invasive appears to refer to its ability to spread, rather than cause detrimental impacts.

303	Agricultural/forestry/horticultural weed	
	Source(s)	Notes

Qsn #	Question	Answer
	Dave's Garden. 2014. PlantFiles: Plains Coreopsis, Calliopsis, Golden Tickseed - <i>Coreopsis tinctoria</i> . <a href="http://davesgarden.com/guides/pf/go/31/">http://davesgarden.com/guides/pf/go/31/</a> . [Accessed 27 Feb 2014]	"It is very invasive however and I'm sure farmers everywhere hate it. I've seen farm fields full of this flower, very pretty but I doubt the cows like it for food." [Unverified speculation on agricultural impacts from a grower in Oklahoma]
	Randall, R.P. 2012. A Global Compendium of Weeds. 2nd Edition. Department of Agriculture and Food, Western Australia	Possibly - Listed as an agricultural weed [No evidence of detrimental impacts to agriculture have been found]

304	Environmental weed	n
	Source(s)	Notes
	Randall, R.P. 2012. A Global Compendium of Weeds. 2nd Edition. Department of Agriculture and Food, Western Australia	No evidence

305	Congeneric weed	y
	Source(s)	Notes
	Liang, Y., Liu, J., Zhang, S. P., Wang, S. J., Guo, W. H., & Wang, R. Q. 2008. Genetic diversity of the invasive plant <i>Coreopsis grandiflora</i> at different altitudes in Laoshan Mountain, China. <i>Canadian Journal of Plant Science</i> , 88 (4): 831-837	" <i>Coreopsis grandiflora</i> has caused damage on Laoshan Mountain by reducing the biodiversity of native species (Liang et al. 2008). Some studies suggest that genetic diversity has no relationship with invasion (Poulin et al. 2005; Li and Ye 2006), but this study's results show that the high genetic diversity seen may play an important role in the invasion of <i>C. grandiflora</i> ."
	Saito, T. I., & Okubo, K. 2013. Influences of invasive herb <i>Coreopsis lanceolata</i> on riparian endemic herbs in relation to the understory light availability. <i>Landscape and ecological engineering</i> , 9(2): 271-280	"In Japan, invasions of alien herb <i>Coreopsis lanceolata</i> are often observed in riparian endemic vegetation, but the invasion influences on light environments and endemic species are insufficiently evaluated. In this study, we investigated the influences of <i>C. lanceolata</i> and native dominant turf <i>Zoysia japonica</i> on the densities of riparian plants (two endemics <i>Artemisia capillaris</i> and <i>Potentilla chinensis</i> and one alien <i>Lespedeza inschanica</i> ) in relation to the understory light availability using 594 0.2 m × 0.2 m plots." ... "We considered that <i>C. lanceolata</i> reduces endemic riparian species but coexists with <i>L. inschanica</i> . Preventing invasion and dominance of <i>C. lanceolata</i> is desirable to conserve endemic riparian vegetation."

401	Produces spines, thorns or burrs	n
	Source(s)	Notes
	Smith, E. B., & Parker, H. M. 1971. A biosystematic study of <i>Coreopsis tinctoria</i> and <i>C. cardaminefolia</i> (Compositae). <i>Brittonia</i> , 23(2): 161-170	"Herbaceous annual to winter annual, glabrous, erect, mostly 3-8 (2-12) dm high. Stems terete, striate, variously branching. Leaves opposite, petiolate below to sessile above, mostly 5-15 cm long; lower and median leaves 1- to 2-pinnatifid; upper leaves undivided or with a few divisions; all leaflets entire; the terminal leaflet of the median leaves linear-lanceolate to narrowly oblanceolate, mostly 1-6 mm wide."

402	Allelopathic	n
	Source(s)	Notes

Qsn #	Question	Answer
	Fujii, Y., Matsuyama, M., Hiradate, S. & Shimozawa, H. 2005. Dish pack method: A new bioassay for volatile allelopathy. In: (Eds.): J.D.I. Harper, M. An, H. Wu and J.H. Kent, Proceedings of the 4th World Congress on Allelopathy, "Establishing the Scientific Base", Fourth World Congress on Allelopathy, Wagga Wagga, New South Wales, Australia. pp. 493-497	"The screening results for allelopathic cover plants by Dish-pack Method, Plant Box Method and Sandwich Method were shown in Table1. In the case of Plant Box Method and Sandwich Method, allelopathic activities were high in legume. At the same time in the case of Dish-pack Method and Sandwich Method, allelopathic activities of Cleome were the highest of all test plants." [Coreopsis tinctoria was not shown to have allelopathic effects]

403	Parasitic	n
	Source(s)	Notes
	Smith, E. B., & Parker, H. M. 1971. A biosystematic study of <i>Coreopsis tinctoria</i> and <i>C. cardaminefolia</i> (Compositae). <i>Brittonia</i> , 23(2): 161-170	"Herbaceous annual to winter annual, glabrous, erect, mostly 3-8 (2-12) dm high" [Asteraceae]

404	Unpalatable to grazing animals	n
	Source(s)	Notes
	Krausman, P. R., Kuenzi, A. J., Etchberger, R. C., Rautenstrauch, K. R., Ordway, L. L., & Hervert, J. J. 1997. Diets of desert mule deer. <i>Journal of Range Management</i> 50(5): 513-522	"Table 6. Forbs and grass reported as food for the desert mule deer." [Includes <i>Coreopsis tinctoria</i> ]
	Williams, L. R., & Cameron, G. N. 1986. Food habits and dietary preferences of Attwater's pocket gopher, <i>Geomys attwateri</i> . <i>Journal of Mammalogy</i> , 67(3): 489-496	"The diet of female pocket gophers was similar to that of males" ... "Additionally, two annual dicots, <i>Croton</i> and <i>Coreopsis tinctoria</i> , were important in fall and the cool-season, annual grass, <i>B. unioloides</i> , was important in winter." [Palatable to gophers]
	Everitt, J.H., Drawe, D.L.& Lonard, R.I. 1999. Field Guide to the Broad-leaved Herbaceous Plants of South Texas: Used by Livestock and Wildlife. Texas Tech University Press, Lubbock, TX	"The leaves are occasionally eaten by white-tailed deer."

405	Toxic to animals	n
	Source(s)	Notes
	Bryson, C.T.& DeFelice, M.S. 2009. Weeds of the South. University of Georgia Press, Athens, GA	"Toxic Properties: None reported."
	Wagstaff, D.J. 2008. International poisonous plants checklist: an evidence-based reference. CRC Press, Boca Raton, FL	No evidence

406	Host for recognized pests and pathogens	n
	Source(s)	Notes
	Missouri Botanical Garden. 2014. <i>Coreopsis tinctoria</i> . <a href="http://www.missouribotanicalgarden.org/PlantFinder/PlantFinderDetails.aspx?kempercode=b732">http://www.missouribotanicalgarden.org/PlantFinder/PlantFinderDetails.aspx?kempercode=b732</a> . [Accessed 28 Feb 2014]	"No serious insect or disease problems. Taller plants may need some support, particularly if exposed to high winds."



Qsn #	Question	Answer
	Gilman, E.F. & Howe, T. 1999. <i>Coreopsis tinctoria</i> . Fact Sheet FPS-144. University of Florida IFAS Extension, Gainesville, FL. <a href="http://edis.ifas.ufl.edu">http://edis.ifas.ufl.edu</a> . [Accessed ]	"Pest resistance: no serious pests are normally seen on the plant" ... "Pests and Diseases: Leaf spots, rust, powdery mildew, aphids, leaf beetles, and mites may be occasional problems. Spotted cucumber beetles eat holes in the leaves. Leaf spots may be seen but are usually not serious."
	Groom, D., Gill, D., Dobbs, S., Fizzell, J., Lamp'I, J. & White, J. 2012. <i>Texas Gardener's Handbook: All You Need to Know to Plan, Plant &amp; Maintain a Texas Garden</i> . Cool Springs Press, Minneapolis, MN	"Pests/Diseases - None"

407	Causes allergies or is otherwise toxic to humans	n
	Source(s)	Notes
	Bryson, C.T.& DeFelice, M.S. 2009. <i>Weeds of the South</i> . University of Georgia Press, Athens, GA	"Toxic Properties: None reported."
	Wagstaff, D.J. 2008. <i>International poisonous plants checklist: an evidence-based reference</i> . CRC Press, Boca Raton, FL	No evidence

408	Creates a fire hazard in natural ecosystems	n
	Source(s)	Notes
	Stafford, K. 2011. <i>Firewise Plant List - Texas</i> . <a href="http://txmg.wpengine.netdna-cdn.com/ellis/files/2012/03/Texas-Plant-Flammability-List.pdf">http://txmg.wpengine.netdna-cdn.com/ellis/files/2012/03/Texas-Plant-Flammability-List.pdf</a> . [Accessed 28 Feb 2014]	" <i>Coreopsis tinctoria</i> - Flammability - Firewise = Low" [Low flammability wildflower recommended for fire prone landscapes]
	Great Plains Fire Safe Council. 2012. <i>Fire Resistant Landscape Plant List for Western South Dakota</i> . <a href="http://www.gpfiresafecouncil.com/pdf/Plant%20List%20for%20Western%20South%20Dakota.pdf">http://www.gpfiresafecouncil.com/pdf/Plant%20List%20for%20Western%20South%20Dakota.pdf</a> . [Accessed 28 Feb 2014]	"The following is a list of some fire-resistive plants that can be used in landscaping. When planning your landscape, use the characteristics of fire-resistive plants along with site characteristics such as slope, aspect, hardiness zone, and amount of precipitation to choose plant material suitable for your site." [ <i>Coreopsis tinctoria</i> listed as a fire-resistive plant]

409	Is a shade tolerant plant at some stage of its life cycle	n
	Source(s)	Notes
	Bond, L. M. 2010. <i>Seed Germination and Growth Requirements of Selected Wildflower Species</i> PhD Dissertation, Auburn University, Auburn, Alabama	" <i>C. tinctoria</i> prefers full sun and well-drained soils along with high temperatures."
	Desert Tropicals. 2005. <i>Calliopsis, Annual Coreopsis, Plains Coreopsis</i> . <a href="http://www.desert-tropicals.com/Plants/Asteraceae/Coreopsis_tinctorum.html">http://www.desert-tropicals.com/Plants/Asteraceae/Coreopsis_tinctorum.html</a> . [Accessed 2 Mar 2014]	"It grows best in full sun, but will tolerate light shade."
	USDA NRCS. 2012. <i>Pollinator-Friendly Plants for the Northeast United States</i> . <a href="ftp://ftp-fc.sc.egov.usda.gov/NY/technical/pmc/pollinator_plants_bfpmc.pdf">ftp://ftp-fc.sc.egov.usda.gov/NY/technical/pmc/pollinator_plants_bfpmc.pdf</a>	"Light requirements- full sun"
	Gartin, P.J. 2007. <i>Some Like It Hot: Flowers That Thrive in Hot Humid Weather</i> . Gibbs Smith, Layton, Utah	"Tickseed is quite famous for its ability to withstand drought. Its only requirement is that it receives full sun."

Qsn #	Question	Answer
410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y
	Source(s)	Notes
	Desert Tropicals. 2005. Calliopsis, Annual Coreopsis, Plains Coreopsis. <a href="http://www.desert-tropicals.com/Plants/Asteraceae/Coreopsis_tinctorum.html">http://www.desert-tropicals.com/Plants/Asteraceae/Coreopsis_tinctorum.html</a> . [Accessed 2 Mar 2014]	"Calliopsis is adapted to many soil types. It grows best on a well-drained soil, but will not tolerate a very dry site. Natural stands are generally found on bottomland areas with ample moisture."
	Gilman, E.F. & Howe, T. 1999. Coreopsis tinctoria. Fact Sheet FPS-144. University of Florida IFAS Extension, Gainesville, FL. <a href="http://edis.ifas.ufl.edu">http://edis.ifas.ufl.edu</a> . [Accessed ]	"Soil tolerances: acidic; slightly alkaline; sand; loam; clay"
	Wasowski, S. & Wasowski, A. 2003. Native Texas Plants: Landscaping Region by Region. Lone Star Books, Lanham, MD	"Soil: Sand, loam, clay; acid or calcareous; poor drainage okay"

411	Climbing or smothering growth habit	n
	Source(s)	Notes
	Smith, E. B., & Parker, H. M. 1971. A biosystematic study of <i>Coreopsis tinctoria</i> and <i>C. cardaminefolia</i> (Compositae). <i>Brittonia</i> , 23(2): 161-170	"Herbaceous annual to winter annual, glabrous, erect, mostly 3-8 (2-12) dm high. Stems terete, striate, variously branching. Leaves opposite, petiolate below to sessile above, mostly 5-15 cm long; lower and median leaves 1- to 2-pinnatifid; upper leaves undivided or with a few divisions; all leaflets entire; the terminal leaflet of the median leaves linear-lanceolate to narrowly oblanceolate, mostly 1-6 mm wide."

412	Forms dense thickets	y
	Source(s)	Notes
	Berntson, G. M., Rajakaruna, N., & Bazzaz, F. A. 1998. Growth and nitrogen uptake in an experimental community of annuals exposed to elevated atmospheric CO <sub>2</sub> . <i>Global Change Biology</i> 4(6): 607-626	" <i>Coreopsis tinctoria</i> (CT) is a winter annual with taproot (Radford et al. 1964) that reaches 60–90 cm in height. Typically it is branched toward the top of the plant. It flowers in July–August. It forms dense stands (Freeman & Schofield 1991) which can cover large areas (e.g. acres, Kirkpatrick 1992)."
	Lommasson, R.C. 1973. Nebraska Wild Flowers. University of Nebraska Press, Lincoln NE	"These annual plants grow to four feet, or even higher, in dense stands."

501	Aquatic	n
	Source(s)	Notes
	Smith, E. B., & Parker, H. M. 1971. A biosystematic study of <i>Coreopsis tinctoria</i> and <i>C. cardaminefolia</i> (Compositae). <i>Brittonia</i> , 23(2): 161-170	"Habitat in roadside ditches, sandy or gravelly lowlands, railroad ballast." [Terrestrial]

Qsn #	Question	Answer
502	Grass	n
	Source(s)	Notes
	Smith, E. B., & Parker, H. M. 1971. A biosystematic study of <i>Coreopsis tinctoria</i> and <i>C. cardaminefolia</i> (Compositae). <i>Brittonia</i> , 23(2): 161-170	"Herbaceous annual to winter annual, glabrous, erect, mostly 3-8 (2-12) dm high." [Asteraceae]
503	Nitrogen fixing woody plant	n
	Source(s)	Notes
	Smith, E. B., & Parker, H. M. 1971. A biosystematic study of <i>Coreopsis tinctoria</i> and <i>C. cardaminefolia</i> (Compositae). <i>Brittonia</i> , 23(2): 161-170	"Herbaceous annual to winter annual, glabrous, erect, mostly 3-8 (2-12) dm high." [Asteraceae]
504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	n
	Source(s)	Notes
	Smith, E. B., & Parker, H. M. 1971. A biosystematic study of <i>Coreopsis tinctoria</i> and <i>C. cardaminefolia</i> (Compositae). <i>Brittonia</i> , 23(2): 161-170	"Herbaceous annual to winter annual, glabrous, erect, mostly 3-8 (2-12) dm high. Stems terete, striate, variously branching. Leaves opposite, petiolate below to sessile above, mostly 5-15 cm long; lower and median leaves 1- to 2-pinnatifid; upper leaves undivided or with a few divisions; all leaflets entire; the terminal leaflet of the median leaves linear-lanceolate to narrowly oblanceolate, mostly 1-6 mm wide." [No evidence]
601	Evidence of substantial reproductive failure in native habitat	n
	Source(s)	Notes
	Bond, L. M. 2010. Seed Germination and Growth Requirements of Selected Wildflower Species PhD Dissertation, Auburn University, Auburn, Alabama	" <i>Coreopsis tinctoria</i> , Asteraceae, is native to the eastern United States although it has spread to a wider range having escaped from cultivation in gardens. It can be sown directly from seed and germinates in 5-10 days under low light exposure. <i>C. tinctoria</i> prefers full sun and well-drained soils along with high temperatures. The leaves are opposite and divided into linear-lanceolate sections, contributing to fine textured foliage (Still, 1994). The inflorescence is radially symmetrical, 5 cm (2 in) in diameter, borne in loose panicles on thin peduncles. Inflorescence colors range from yellow to orange to crimson shades, flowering early summer through midsummer. It is a multi-stemmed plant with thin, wiry stems and reaches a height of 60-91 cm (2-3 ft) (Phillips, 1985; Still, 1994)." [No evidence]
602	Produces viable seed	y
	Source(s)	Notes
	Bond, L. M. 2010. Seed Germination and Growth Requirements of Selected Wildflower Species PhD Dissertation, Auburn University, Auburn, Alabama	" <i>Coreopsis tinctoria</i> , Asteraceae, is native to the eastern United States although it has spread to a wider range having escaped from cultivation in gardens. It can be sown directly from seed and germinates in 5-10 days under low light exposure."

Qsn #	Question	Answer
603	<b>Hybridizes naturally</b>	<b>y</b>
	<b>Source(s)</b>	<b>Notes</b>
	Smith, E. B. 1975. The chromosome numbers of North American <i>Coreopsis</i> with phyletic interpretations. <i>Botanical Gazette</i> , 136(1): 78-86	"I have produced an intersectional artificial hybrid between <i>C. tinctoria</i> and <i>C. gladiata</i> . It is vegetatively vigorous but almost completely sterile" [Capable of artificial hybridization]
	Smith, S. M., & Deng, Z. 2012. Pollen-mediated Gene Flow from <i>Coreopsis tinctoria</i> to <i>Coreopsis leavenworthii</i> : Inheritance of Morphological Markers and Determination of Gene Flow Rates as Affected by Separation Distances. <i>Journal of the American Society for Horticultural Science</i> , 137(3): 173-179	"In the current study, hand pollination showed that <i>C. leavenworthii</i> and <i>C. tinctoria</i> were highly compatible. F1 hybrids were fertile and readily produced F2 and BC1 individuals." ... "Gene flow from <i>C. tinctoria</i> to <i>C. leavenworthii</i> under field conditions followed a leptokurtic curve. Based on the obtained regression equation, separating the two species by 60 m or more could lower the pollen-mediated gene flow from <i>C. tinctoria</i> to minimal levels and protect the genetic integrity of <i>C. leavenworthii</i> ."

604	<b>Self-compatible or apomictic</b>	<b>n</b>
	<b>Source(s)</b>	<b>Notes</b>
	Smith, E. B. 1982. Phyletic trends in section <i>Coreopsis</i> of the genus <i>Coreopsis</i> (Compositae). <i>Botanical Gazette</i> , 143 (1): 121-124	".All species of section <i>Coreopsis</i> are self-incompatible."
	Noyes, R. D. 2007. Apomixis in the Asteraceae: diamonds in the rough. <i>Functional Plant Science and Biotechnology</i> , 1(2): 207-222	"Apospory is cited for <i>Coreopsis bicolor</i> by Gustafsson (1946-1947), Battaglia (1951), and Pullaiah (1984) based on the report of Gelin (1934). According to Turner (1960), this usage refers to <i>Coreopsis tinctoria</i> Nutt. Gustafsson (1946-1947) reflects the comments of Gelin (1934) in noting that although the species exhibits apospory, it lacks parthenogenetic embryo formation. This indicates that the aposporous gametophytes are nonfunctional, and therefore the species lacks effective apomixis." [Not apomictic]
	Fryxell, P. A. 1957. Mode of reproduction of higher plants. <i>The Botanical Review</i> , 23(3): 135-233	"VI. Tabulation of Modes of Reproduction" ... " <i>Coreopsis tinctoria</i> - Self-incompatible (slight self-compatibility) with low rate of apomixes" [In contrast to Noyes (2007) which describes <i>C. tinctoria</i> as not apomictic]

605	<b>Requires specialist pollinators</b>	<b>n</b>
	<b>Source(s)</b>	<b>Notes</b>
	USDA NRCS. 2012. Pollinator-Friendly Plants for the Northeast United States. <a href="ftp://ftp-fc.sc.egov.usda.gov/NY/technical/pmc/pollinator_plants_bfpmc.pdf">ftp://ftp-fc.sc.egov.usda.gov/NY/technical/pmc/pollinator_plants_bfpmc.pdf</a>	" <i>Coreopsis tinctoria</i> - Plains <i>Coreopsis</i> " ... "Pollinator value- medium" ... "Value to Beneficial Insects- long-tongued bees, short-tongued bees, wasps, flies, butterflies, skippers, and beetles."
	Wojcik, V. A., Frankie, G. W., Thorp, R. W., & Hernandez, J. L. (2008). Seasonality in bees and their floral resource plants at a constructed urban bee habitat in Berkeley, California. <i>Journal of the Kansas Entomological Society</i> , 81 (1), 15-28.	"In mid 2003 a diverse floral resource was planted in a small urban residential plot at the University of California, Berkeley Oxford Tract with the goal of attracting local native California bee species to assess emerging patterns of diversity and seasonality." ... "Implications of these finding are discussed in terms of managing and conserving local bees in new and more developed urban gardens." ... "Appendix 1. Pollen (P) and nectar (N) resources present at the Oxford Tract garden in the 2004 Season." [ <i>Coreopsis tinctoria</i> included as a pollen & nectar source for bees]

Qsn #	Question	Answer
606	<b>Reproduction by vegetative fragmentation</b>	<b>n</b>
	<b>Source(s)</b>	<b>Notes</b>
	Snyder, L.C. 1991. Flowers for Northern Gardens. University of Minnesota Press, Minneapolis, MN	"...it is propagated only from seeds."
	Wax, L.M., Fawcett, R.S. & Isely, D.. 1999. Weeds of the North Central States. North Central Regional Research Publication #281. Agricultural Experiment Stations University of Illinois, Urbana	"Annual, reproducing by seed" [No evidence]

607	<b>Minimum generative time (years)</b>	<b>1</b>
	<b>Source(s)</b>	<b>Notes</b>
	Smith, E. B., & Parker, H. M. 1971. A biosystematic study of <i>Coreopsis tinctoria</i> and <i>C. cardaminefolia</i> (Compositae). <i>Brittonia</i> , 23(2): 161-170	" <i>Coreopsis tinctoria</i> Nutt. is a small, glabrous, aromatic, annual Composite found in the United States in low wet areas, mostly in the Midwest, South, and mid-Atlantic Coast states." [Annual. Reaches maturity in 1 growing season]

701	<b>Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)</b>	
	<b>Source(s)</b>	<b>Notes</b>
	Britton, N.L. & Brown, A. 1913. An Illustrated Flora of the Northern United States, Canada and the British Possessions. Vol. III. Gentianaceae to Compositae. Charles Scribner's Sons, New York, NY	"Escaped from gardens to roadsides and waste places eastward." [Colonization of disturbed sites & heavily trafficked corridors may aid in unintentional dispersal]
	Haines, A. 2011. New England Wild Flower Society's Flora Novae Angliae: A Manual for the Identification of Native and Naturalized Higher Vascular Plants of New England. Yale University Press, Yale, CT	"Fields, roadsides, waste areas, dumps" [Distribution along roads probably aids in inadvertent dispersal]

702	<b>Propagules dispersed intentionally by people</b>	<b>y</b>
	<b>Source(s)</b>	<b>Notes</b>
	Smith, E. B., & Parker, H. M. 1971. A biosystematic study of <i>Coreopsis tinctoria</i> and <i>C. cardaminefolia</i> (Compositae). <i>Brittonia</i> , 23(2): 161-170	" <i>Coreopsis tinctoria</i> has been, in years past, a favorite garden species, and still is available in several cultivars from seed companies under the old name, "Calliopsis.""
	Wu, Z. Y., Raven, P. H. & Hong, D. Y., (eds.). 2011. Flora of China Volume 20-21 (Asteraceae). Science Press, Beijing & Missouri Botanical Garden Press, St. Louis	" <i>Coreopsis tinctoria</i> is widely grown in public and residential gardens, is grown commercially (for cut flowers), and has become widely established in the Flora area."
	Missouri Botanical Garden. 2014. <i>Coreopsis tinctoria</i> . <a href="http://www.missouribotanicalgarden.org/PlantFinder/PlantFinderDetails.aspx?kempercode=b732">http://www.missouribotanicalgarden.org/PlantFinder/PlantFinderDetails.aspx?kempercode=b732</a> . [Accessed 28 Feb 2014]	"It is commonly cultivated in gardens as an annual, and has over time escaped from gardens and naturalized throughout most of the eastern U. S. to the Atlantic Ocean."

703	<b>Propagules likely to disperse as a produce contaminant</b>	
	<b>Source(s)</b>	<b>Notes</b>

Qsn #	Question	Answer
	Nesom, G. L. 2004. Asteraceae from wool mill sites in South Carolina, including new records for North America. SIDA, Contributions to Botany, 21: 1215-1223	"Documentation is given for 73 taxa of Asteraceae collected in 1957-1960 from wool mill sites in Berkeley County and Florence County, South Carolina." ... "The wool combing mills received raw fleece and processed it toward production of clean wool for spinning. Early stages in the process are mechanical shaking (removes dirt and some plant matter), "scouring" (removes chemical substances and sand), and "combing" (removes finer plant material as well as shorter, weaker fibers). Waste from these processes at the South Carolina mills was the source of propagules for species collected by Ahles and Haesloop. Delivery of the raw wool probably was by railroad, because both of the sites are along the CSX Railroad, which runs roughly parallel to the coast." [Coreopsis tinctoria possibly moved into South Carolina as a contaminant of wool]

704	Propagules adapted to wind dispersal	
	Source(s)	Notes
	Neyland, R. 2009. Wildflowers of the Coastal Plain: A Field Guide, Includes the Lower Mississippi River Valley, Gulf, and Atlantic Coastal States. LSU Press, Baton Rouge, LA	"Fruits are oblong black achenes that are winged or wingless." [Possibly if achenes are winged]
	Wax, L.M., Fawcett, R.S. & Isely, D.. 1999. Weeds of the North Central States. North Central Regional Research Publication #281. Agricultural Experiment Stations University of Illinois, Urbana	"Seed small, linear-oblong, incurved, wingless, black with a white scar." [Unlikely, given wingless morphology]

705	Propagules water dispersed	y
	Source(s)	Notes
	Yoshikawa, M., Hoshino, Y., Iwata, N. 2013, Role of seed settleability and settling velocity in water for plant colonization of river gravel bars. Journal of Vegetation Science, 24: 712-723	"Oenothera rosea and Coreopsis tinctoria originating from North America are also widespread along the middle reaches of the Tama River. This suggests that expansion of these alien species is also caused by the submerged dispersal and accumulation of their seeds in sandy deposits."
	Webb, C. J., Sykes, W. R., & Garnock-Jones, P. J. 1988. Flora of New Zealand Volume IV. Botany Division, DSIR, Christchurch, New Zealand	"Stony roadside and riverbed." [Distribution in riverbeds suggests possible dispersal by water]

706	Propagules bird dispersed	n
	Source(s)	Notes
	Smith, E. B., & Parker, H. M. 1971. A biosystematic study of Coreopsis tinctoria and C. cardaminefolia (Compositae). Brittonia, 23(2): 161-170	"Achenes linear-oblong, mostly 1.5-2.5 mm long, black, wingless or narrowly to broadly (up to 1.1 mm) winged, minutely papillate on one or both sides or glabrous. Chaff of the receptacle linear-acute, deciduous with the achenes." [No evidence. Not fleshy-fruited]
	Dave's Garden. 2014. PlantFiles: Plains Coreopsis, Calliopsis, Golden Tickseed - Coreopsis tinctoria. <a href="http://davesgarden.com/guides/pf/go/31/">http://davesgarden.com/guides/pf/go/31/</a> . [Accessed 27 Feb 2014]	"I've grown it in an unstructured, cottage garden type bed and enjoyed it a lot. It reseeds happily and Goldfinches tend to eat enough of them to keep it from becoming invasive here." [Observation on bird seed predation from a grower in Kentucky]

707	Propagules dispersed by other animals (externally)	n
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Qsn #	Question	Answer
	<b>Source(s)</b>	<b>Notes</b>
	Smith, E. B., & Parker, H. M. 1971. A biosystematic study of <i>Coreopsis tinctoria</i> and <i>C. cardaminefolia</i> (Compositae). <i>Brittonia</i> , 23(2): 161-170	"Achenes linear-oblong, mostly 1.5-2.5 mm long, black, wingless or narrowly to broadly (up to 1.1 mm) winged, minutely papillate on one or both sides or glabrous. Chaff of the receptacle linear acute, deciduous with the achenes." [Unlikely. No means of external attachment]

708	Propagules survive passage through the gut	
	<b>Source(s)</b>	<b>Notes</b>
	Smith, E. B., & Parker, H. M. 1971. A biosystematic study of <i>Coreopsis tinctoria</i> and <i>C. cardaminefolia</i> (Compositae). <i>Brittonia</i> , 23(2): 161-170	"Achenes linear-oblong, mostly 1.5-2.5 mm long, black, wingless or narrowly to broadly (up to 1.1 mm) winged, minutely papillate on one or both sides or glabrous. Chaff of the receptacle linear acute, deciduous with the achenes." [Seeds unlikely to be ingested accidentally. If consumed, more likely to be eaten by seed predators]

801	Prolific seed production (>1000/m2)	y
	<b>Source(s)</b>	<b>Notes</b>
	Beas, B. J., Smith, L. M., Hickman, K. R., LaGrange, T. G., & Stutheit, R. 2013. Seed bank responses to wetland restoration: Do restored wetlands resemble reference conditions following sediment removal?. <i>Aquatic Botany</i> , 108: 7-15	"Table 2 Germinating species from seed bank samples taken from wetlands in the Rainwater Basin region, NE. Germinating seed density was estimated from basins where each sample was detected and is expressed as the number of germinating seeds per square meter in a layer of soil 5 cm thick." [Coreopsis tinctoria produced seed densities of 498.7 seeds/m2 in Restored and 362.6 seeds/m2 in Reference sites]
	Abella, S. R., Springer, J. D., & Covington, W. W. 2007. Seed banks of an Arizona Pinus ponderosa landscape: responses to environmental gradients and fire cues. <i>Canadian Journal of Forest Research</i> , 37(3), 552-567	"Table 3. Seed-bank characteristics and correspondence to aboveground vegetation for the 30 species most frequently detected in summer seed-bank samples from one hundred and two 0.05 ha plots in a P. ponderosa landscape in northern Arizona." [Coreopsis tinctoria - 0–5 cm depth = 833 Seeds/m2; 5–10 cm depth = 833 Seeds/m2; 0–10 cm (total) depth = 1250 Seeds/m2]
	WRA Specialist. 2014. Personal Communication	Research has demonstrated that this species can produce seed densities in excess of 1000 seeds/m2 in certain situations

802	Evidence that a persistent propagule bank is formed (>1 yr)	
	<b>Source(s)</b>	<b>Notes</b>
	Royal Botanic Gardens Kew. 2008. Seed Information Database (SID). Version 7.1. <a href="http://data.kew.org/sid/">http://data.kew.org/sid/</a> . [Accessed 28 Feb 2014]	"Storage Behaviour: Orthodox p; Storage Conditions: Viability is halved after >8 years storage under laboratory conditions (Priestley, 1986)" [Possibly Yes. Orthodox storage]
	McDonald, M.B. & Kwong, F.Y. 2005. Flower Seeds. Biology and Technology. CABI Publishing, Wallingford, UK	Table 10.1. Relative storage life of flower seeds if maintained under satisfactory storage conditions. Short = less than 1 year, Medium = less than 3 years. Long = more than 3 years." [The genus Coreopsis is categorized as "Short" suggesting seeds might not be stored for over 1 year]

803	Well controlled by herbicides	y
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Qsn #	Question	Answer
	<b>Source(s)</b>	<b>Notes</b>
	Klingman, D.L., Bovey, R.W., Knake, E.L., Lange, A.H., Meade, J.A., Skroach, W.A., Stewart, R.E. & Wyse, D.L.1983. USDA Weed Control Compendium. AD-BU-2281. Extension Service, U.S. Department of Agriculture, Washington, DC	"Table 1. Susceptibility of common weeds to control by phenoxy and other systemic herbicides" [Coreopsis, plains ( <i>Coreopsis tinctoria</i> ) - Control: 2,4-D = E (Excellent) Over 95 percent of the weed population is killed by a single treatment.; MCPA = G (Good) One treatment per year maintains 85 to 94 percent suppression of top growth, or more than 95 percent of the weed population is killed by two or three treatments.; Dicamba = E (Excellent); Picloram = E (Excellent); Glyphosate = E (Excellent)]

804	Tolerates, or benefits from, mutilation, cultivation, or fire	
	<b>Source(s)</b>	<b>Notes</b>
	Gartin, P.J. 2007. Some Like It Hot: Flowers That Thrive in Hot Humid Weather. Gibbs Smith, Layton, Utah	"Coreopsis will poop out if it is not regularly deadheaded." ... "Cutting back the plants, no matter if it is done recklessly, should get them blooming again." [Tolerates removal of spent flowers]
	Wolfe, J. 2014. How to Grow Coreopsis Tinctoria. <a href="http://homeguides.sfgate.com/grow-coreopsis-tinctoria-38846.html">http://homeguides.sfgate.com/grow-coreopsis-tinctoria-38846.html</a> . [Accessed 2 Mar 2014]	"Deadhead individual coreopsis flowers as they fade, or cut entire plants back by one-third with pruning shears in midsummer to encourage new branching and blooms. Dispose of the old flowerheads where they won't self-sow." [Cutting back 1/3 of plant will result in regrowth]

805	Effective natural enemies present locally (e.g. introduced biocontrol agents)	
	<b>Source(s)</b>	<b>Notes</b>
	WRA Specialist. 2014. Personal Communication	Unknown



**Summary of Risk Traits:**

## High Risk / Undesirable Traits

- Broad climate suitability (Can grow in >5 hardiness zones)
- Widely naturalized
- A garden & disturbance weed
- Other *Coreopsis* species have become invasive
- Tolerates a wide range of soil conditions
- Can form dense stands that may potentially exclude other vegetation
- Seeds freely
- Hybridizes with other *Coreopsis* species
- Annual – able to reach maturity in one growing season
- Seeds dispersed intentionally by people, by water movement, and possibly in soil
- Prolific seed production (>1000 seeds/m<sup>2</sup> in certain situations)

## Low Risk or Desirable Traits

- A temperate species (may only be invasive at higher elevation in tropics)
- Unarmed (no spines, thorns or burrs)
- Palatable to grazing animals
- Not reported to be toxic
- Requires full sun
- Self-incompatible
- Used as an ornamental & to attract & benefit pollinators
- Herbicides may provide effective control