NEW YORK

NON-NATIVE PLANT INVASIVENESS RANKING FORM FOR NATURAL / MINIMALLY MANAGED AREAS

Scientific name:	Phyllostachys aureosulcata McClure_and_P.aurea Carrière ex A. Rivière and C. Rivière) USDA Plants Code: PHAU80 and PHAU8
Common names:	yellow groove bamboo [grove is a misspelling] and golden bamboo
Native distribution:	China
Date assessed:	Genus 10 May 2010; species July—Aug. 2012; Jan.—March 2013
Assessors:	Genus G. Moore; species Steven Glenn, Marilyn Jordan and LIISMA SRC
Reviewers:	LIISMA SRC
Date Approved:	Genus March 10, 2010; both species March 6, 2013 Form version: 28 Nov. 2012

New York Invasiveness Rank: Not Assessable

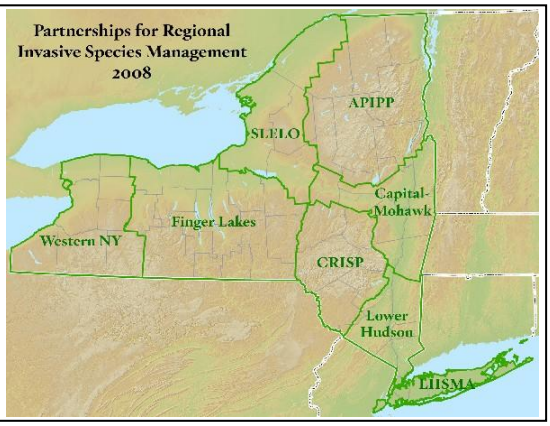
Distribution and Invasiveness Rank (*Obtain from PRISM invasiveness ranking form*)			
	Status of this species in each PRISM:	Current Distribution	PRISM Invasiveness Rank
1	Adirondack Park Invasive Program	Not Assessed	Not Assessed
2	Capital/Mohawk	Not Assessed	Not Assessed
3	Catskill Regional Invasive Species Partnership	Not Assessed	Not Assessed
4	Finger Lakes	Not Assessed	Not Assessed
5	Long Island Invasive Species Management Area	Not Present	Not Assessable
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)	24
2	Biological characteristic and dispersal ability	25 (22)	15
3	Ecological amplitude and distribution	25 (25)	15
4	Difficulty of control	10 (7)	6
	Outcome score	100 (84)[b]	60[a]
	Relative maximum score † If assessable (escapes	cultivation) would rank H	71.43
	New York Invasiveness Rank §	Not Assessable	

* 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
Not Assessable: not persistent in NY, or not found outside of cultivation.

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



The NYS invasiveness ranking protocol is applicable only to nonnative plant species that escape cultivation and establish new occurrences in natural/minimally managed areas without the aid of people. No conclusive evidence of escapes from cultivation by *P. aureosulcata* in the Northeastern US could be found. All known occurrences of *P. aureosulcata* appear to be either remnants of past cultivation or vegetative spread from a planted specimen and it appears unlikely that this would change in the future. Therefore *P. aureosulcata* must be ranked "Not Assessable" (See documentation for questions A1.1 and A2.1 on page 2). Normally no score would be recorded for a "NA" species. However LIISMA SRC retained the scores on this form to document significant impacts that this species may cause in both natural and cultivated areas resulting from aggressive vegetative spread.

Documentation: No occurrences of Phyllostachys aureosulcata or P. aurea in natural areas that are natural escapes from cultivation are known in NYS. Although Phyllostachys is widely distributed on Long Island in gardens and in areas that are not currently cultivated there is no convincing evidence that any of these occurrences are natural escapes from cutivation. For example some occurrences of bamboo in New York City Parks are known to have originated from dumped landcape materials, or to have been planted by nearby residents.
Sources of information:
Brooklyn Botanic Garden, 2012; Weldy & Werier, 2012; Gleason & Cronquist, 1991; (A.Lindberg; A.Greller pers.comm.)

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
Unlikely	Long Island Invasive Species Management Area
Not Assessed	Lower Hudson
Not Assessed	Saint Lawrence/Eastern Lake Ontario
Not Assessed	Western New York

Documentation: Natural establishment of new occurrences of P. aureosulcata and P. aurea in natural areas in the northeast appears unlikely (see below). The NYS point score is retained to indicate ecological invasiveness potential should the species escape cultivation in the future.

Phyllostachys aureosulcata is the species of "running" bamboo most commonly used in landscape settings in the northeast (in part because of its cold-hardiness) and appears to be the species that most commonly causes problems in both natural and cultivated settings in the northeast and mid-Atlantic due to its aggressive vegetative spread. Phyllostachys aurea is a closely related species that is problematic in the southern US. These two species are similar in morphology, behavior and ecological impacts. USDA APHIS (2012 and 2012(a) states that "Phyllostachys aurea is somewhat less cold-tolerant than P. aureosulcata and is likely to be limited in its northern expansion by winter cold temperatures. Otherwise, they present a similar risk and managing these species similarly may be prudent." **Since insufficient data are available to assess P. aureosulcata SRC relied heavily on data for P. aurea that are relevant for NY in this assessment. Therefore we consider this document an assessment of both of these species of Phyllostachys.**

Many species of bamboo grow well in NY climates and are widespread in cultivated settings. Confirming that a given occurrence is an escape from cultivation – or a remnant of past cultivation – is difficult since evidence of past human habitation disappear with time and "running" bamboo species can spread widely. No Phyllostachys species is treated in the Gleason & Cronquist's Manual, the USDA NRCS database, the New York Flora Atlas (Weldy and Werier 2012), BBG's New York Metropolitan Flora Project, or New Jersey Wild Plants. Specimens in herbaria are filings under cultivation (BKL!, CONN!, NY!) [! indicates that the author (Glenn) looked at herbaria records online].

In addition identification of introduced bamboos is hampered by the lack of taxonomic studies in their countries of origin, infrequent flowering, and the large number of taxa not yet described. For these reasons, and the lack of study by many floristic workers cited above, the correct identification of bamboo reports may be suspect thus further obscuring their true abundance and distribution.

Production of flowers and seeds in native locations is rare, and production of seeds in non-native stands is not known. Out of 270 occurrences documented in Connecticut by Feb. 2013 (C.Rickel 2011-2013 pers. comm.) only one or two might possibly have resulted from natural spread (i.e. rhizomes carried downstream by flooding but conclusive proof is lacking) (e.g. Southbury CT http://www.eddmaps.org/distribution/point.cfm?id=2016120 and possible source# 2016118 ; Tumbull CT http://www.eddmaps.org/distribution/point.cfm?id=2646653 and possibe source# 2646652). Horticultural

propagation of bamboo requires care be taken: long pieces of young (2-3 yrs) rhizome with 3 or 4 intact buds are needed and they must be kept continually moist for weeks to months in order to root (http://bit.ly/14D2HXQ). Such conditions could be met during a flood only if a substantial length of rhizome were totally buried by soil/sand in a location that remained continually moist. Although this may be possible it is likely rare (SRC; J. Ward 2011). Thus without conclusive proof otherwise it appears that essentially all occurrences in natural and cultivated settings in the northeast originated from planted specimens, or possibly from vegetative material (rhizomes) transported by people moving yard debris or by snowplows etc. in which rhizome fragments were buried. See documentation for Question 2.1 for additional information.
Sources of information (e.g.: distribution models, literature, expert opinions):
Brooklyn Botanic Garden 2012; Gleason and Cronquist 1991; Stapleton & Barkworth, 2007; Young & Hau, 1961; C.Rickel (pers comm. 2011-2013); J.Ward (pers. comm 2011- 2012).

If the species does not occur and is not likely to occur in any of the PRISMs, then stop here as there is no need to assess the species. Rank is "Not Assessable."

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

Documentation: See above.
Sources of information:
..

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	Wetland Habitats	Upland Habitats
☐ Salt/brackish waters	☐ Salt/brackish marshes	☒ Cultivated*
☐ Freshwater tidal	☐ Freshwater marshes	☒ Grasslands/old fields
☐ Rivers/streams	☐ Peatlands	☐ Shrublands
☐ Natural lakes and ponds	☐ Shrub swamps	☒ Forests/woodlands
☐ Vernal pools	☒ Forested wetlands/riparian	☐ Alpine
☐ Reservoirs/impoundments*	☒ Ditches*	☒ Roadsides*
	☐ Beaches and/or coastal dunes	

Other potential or known suitable habitats within New York:

Documentation:
Sources of information:
Basinger, 2001; Brooklyn Botanic Garden 2010.

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 there are no reports of impacts and the 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 7

Documentation:
Identify ecosystem processes impacted (or if applicable, justify choosing answer A in the absence of impact information)
Dense stands clearly reduce light availability significantly (SRC 2012). Gravuer (2008 NatureServe) assessment of P. aurea: "no mention of specific ecosystem-level impacts found in literature; apparently produces considerable leaf litter (Gonzalez and DallaRosa 2006), which may have a mild influence on soil nutrient cycling." "Regardng fires, stands may also increase the fuel load and could impact fire regimes." Author's and SRC pers. comm. and obs 2010.
Sources of information:
Moore 2010 pers. obs.; Gravuer 2008; U.S. Forest Service FEIS.

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 10

Documentation:
Identify type of impact or alteration:
Gravuer (2008): P. aurea 'Can form dense stands up to 12-15 m tall (Weakley 2008); in the Florida Invasive Plants Geodatabase (FLInv), about half of documented infestations were rated "dense monoculture" or "dominant cover," with the other half described as "scattered plants or clumps" (FNAI 2008). Infestations alter wildlife habitat (Gonzalez and DallaRosa 2006). Within open forest communities, it appears that infestations would form a new layer of vegetation. The species can form solid dense patches with little to nothing growing below it (Moore 2010 pers. obs.)

SRC 2012 agreed P. aureosulcata occupies the understory in forests and eradicates layers below. No additional impacts on natural community structure could be located regarding this species other than anecdotal web statements noting this species ability to form dense , monotypic stands.
Sources of information:
Gravuer, 2008; Moore 2010 pers.obs; Gonzalez and Dalla Rosa 2006.

1.3. Impact on Natural Community Composition

A.	No perceived impact; causes no apparent change in native populations	0
B.	Influences community composition (e.g., reduces the number of individuals in one or more native species in the community)	3
C.	Significantly alters community composition (e.g., produces a significant reduction in the population size of one or more native species in the community)	7
D.	Causes major alteration in community composition (e.g., results in the extirpation of one or several native species, reducing biodiversity or change the community composition towards species exotic to the natural community)	10

U. Unknown

Score 7

Documentation:
Identify type of impact or alteration:
P. aurea 'Can form dense, impenetrable monocultures that displace native species (Staples et al. 2002, Gonzalez and DallaRosa 2006) and significantly reduce the number of native species growing in the community (Moore 2010).
Sources of information:
Staples eet al. 2002; Gonzalez & DallaRosa, 2006; Gravuer, 2008; Moore 2010 pers. obs.

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 mention of disproportionate impacts found in literature (Gravuer 2006). Litter of P. aurea is believed to affect litter-feeding stream invertebrates (Gonzalez and DallaRosa 2006) but no source for this information is provided by the authors. No studies of effects on species or species groups were found by G.Moore or S. Glenn in earlier assessments of the genus Phyllostachys (2010) or P. aureosulcata (2012).
One study hypothesizes the establishment of leptomorphic* bamboos in general could potentially trigger increases in the size of populations of Peromyscus spp. (deer mice). No additional impacts of Phyllostachys aureosulcata on other species could be located. Need better documentation to score.
(*Leptomorphic: long thin rhizome typical of running bamboos…usually thinner than the culms they produce and their internodes are long, slender and hollow. mrbamboo.com.au/care/17-glossary)
Sources of information:
Moore 2010 pers. obs.; Gonzalez & DallaRosa 2006; 2006; Gravuer, 2008, Mack & Smith, 2011

Total Possible 30
Section One Total 24

2. BIOLOGICAL CHARACTERISTICS AND DISPERSAL ABILITY

2.1. Mode and rate of reproduction

A. No reproduction by seeds or vegetative propagules (i.e. plant sterile with no sexual or asexual reproduction). Such a species should be ranked "Not Assessable" as it will occur only in cultivated settings and cannot escape into natural/minimally managed areas. End the assessment here. 0
B. Limited reproduction (fewer than 10 viable seeds per plant; if seed viability is not known, then maximum seed production is less than 100 seeds per plant) AND no reproduction by vegetative propagules (e.g. bulbils, turions, pieces of rhizomes, etc.) is documented as a natural (not spread by people) mode of dispersal across gaps by the species. 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 reproduction by vegetative propagules (e.g. bulbils, turions, pieces of rhizomes, etc.) is documented as a natural (not spread by people) mode of dispersal across gaps by the species. For aquatic species viable plant fragments may be treated as vegetative propagules. 2

D. Significant reproduction by seeds (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) –OR abundant reproduction by vegetative propagules (e.g. bulbils, turions, pieces of rhizomes, etc.) is documented as a natural (not spread by people) mode of dispersal across gaps by the species. For aquatic species viable plant fragments may be treated as vegetative propagules. 4

U. Unknown

Score 0

Documentation:

Describe key reproductive characteristics (including seeds per plant):

Production of flowers and seeds in native locations is rare, and production of seeds in non-native stands is not known. Plants can spread vegetatively well beyond original planting locations but no conclusive proof of natural escapes from cultivation could be found (establishment of new populations remote from a planted location without the aid of people). See documentation for A 2.1 on page 2. It appears unlikely that this would change in the future. Therefore P. aureosulcata scores 0 points for this question and must be ranked "Not Assessable"

Additional information:

While flowers have been described (Stapleton & Barkworth, 2007; Zhengyi, et al. 2006); flowering is probably rare as McClure (1945) stated at the time "inflorescence was unknown" and Gielis, et al. (1997) stated that flowers were known for only 23 of the approximate 75 Phyllostachys spp. Additionally, researchers (Friar & Kochert, 1994) bemoaned the lack of availability of floral characters in researching this genus.

The often held belief that flowering results in the demise of bamboo is incorrect; although in some cases flowering and seed formation can be severely debilitating, recovery is possible, especially in leptomorphic species (Chapman, 1997; Whittaker, 2005).

These species (as are all Phyllostachys) produce leptomorphic (runnning) rhizomes (Lybeer, 2006; Stapleton & Barkworth, 2007; Young & Hau, 1961) . Young & Hau further elaborate that the terminal bud of a rhizome usually dies before active growth begins the following season; resulting in the sprouting of one to several lateral buds just back of the terminal. This results in the development of a dense inter-connected rhizome system.

Nursery web sites acknowledge that these species can spread very aggressively and one anecdotally states for P. aureosulcata that "the rhizomes can travel very fast, up to ten feet from the parent plant, through the summer and fall." Although one author (Whittaker, 2005) claims that this species remains in a tighter clump with sunted rhizomes in colder climates.

Sources of information:

Chapman, 1997; McClure, 1945; Friar & Kochert, 1994; Gielis, et al. 1997; Lybeer, 2006; Stapleton, & Barkworth, 2007; Whittaker, 2005; Young & Haun, 1961; Zhengyi, et al. 2006; Moore 2010 pers.obs

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 1

Documentation:

Identify dispersal mechanisms:

Seed production extremely rare and without obvious adaptations for long distance dispersal. Long distance dispersal can rarely occur when pieces of the rhizomes or stems are moved by people or floodwaters along streams. Mainly spreads clonally via rhizomes, see question 2.1

Sources of information:
McClure, 1945; Friar & Kochert, 1994; Gielis, et al. 1997; Lybeer, 2006; Stapleton, & Barkworth, 2007; Young & Haun, 1961; Zhengyi, et al. 2006 ; C.Rickel (pers comm. 2012); J.Ward (pers. comm 2011 and 2012).

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 3

Documentation:
Identify dispersal mechanisms:
Phyllostachys species are frequently grown, and probably are the most popular bamboo sold due to lower cost than many others. Could be spread by direct means when it is grown or when soil with viable rhizomes or stems present is moved or dumped. One source suggests that this species has been "farmed" in Massachessetts (Barnhart, 1983).
Sources of information:
Barnhart, 1983; Gravuer, 2008; Moore 2010 pers.obs; Stapleton & Barkworth, 2007; Whittaker, 2005; Young & Haun, 1961

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:
Pernennial, some shade tolerance, ability to grow on nutrient poor soils; fast growth. Whittaker (2005) states that all bamboos tolerate a wide range of soil pH.
Sources of information:
McClure, 1945; Moore 2010 pers. obs; Stapleton & Barkworth, 2007; Whittaker, 2005; Young & Haun, 1961; Zhengyi et al. 2006

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 2

Documentation:
Describe growth form:
Forms dense monotypic thickets.
Sources of information:
Moore 2010 pers.obs; Stapleton & Barkworth, 2007; Gravuer, 2008

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:
Sexual propagules are rarely produced and no information regarding germination was found in literature except that Whittaker (2005) states that bamboos in general germinate easily. Regeneration requirements of rhizomes or stems not known for wild material.
Sources of information:
McClure, 1945; Friar & Kochert, 1994; Gielis, et al. 1997; Lybeer, 2006; Stapleton, & Barkworth, 2007; Whittaker, 2005; Young & Haun, 1961; Zhengyi, et al. 2006

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:
Phyllostachys nigra was assessed as "High Risk" by Pacific Island Ecosystems at Risk (PIER 2011). They used closely related WRA asssessment protocols for Hawaii, Australia or Florida. Point score was 12 (> 6 = reject the plant for import (Australia) or species likely to be of high risk (Pacific and Florida (U.S.)).
Various sources including nursery web sites acknowledge that many Phyllostachys species can spread very aggressively though no additional regional or national authorities have assessed Phyllostachys species as invasive or High Risk using a documented invasiveness asssessment protocol other than USDA APHIS for P. aureosulcata and P. aurea; both were assessed as high risk.
Information about invasiveness assessments of Phyllostachys species are included here for possible use in future assessments:
P. aurea Carr. ex A. & C. Rivière and Phyllostachys aureosulcata McClure were both assessed as "High Risk" for invasive behavior in the USA by the USDA APHIS using their Weed Risk Assessment tool. P. aureosulcata's numerical scores indicated it to be a "minor-invader" but their secondary screening tool gave a result of High Risk (Note the only options based on scores are High Risk, Evaluate Further or Low Risk). "P. aureosulcata did not obtain higher risk scores because of relatively low seed production, limited dispersal mechanisms, and impacts that are primarily limited to anthropogenic areas. " The USDA APHIS WRA does not distinguish between spread by propagules and spread by vegetative growth from an initial location. The assessment of P. aureosulcata states that because of extensive vegetative spread P. aureosulcata will eventually form a forest and can impact natural as well as anthropogenic areas (USDA APHIS 2012(a) page 6).
Phyllostachys bambusoides and P. nigra are listed as "Environmental weed" and "Naturalised and known to be a minor problem warranting control at 4 or more locations within a State or Territory" (Groves et al. 2005)
Sources of information:
USDA APHIS 2012 and 2012(a); Mehrhoff, et al. 2003; NJISST, 2012; Stapleton, M.A. & M.E. Barkworth. 2007; Groves et al. 2005.

Total Possible 22
Section Two Total 15

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: "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 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 4

Documentation:
Identify reason for selection, or evidence of weedy history:
Stands of P. aureosulcata greater than 0.25 acre known from New York (Nassau County) and New Jersey. Some stands from New Jersey occurring with few other invasives present.
Sources of information:
BBG 2010; Moore 2010 pers. obs.

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 one natural habitat given at A2.3	1
C.	Known to occur in two natural habitats given at A2.3	2
D.	Known to occur in three natural habitat given at A2.3	4
E.	Known to occur in four or more natural habitats given at A2.3	6
U.	Unknown	

Score 4

Documentation:
Identify type of habitats where it occurs:
See A2.3.
Sources of information:
Basinger, 2001; BBG 2010; Moore 2010 pers.obs.

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 0

Documentation:
Identify type of disturbance:
Members of Phyllostachys reportedly found only in anthropogenic disturbed areas (Moore, 2010; Suiter & Evans. 1999). No literature could be located suggesting that this species can establish without human introduction. There are anecdotal reports in CT of P. aureosulcata establishing on stream banks from rhizomes eroded and washed downstream by flooding from cultivated stands, but no conclusive proof. One study of another species with leptomorphic rhizomes (Arundinaria gigantea) in Lousiana suggest that multiple anthropogenic disturbances may accelerate formation of monotypic stands via rapid clonal growth (Gagnon & Platt, 2008).

Sources of information:
Gagnon & Platt, 2008; Moore 2010 pers.obs; Suiter & Evans. 1999;

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:
Phyllostachys aureosulcata occurs in northeast China with climates similar to New York. Although Lybeer (1996) states that for many Phyllostachys their natural distributions have probably become obscure through years of cultivation. Within the bamboos, Phyllostachys species are the most northerly distributed giant bamboos (Lybeer, 2006) with P. aureosulcata one of the most cold hardy (Whittaker, 2005).

It is cultivated in North America as far north as Toronto, Canada. One nursery web site anecdotally states: "…very cold hardy. We have customers growing this cold hardy species in parts of Minnesota, University of Minnesota Arboretum, Iowa and Nebraska. One of our customers in zone 3b/4a Wisconsin where temperatures have gone to -30 reported his 'yellow groove' dies back in the Winter months. It comes back each Spring 6 to 8 feet tall from a 5 year old planting." Another nursery web site states "In USDA Climate Zone 4 expect mature size canes to be 8 feet in height with some top kill during severe winter months."
Sources of information:
Lybeer, 2006; Whittaker, 2005; Zhengyi, et al. 2006

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 3

Documentation:
Identify states and provinces invaded:
P. aureosulcata: WV, VA, KY (USDA & Weakley 2011); PA (BONAP). P. aurea: MD, VA (USDA); KY, DE (BONAP). One or both species: WV, VA, KY, PA, MD, DE. BUT see discussion in Section A2.1 about difficulties in determining if an occurrence has truly escaped from cultivation.
Sources of information: See known introduced range in plants.usda.gov, and update with information from states and Canadian provinces.
Basinger, 2001; Suiter & Evans. 1999; USDA, 2012; BONAP 2013

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 1

Documentation:
Describe distribution:
LIISMA - BUT see discussion in Section A2.2 about difficulties in determining if an occurrence has truly escaped from cultivation.
Sources of information:
BBG 2012

Total Possible 25
Section Three Total 15

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 U

Documentation:
Identify longevity of seed bank:
Doubtful that detached pieces of rhizomes or stems could remain viable for more than a year. Seed production not known for non-native populations and very rare in native populations (see Sect. 2.1). No literature could be found regarding seed banking in non-native or native populations.
Sources of information:
Graveur 2008; Moore 2012.

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:
All Phyllostachys species produces leptomorphic (runnning) rhizomes and establish an extensive underground root system (Lybeer, 2006; Stapleton & Barkworth, 2007; Young & Haun, 1961) . Young & Haun further elaborate that the terminal bud of a rhizome usually dies before active growth begins the following season; resulting in the sprouting of one to several lateral buds just back of the terminal. This results in the development of a dense inter-connected rhizome system.Whittaker (2005) suggests that Phyllostachys in general do not spread as agressively in colder climates and have stunted rhizomes.
Sources of information:
Lybeer, 2006; Moore 2010 pers. obs.; Stapleton, & Barkworth, 2007; Young & Haun, 1961;

4.3. Level of effort required

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

Score 4

Documentation:

Identify types of control methods and time-term required:
Gravuer (2008): "In natural areas, the control method of choice would likely be repeated cutting/mowing (when infestations are small or herbicides cannot be used) or the "cut stump" method of cutting and then applying an herbicide (when infestations are larger and herbicides are permitted). Cutting/mowing is relatively labor-intensive; it must be repeated several times throughout the growing season, and monitoring and re-treatment are necessary for several growing seasons until the energy reserves in the rhizomes are exhausted (SE-EPPC 2003). Cut stump" treatments are also likely to require multiple visits, as single applications of herbicides do not tend to effectively control this species (Czarnota and Derr 2007). Both the cutting/mowing and cut stump treatment methods require follow-up, such that the control program will almost certainly require more than two years, but probably not more than 10 years. The effective herbicide with the least impact on co-occurring natives appears to be glyphosate; however, as noted by the Center for Aquatic and Invasive Plants (2008), glyphosate is a non-selective systemic herbicide that may kill non-target, partially sprayed plants. Still, if applied carefully to cut stumps, glyphosate would probably harm co-occurring natives less than 25% of the time. Damage to natives from cutting/mowing is assumed to be below this threshold as well." Presence in wetlands will require permits for removal activities."

One (albeit dated) study in Puerto Rico tested over 20 chemicals for bamboo control, the most effective for several species were- trichloroacetic acid (TCA), Dalapon, Monuron, Amitrole; including basal applications to cut bamboo stumps, and foliage sprays- the most resistant was the leptomorphic cogener Phyllostachys bambusoides – follow-up treatment was necessary (Cruzado, et al. 1961).

Sources of information:
Angelo & Boufford, 2012; Brooklyn Botanic Garden, 2012; Cruzado, et al. 1961; George Safford Torrey Herbarium (CONN), 2012; Gleason & Cronquist, 1991; Gravuer (2008); Hough, 1983; Stapleton & Barkworth, 2007; Stapleton, 2007; Weldy & Werier, 2012; Whittaker, 2005; Young & Haun, 1961.

Total Possible 7
Section Four Total 6

Total for 4 sections Possible 84
Total for 4 sections 60

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: 'Alata albovariegata', 'Argus', 'Harbin', 'Harbin Inversa', 'Lama Tempel' [sic], 'Nigra', 'Yellow Groove', forma aureosulcata, forma pekinensis, forma spectabilis (alt. 'Spectabilis'), forma aureocaulis (alt. 'Aureocaulis')

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