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)**:**	Xanthium spinosum
Synonyms:	Acanthoxanthium spinosum (L.) Fourr., Xanthium spinosum L. var. inerme Bel
Common names:	Bathurst burr, dagger cocklebur, daggerweed, prickly burweed, spiny burweed, spiny clotbur, spiny cockleburr, thorny burweed, spanish-thistle, spiny burweed.
Evaluation date (mm/dd/yy)**:**	04/01/2010
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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:
Xanthium spinosum (spiney cocklebur) is closely related to Xanthium strumarium (common cocklebur), which is native to Colorado. X. spinosum has a widespread distribution, but primarily occurs in disturbed, open habitats. It is capable of forming dense stands in ruderal habitats, but in natural habitats, it is most often found as scattered individuals.

X. spinosm will grow in similar habitats as X. strumarium. Riparian areas are most susceptible, but invasiveness does not appear to threaten established plant communities. However, X. spinosum is highly toxic to grazing animals, particularly horses. It is debatable that this plant deserves noxious status based on toxins and burs, but known infestations should be regularly observed for impacts.

Table 2. Criteria, Section, and Overall Scores

1.1	Impact on abiotic ecosystem processes	C	Other Pub. Mat'l	**Impact** *Enter four characters from Q1.1-1.4 below:* **CCCD** *Using matrix, determine score and enter below:* **C**		
1.2	Impact on plant community	C	Other Pub. Mat'l			
1.3	Impact on higher trophic levels	C	Rev'd, Sci. Pub'n			
1.4	Impact on genetic integrity	D	Rev'd, Sci. Pub'n			
2.1	Role of anthropogenic and natural disturbance	B (2 pts)	Other Pub. Mat'l	**Invasiveness** *Enter the sum total of all points for Q2.1-2.7 below:* **14** *Use matrix to determine score and enter below:* **B**		**Wildlands Plant Score** *Using matrix, determine Overall Score and Alert Status from the first, second, and third section scores and enter below:* **Limited** **No Alert**
2.2	Local rate of spread with no management	B (2 pts)	Other Pub. Mat'l			
2.3	Recent trend in total area infested within state	D (0 pts)	Other Pub. Mat'l			
2.4	Innate reproductive potential Wksht A	B (2 pts)	Rev'd, Sci. Pub'n			
2.5	Potential for human-caused dispersal	B (2 pts)	Other Pub. Mat'l			
2.6	Potential for natural long-distance dispersal	A (3 pts)	Other Pub. Mat'l			
2.7	Other regions invaded	A (3 pts)	Other Pub. Mat'l			
3.1	Ecological amplitude/Range	A	Other Pub. Mat'l	**Distribution** *Using matrix, determine score and enter below:* **B**		
3.2	Distribution/Peak frequency Wrksht B	U	Other Pub. Mat'l			

4.1	Poisonous to livestock	**A (3 pts)**	**Other Pub. Mat'l**
4.2	Detrimental to economic crops	**B (2 pts)**	**Other Pub. Mat'l**
4.3	Detrimental to management of agricultural system, rangeland and pasture	**B (2 pts)**	**Other Pub. Mat'l**
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:

10

Use matrix to determine score and enter below:

A

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 Other Pub. Mat'l back
Identify ecosystem processes impacted: X. spinosum has the potential to alter geomorphological and hydrological regimes.
Rationale: X. spinosum prefers riparian areas including irrigation routes and floodplains. If given the opportunity to become established, it may increase sedimentation rates in irrigation systems. It may also hinder water flows in irrigation ditches and ponds.
Sources of information: Pitcher, D. 1989. Element Stewardship Abstract for Xanthium spinosum. NRCS. [http://www.imapinvasives.org/GIST/ESA/esapages/documnts/xantspi.pdf]
Question 1.2 Impact on plant community composition, structure, and interactions C Other Pub. Mat'l back
Identify type of impact or alteration: X. spinosum can compete with desirable riparian communities, but impacts will not likely be detrimental.
Rationale: Even though X. spinosum can compete with vegetation that is more desirable for waterfowl, it will not likely have great impacts on established plant communities. It has a high water requirement and prefers warm moist soils in open areas; thus, is more likely to establish in open niches and not invade established communities. When it does invade established communities, it is typically found as scattered individuals. However, populations have the potential to become dominant in available areas due to prolific seed production and high germination and survival rates.
Sources of information: Anonymous. 2005. Pacific Islands Environmental Risk: Xanthium spinosum. [http://www.hear.org/pier/species/xanthium_spinosum.htm] Generated 4/2010. Pitcher, D. 1989. Element Stewardship Abstract for Xanthium spinosum. NRCS. [http://www.imapinvasives.org/GIST/ESA/esapages/documnts/xantspi.pdf]
Question 1.3 Impact on higher trophic levels C Rev'd, Sci. Pub'n back
Identify type of impact or alteration: The burrs can be a particular nuisance to livestock and wildlife. Seeds and seedlings can be very toxic to livestock and wildlife.
Rationale: X. spinosum has little value for forage or cover, but it can compete with vegetation that is more desirable for waterfowl and other waterbirds. Burrs can become tangled in the hides of livestock and wildlife. Although not highly palatable, seedlings can be toxic if consumed by animals.
Sources of information: Pitcher, D. 1989. Element Stewardship Abstract for Xanthium spinosum. NRCS. [http://www.imapinvasives.org/GIST/ESA/esapages/documnts/xantspi.pdf]

Holm, L.G., D.L. Plucknett, J.V. Pancho, and J.P. Herberger. 1977. The world's worst weeds. University Press of Hawaii, Honolulu. 609

US Fish and Wildlife Services. 2009. Modoc National Wildlife Refuge Environmental Assessment. Modoc National Wildlife Refuge. PO Box 1610 Alturas, CA 96101

Question 1.4 Impact on genetic integrity D Rev'd, Sci. Pub'n back

Identify impacts: Literature does not indicate successful hybridization between X. spinosum and other Xanthium species.

Rationale: Xanthium spinosum does not exhibit the morphological diversity of X. strumarium and is considered the more genetically stable species (Love and Dansereau 1959). X. strumarium (native to Colorado) successfully hybridizes with other Xanthium species, but hybridization between X. spinosum and X. strumarium has not been successful (Bitter 1908).

Sources of information:

Love, D. and P. Dansereau. 1959. Biosystematic studies on Xanthium: taxonomic appraisal and ecological status. Canadian J. Botany 37:173-208.

McMillan, C. 1975. Experimental Hybridization of Xanthium strumarium (Compositae) from Asia and America. I. Responses of F1 Hybrids to Photoperiod and Temperature. American Journal of Botany. 62:1, 41-47.

Bitter 1908. Ueber Verschiedenheiten in der Entwicklungsdauer bei Xanthium-. Rassen. Abh. Naturwiss. Ver. Bremen 19: 290-297 (In McMillan 1975)

Question 2.1 Role of anthropogenic and natural disturbance in establishment B Other Pub. Mat'l back

Describe role of disturbance: Grazing, altered hydrology, construction, and floods can facilitate establishment.

Rationale: The direct activity of grazing may not have a large impact on establishment, but livestock can easily transport seeds. X. spinosum is commonly found in moist areas including ditches, canals, and water holes. The construction of irrigation corridors and livestock ponds provide very suitable habitat for establishment.

Floods can easily transport seeds and flood plains provide suitable habitat for germination and establishment of those seeds.

Sources of information:

Pitcher, D. 1989. Element Stewardship Abstract for Xanthium spinosum. NRCS. [http://www.imapinvasives.org/GIST/ESA/esapages/documnts/xantspi.pdf]

Question 2.2 Local rate of spread with no management B Other Pub. Mat'l back

Describe rate of spread: Without management, X. spinosum can spread along waterways and highly travelled wildlife and livestock routes.

Rationale: X. spinosum has a high water requirement and does best on warm, moist soils. It is commonly found near water and the seeds are often trasported along waterways. The seed pods attach to the hides of livestock

and wildlife and are capable of being trasported to new locations. X. spinosum can quickly become dominant in an area due to prolific seed production and high germination and survival rates. The presence of two seed types in each burr, germinating at different times, increases establishment rates.

Sources of information:

Pitcher, D. 1989. Element Stewardship Abstract for Xanthium spinosum. NRCS. [http://www.imapinvasives.org/GIST/ESA/esapages/documnts/xantspi.pdf]

Question 2.3 Recent trend in total area infested within state D Other Pub. Mat'l back

Describe trend: Records indicate that plants were present in Bent, Prowers, and Las Animas county.

Rationale: Herbarium records and PLANTS database indicate records of plants in the mid 1900's. No current information suggests that populations exist. One of these plants was found near a feed lot; it can be inferred that this plant arrived as a burr attached to livestock.

Sources of information:

University of Colorado at Boulder - Museum of Natural History, Botany Database. [http://cumuseum.colorado.edu/Research/Botany/Databases/county_species.html]

Graham and Ackerfield, CSU Herbarium. 2008. [http://wsprod.colostate.edu/cwis440/herbarium/plantinfo.asp?PlantID=167]

USDA PLANTS Database. Plants profile for Xanthium spinosum (spiney cocklebur). Generated 4/2010.

Question 2.4 Innate reproductive potential B Rev'd, Sci. Pub'n back

Describe key reproductive characteristics: Reproduction occurs by seed only.

Rationale: Seeds tend to germinate during the summer rains or whenever soil moisture is adequate. In the Northern Hemisphere, X. spinosum flowers between July and September, and fruits are produced from September to November (Parsons 1973). They produce an average of 150 seeds per plant.

Each burr has two seed cavities containing 1 seed. Both seeds germinate readily if the seed coat is removed. Typically, one seed has a shorter dormancy period and germinates within the first year after being shed. The second seed will germinate 2-3 years later. This staggered germination means that the seedlings may emerge at any time over a period of several years during favorable growing conditions (Redosevich and Holt 1984).

Sources of information:

Washington State Noxious Weed Control Board. 2007. Information about spiney cocklebur (Xanthium spinosum). [http://www.nwcb.wa.gov/weed_info/Written_findings/Xanthium_spinosum.html]

Parsons, W.T. 1973. Noxious weeds of Victoria. Inkata Press, Ltd., Melbourne, Australia. 300 pp

Redosevich, S.R. and J.S. Holt. 1984. Weed ecology. John Wiley & Sons, New York. 265 pp.

Question 2.5 Potential for human-caused dispersal	B Other Pub. Mat'l back
Identify dispersal mechanisms: Capable of being dispersed long distances by humans.	
Rationale: Seed pods float and can be dispersed through irrigation systems. The numerous spines on seed pods easily attach to clothing and can be transported long distances. Seed pods can also be moved with mud that attaches to equipment. Irrigation ditches and ponds used to hold irrigation water need to be cleaned with equipment, seeds in these areas can easily be transported with mud on equipment.	
Sources of information: Pitcher, D. 1989. Element Stewardship Abstract for Xanthium spinosum. NRCS. [http://www.imapinvasives.org/GIST/ESA/esapages/documnts/xantspi.pdf]	

Question 2.6 Potential for natural long-distance dispersal	A Other Pub. Mat'l back
Identify dispersal mechanisms: High potential to be dispersed long distances.	
Rationale: Numerous barbs on seed pods provide ideal conditions for attaching to fur of livestock and wildlife. Seed pods also float and can be dispersed long distances with moving water.	
Sources of information: Pitcher, D. 1989. Element Stewardship Abstract for Xanthium spinosum. NRCS. [http://www.imapinvasives.org/GIST/ESA/esapages/documnts/xantspi.pdf]	

Question 2.7 Other regions invaded	A Other Pub. Mat'l back
Identify other regions: X. spinosum is a serious problem in parts of Australia and is designated a noxious weed in Arkansas, Oregon, and Washington.	
Rationale: X. spinosum has invaded riparian corridors, lowland grasslands, woody grasslands, irrigated agriculture, dryland agriculture, developed areas, and arid shrublands in parts of Australia. It's native range is South America. It is a weed of open areas and waste places. The plant grows along roads, in pastures, meadows, cultivated fields, farm yards, roadsides and disturbed areas. It is common around water holes, along floodplains, canals, ditches, creek flats, river terraces, and other moist places. Tolerates some water logging as it occurs in seasonal fresh water wetlands. Tolerates some salinity, but found in a wide variety of soil types. In Washington, X. spinosum is a class C weed: "… already widespread in WA or of special interest to the state's agricultural industry." In Washington, X. spinosum is primarily found in USDA growing zone 7 In Oregon, X. spinosum is a list B weed: "a weed of economic importance which is regionally abundant, but which may have limited distribution in some counties." In Oregon, X. spinosum is found primarily in USDA growing zone 6.	
Sources of information: Pitcher, D. 1989. Element Stewardship Abstract for Xanthium spinosum. NRCS. [http://www.imapinvasives.org/GIST/ESA/esapages/documnts/xantspi.pdf]	

Victoria Department of Primary Industries. 2009. Invasiveness Assessment - Bathurst Burr (Xanthium spinosum) in Victoria. [http://www.dpi.vic.gov.au/dpi/vro/vrosite.nsf/pages/invasive_bathurst_burr]

USDA Plant Hardiness Zone Map [http://www.cliftyview.com/img/usda_map_full.jpg]

Noxious Weed Policy and Classification System. 2010. Oregon Dept. of Ag. Noxious Weed Control Program. [http://www.oregon.gov/ODA/PLANT/WEEDS/docs/weed_policy.pdf]

Washington State Department of Agriculture. 2010. Washington State Weed Control Board. [http://www.nwcb.wa.gov/documents/weed%20lists/State_Weed_List_2010.pdf]

Question 3.1 Ecological amplitude/Range A Other Pub. Mat'l back

Describe ecological amplitude, identifying date of source information and approximate date of introduction to the state, if known: Even though X. spinosum exhibits a widespread ecological amplitude, the only two records of X. spinosum in the state are from 1950 and 1960.

Rationale: One plant was collected in the City of Lamar in 1950 and the other was found at a feed lot north west of Las Animas. X. spinosum will inhabit riparian areas, irrigated pastures, hay meadows, shrublands, and waste areas.

Sources of information:

Graham and Ackerfield, CSU Herbarium. 2008. [http://wsprod.colostate.edu/cwis440/herbarium/plantinfo.asp?PlantID=167]

USDA PLANTS Database. Plants profile for Xanthium spinosum (spiney cocklebur). Generated 4/2010.

Question 3.2 Distribution/Peak frequency U Other Pub. Mat'l back

Describe distribution: The only confirmed records in Colorado indicate that plants were found more than 50 years ago.

Rationale: Of the two known records, one was found in the town of Lamar and the other was next to a feedlot. No recent records have been found which indicate that X. spinosum is in the state of Colorado.

Sources of information:

USDA PLANTS Database. Plants profile for Xanthium spinosum (spiney cocklebur). Generated 4/2010.

Graham and Ackerfield, CSU Herbarium. 2008. [http://wsprod.colostate.edu/cwis440/herbarium/plantinfo.asp?PlantID=167]

Question 4.1 Poisonous to Livestock A Other Pub. Mat'l back

Describe impacts in terms of high probability of death, long-term health impacts, or short-term health impacts: Can be very poisonous to livestock, particularly horses and swine.

Rationale: Seeds and seedlings contain the toxic compound, carboxyatractyloside. Ingestion of cotyledons to 0.75 to 1.5 percent of the animal's body weight will cause toxicity. Death may occur in hours or days. Toxicity may occur near watering holes where the water level consistently drops, providing ideal conditions for seed

banks to germinate in succession.

Sources of information:

Pitcher, D. 1989. Element Stewardship Abstract for Xanthium spinosum. NRCS. [http://www.imapinvasives.org/GIST/ESA/esapages/documnts/xantspi.pdf]

Question 4.2 Detrimental to Economic Crops B Other Pub. Mat'l back

Describe impacts to all aspects of cropping systems (see guidelines): X. spinosum is primarily a problem in pastures and rangeland, but can show up in economic crops.

Rationale: In Australia, X. spinosum is a problem in some agronomic crops including cotton, maize, peas, potatoes, soybeans, sorghum and grapes. In Colorado, there could be a minor to moderate impact on crops, but this plant was recorded as being here 50 years ago and has yet to cause any grower concerns.

Sources of information:

Pitcher, D. 1989. Element Stewardship Abstract for Xanthium spinosum. NRCS. [http://www.imapinvasives.org/GIST/ESA/esapages/documnts/xantspi.pdf]

Victoria Department of Primary Industries. 2009. Invasiveness Assessment - Bathurst Burr (Xanthium spinosum) in Victoria. [http://www.dpi.vic.gov.au/dpi/vro/vrosite.nsf/pages/invasive_bathurst_burr]

Question 4.3 Detrimental to Mgmt of Agricultural System, Rangeland and Pasture B Other Pub. Mat'l back

Describe impacts to water diversion systems, increased water use, reduced forage for livestock: With the proper conditions, X. spinosum can be a problem for the management of agricultural systems.

Rationale: Irrigation corridors and ponds can become heavily infested by X. spinosum when the water table drops. Large infestations growing in ponds and ditches can hinder water flows, increase sediment rates, and produce more propagules to be transported downstream. These hydrological alterations may require additional inputs to mitigate problems.

The burrs of X. spinosum can become tangled in the hides of livstock, inducing dermal sores and reducing the quality of wool in sheep production.

Sources of information:

Pitcher, D. 1989. Element Stewardship Abstract for Xanthium spinosum. NRCS. [http://www.imapinvasives.org/GIST/ESA/esapages/documnts/xantspi.pdf]

Washington State Noxious Weed Control Board. 2007. Spiney cockelbur (Xanthium spinosum) [http://www.nwcb.wa.gov/weed_info/Written_findings/Xanthium_spinosum.html] Generated 4/2010

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: Property values may decreased with large infestations. X. spinosum. Seed pods can be a nuisance, and can negatively impact the recreation value of riparian areas.

Rationale: Large infestations are undesirable for properties. Seed pods can be a nuisance for recreational activity in riparian areas. The morphology of the plants and the seed pods can deter recreation activities such as fishing, boating, swimming, and hiking.
Sources of information: Pitcher, D. 1989. Element Stewardship Abstract for Xanthium spinosum. NRCS. [http://www.imapinvasives.org/GIST/ESA/esapages/documnts/xantspi.pdf]

Worksheet A

back

Reaches reproductive maturity in 2 years or less	**Yes: 1 pt**
Dense infestations produce >1,000 viable seed per square meter	**No: 0 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 *both* self-pollination and cross-pollination	**Unknown: 0 pts**
Has quickly spreading vegetative structures (rhizomes, roots, etc.) that may root at nodes	**No: 0 pt**
Fragments easily and fragments can become established elsewhere	**No: 0 pts**
Resprouts readily when cut, grazed, or burned	**No: 0 pt**
	5 pts **1 unknown**
	B (4-5 pts)

Note any related traits: The literature does not indicate whether X. spinosum is a self-pollinator, an outcrosser, or both. The closely related species, X. strumarium is capable of both, suggesting X. spinosum might be as well. However, Bitter (1908) found that X. spinosum is not compatible with X. strumarium.

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	**Unknown**
	Riparian shrublands	**Unknown**
	Wet meadows	**Unknown**
Grasslands	Shortgrass prairie	**Unknown**
	Tallgrass prairie	**score**
	Sandsage prairie	**score**
	Montane meadows	**score**
Irrigated Agriculture	Hay meadows	**Unknown**
	Irrigated crops (alfalfa, corn, sugar beets)	**Unknown**
Dryland Agriculture	Dryland crops (wheat, corn, millet, dryland grass hay, sunflowers, mustard for biodiesel)	**Unknown**
Developed Lands	Urban, exurban, industrial	**Unknown**
Arid Shrublands	Sagebrush shrublands	**Unknown**
	Foothills shrublands	**Unknown**
	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	**Yes: 1 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.	**Yes: 1 pt**
Impact of listing detrimental to industry; agriculture, horticulture, nursery, and/or seed	**Yes: 2 pt**
	6 pts Total Unknowns
	A (4+ pts)
Note any related traits: enter text here	