Phyllostachys aurea

- INTRODUCTORY
- DISTRIBUTION AND OCCURRENCE
- BOTANICAL AND ECOLOGICAL CHARACTERISTICS
- FIRE EFFECTS AND MANAGEMENT
- MANAGEMENT CONSIDERATIONS
- APPENDIX: FIRE REGIME TABLE
- REFERENCES

INTRODUCTORY

- AUTHORSHIP AND CITATION
- FEIS ABBREVIATION
- NRCS PLANT CODE
- COMMON NAMES
- TAXONOMY
- SYNONYMS
- LIFE FORM

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AUTHORSHIP AND CITATION:
Gucker, Corey L. 2009. Phyllostachys aurea. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: http://www.fs.fed.us/database/feis/ [2009, December 7].

FEIS ABBREVIATION:
PHYAUR

NRCS PLANT CODE [53]:
PHAU8

COMMON NAMES:
golden bamboo
fish-pole bamboo

TAXONOMY:
The scientific name of golden bamboo is *Phyllostachys aurea* Carrière ex. A. Rivière & C. Rivière (Poaceae) [27]. Golden bamboo belongs to the Bambusoideae subfamily (Ascher. & Graeb.), Bambusae tribe (Nees), and Shibateinae subtribe [13].

SYNONYMS:
None

LIFE FORM:
Graminoid

DISTRIBUTION AND OCCURRENCE

SPECIES: Phyllostachys aurea

- GENERAL DISTRIBUTION
- HABITAT TYPES AND PLANT COMMUNITIES

GENERAL DISTRIBUTION:
Golden bamboo is not native to North America but is cultivated as far north as Vancouver, British Columbia, in the West and Buffalo, New York, in the East [3,33]. Escaped populations, however, are generally restricted to the southern United States from Texas to Florida and from Arkansas to North Carolina [11,15,24,39,56]. Golden bamboo also occurs outside of cultivation on the islands of Hawaii and Oahu [44]. Populations are also reported in Oregon and 3 California counties, but the extent of escaped cultivars on the West Coast is poorly documented [43,53]. Generally golden bamboo occurs in urban areas near planting sites. In Texas, golden bamboo occurs in the Lower Galveston Bay watershed within urban and residential areas of Houston [28]. In Tennessee, golden bamboo persists in areas where it was cultivated, but as of 1994, no populations had escaped from the cultivated area [11]. Grass Manual on the Web provides a map of golden bamboo's North American distribution.

Golden bamboo may be native to both China and Japan's temperate and subtropical regions [13]. Some reports suggest that golden bamboo is native only to China [3,33,56] but has become common in Japan after hundreds of years of cultivation [50].

Because primary literature and original research on golden bamboo are lacking, this summary has relied heavily on information presented in floras [3,12,39] and other reviews [1,8,13,25,28,33,36,43,44,50,51]. Information presented in these reviews often lacked supporting documentation and details. Additional research on golden bamboo is necessary before the information in this and other reviews can be properly assessed for accuracy and completeness.

Introduction and local spread: Golden bamboo has been widely planted as an ornamental in tropical to temperate areas of the world [13]. In the United States, golden bamboo was first planted in Alabama in 1882 [28,33]. As of 1971, it occurred in Alabama's Covington, Coffee, Henry, Bullock, Tallapoosa, and Chambers counties. Golden bamboo was sometimes planted for its use in making fishing poles. Escaping populations are most common on the Coastal Plain [9]. As of 1968, golden bamboo was reported in South Carolina's Lexington and Spartanburg counties and in North Carolina's Chatham and Mecklenburg counties [39]. In southern forests, a report estimated that nonnative bamboos (*Phyllostachys* spp.) occupied 71,560 acres (28,960 ha) in 2008 [37].

Although golden bamboo is generally found near planting sites, in some areas there has been extensive spread that has negatively impacted native plant communities. In Texas, golden bamboo has been widely cultivated, and in Grayson and Tarrant counties, extensive stands are spreading on sandy soils [12]. In a study of riparian areas in Georgia, researchers sampled 15 watersheds in the west-central part of the state. Golden bamboo occurred in just 1 urban watershed. Plants were found in a "natural" area adjacent to a city park but away from mowed or high foot traffic areas [32]. Although golden bamboo was not reported in a 1991 survey of Cumberland Island, Georgia, researchers estimated that it occupied an area of 31,440 feet^2 (2,921 m^2) in surveys conducted in 2003 and 2004. Nonnative taxa were of secondary importance in the 1991 survey, which focused on rare native taxa. In 2003 and 2004, golden bamboo did not occur in "natural areas", but researchers noted seedlings or new clones at the periphery of established clumps [23]. In a 1980 survey of southeastern National Park Service officials, golden bamboo was noted in South

Carolina's Congaree Swamp National Monument and Cowpens National Battlefield [4]. In Hawaii, golden bamboo was first reported in native plant communities in 1992, although it has been cultivated in the state for a "long time". Researchers found a clone covering 1 acre (0.4 ha) of a steep hillside in Kailua, Oahu, Hawaii. The clone originated from a roadside ornamental planting and forms a near monoculture on the hillside [44]. In the French Mediterranean backcountry, researchers identified 407 nonnative perennials planted in 120 private gardens. Of the nonnative garden perennials, golden bamboo was 1 of 20 that escaped into adjacent abandoned fields [35].

HABITAT TYPES AND PLANT COMMUNITIES:
In its native China, golden bamboo grows in deciduous and coniferous forests [43], which are common habitats in the United States as well. Golden bamboo has invaded secondary forests, forest clearings, and forest edges in Texas [28]. Although rare in southwestern Louisiana, golden bamboo is reported in both prairies and pine woodlands [14]. On the Cumberland Island National Seashore in Camden County, Georgia, golden bamboo is spreading vegetatively from roadsides into hammock/pine-oak (*Pinus-Quercus*) forests [57]. In South Carolina, golden bamboo occurs in the Piedmont and the Coastal Plain [42].

BOTANICAL AND ECOLOGICAL CHARACTERISTICS

SPECIES: Phyllostachys aurea

- GENERAL BOTANICAL CHARACTERISTICS
- SEASONAL DEVELOPMENT
- REGENERATION PROCESSES
- SITE CHARACTERISTICS
- SUCCESSIONAL STATUS

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Because primary literature and original research on golden bamboo are lacking, this summary has relied heavily on information presented in floras [3,12,39] and other reviews [1,8,13,25,28,33,36,43,44,50,51]. The information in these reviews often lacked supporting documentation and details. Additional research on golden bamboo is necessary before the information in this and other reviews can be properly assessed for accuracy and completeness.

GENERAL BOTANICAL CHARACTERISTICS:

- **Botanical description**
- **Raunkiaer life form**

Botanical description: This description covers characteristics that may be relevant to fire ecology and is not meant for identification. Keys for identification are available (e.g., [3,12,39]).

Aboveground description: Golden bamboo is a large, somewhat woody, rhizomatous, perennial grass that produces clumps of single branching stems [12,39,43]. Stems of established clones grow quickly and at maturity can range from 7 to 39 feet (2-12 m) tall. Stem diameters may reach 6 inches (15 cm) but are typically 3.5 inches (9 cm) or less [3,17,33,50,51]. Stems appear jointed because of swollen internodes [36,43]. Branches often occur in pairs [51], and stems and branches are green when plants are young but turn golden yellow with age [13]. Golden bamboo branches produce up to 6 leaves, which are often arranged in fan-like clusters. Leaf blades are narrow, grass-like and generally measure 2 to 6 inches (5-15 cm) long and up to 0.8 inch (2 cm) wide [12,39,44,50].

Flowers and seeds are rarely produced by golden bamboo [8,12], and in much of the United States, flowers have never been observed [17,39]. When produced, flowers occur in spikelets up to 2 inches (2.5 cm) long with 8 to 12 flowers [13,50,51]. Flower production and the fate of flowering plants are discussed more in Seed production.

Belowground description: Golden bamboo produces long, slender, and often hollow rhizomes. Rhizomes are branching, produce true roots, and generally exist entirely below ground. Each internode of the rhizome is capable of producing another rhizome or a new stem. Rhizomes grow horizontally and can support rapid spread [13,28,33,51].

Raunkiaer [40] **life form:**
Phanerophyte
Geophyte

SEASONAL DEVELOPMENT:
Golden bamboo stems generally emerge in the spring. In China, stems of established clones emerge in April and can reach their full height in a month [13]. Flowering is rare [28,44], and reports indicate that golden bamboo flowers sporadically and gregariously [13,36]. Some reports suggest that golden bamboo plants die after flowering [25,28], while others dispute this claim [13]. For a more complete discussion on this topic, see Seed production.

REGENERATION PROCESSES:
Although golden bamboo is capable of reproducing by seed, the rarity of flowering in the United States makes sexual reproduction unlikely. Vegetative spread occurs through rhizomes. The division of clumps and moving of rhizome fragments are the primary methods of golden bamboo reproduction [25,51].

- **Pollination and breeding system**
- **Seed production**
- **Seed dispersal, seed banking, and germination**
- **Seedling establishment and plant growth**
- **Vegetative regeneration**

Pollination and breeding system: Information specific to golden bamboo pollination and breeding was lacking as of the writing of this review (2009). Bamboo (Tribe *Bambuseae*) flowers are wind pollinated. Evidence suggests that flowers are cross pollinated, suggesting that isolated clones may produce little or no seed [25].

Seed production: Reports vary on the likelihood of flowering and the fate of golden bamboo clones after flowering. Most reports indicate that golden bamboo produces masses of flowers sporadically and synchronously, but reported intervals between mass flowering events range from 7 to 30 years ([13,36], Keesing personal communication cited in [25]). Janzen [25] indicates that bamboos are strictly monocarpic, and clumps destined to flower do not produce new

stems in the year prior to flowering. Other researchers [13,20] report that golden bamboo clumps do not die after flowering. Hisamoto and Kobayashi [20] indicated that aboveground stems died after flowering but rhizomes did not. After flowering, rhizomes were capable of sprouting. If sprouts produced variegated leaves, the stems flowered again and died, but if sprouts produced nonvariegated leaves, the stem ceased to flower but continued vegetative growth [20]. It is possible that stem death and plant death have been confused in golden bamboo reviews.

Variable flowering intervals are reported from several native and nonnative golden bamboo habitats. Although golden bamboo has been observed for decades in Texas, flowering has been rare [28]. Just a single flowering specimen was reported in north-central Texas [12]. Based on observations made on golden bamboo plants in Europe, Keesing suggests that plants produce masses of seed at 14- to 19-year intervals (personal communication cited in [25]). Dransfield and Widjaja [13] report that bamboo flowering occurs at 15- to 30-year intervals. Naturalized golden bamboo populations in Java, Indonesia, never flowered, and flowering in Japan occurred from 1916 to 1921 [13].

Seed dispersal, seed banking, and germination: Because seed production is rare, information on seed dispersal, seed banking, and germination was lacking as of the writing of this review (2009). Seeds produced by golden bamboo germinate once mature and moist. While dry seeds may sit dormant for several months, it is thought that viability is lost over time and that golden bamboo seeds lack any long-term dormancy [25].

Seedling establishment and plant growth: While golden bamboo plants can be produced from seed, this is rare.

Vegetative growth from established clones can be rapid. Stems may reach full height within 1 month of emergence [13]. Golden bamboo stem growth was monitored in a plantation on Japan's Kyoto University campus. On 20 May, stems were about 20 inches (50 cm) tall, and by 24 June, stems were about 280 inches (700 cm) tall [46].

Vegetative regeneration: Rhizome growth by golden bamboo clones can result in the development of dense thickets and colonies [12,31,43]. A single golden bamboo clump can produce up to 9.3 miles (15 km) of stems in its lifetime [8]. Golden bamboo "once established, is very aggressive in both its rate of growth as well as the sprouting of new stems". Spread is often "rapid" in all directions from the point of establishment [28].

Golden bamboo sprouts after cutting [50], and dispersal is primarily through vegetative means. Researchers suspect that golden bamboo may be dispersed by rhizome fragments discarded in yard waste [31].

SITE CHARACTERISTICS:
Roadsides, rights of way, and old home sites are the most commonly described habitats with dense and extensive golden bamboo stands [1,28,36,57]. However, golden bamboo also occurs in secondary forests, forest clearings, and forest edges in Texas [28], prairie and pine forests in southwestern Louisiana [14], natural areas and parks in Alabama [1], and is spreading into hammock/pine-oak forests on Cumberland Island National Seashore in Georgia [57].

Climate: Although most common as an escaped cultivar in the southern United States, golden bamboo survives in climates as far north as Vancouver, British Columbia, in the West and Buffalo, New York, in the East [3]. Golden bamboo plants tolerate temperatures as low as -4 °F (-18 °C) [13,51]. Golden bamboo escapes occur on Cumberland Island, Georgia, where the climate is subtropical. Summers are hot and humid and winters are short and mild. The average high and low monthly temperatures are 81 °F (27 °C) and 54 °F (12 °C). Annual precipitation averages 51 inches (1,295 mm), and rains are generally heavy from September to October [57].

Elevation: In China, golden bamboo stands occur at elevations of up to 3,300 feet (1,000 m) in the southeast and up to 6,600 feet (2,000 m) in the southwest [13,51]. As of 2009, elevation tolerances for golden bamboo were not reported for the United States.

Soils: Golden bamboo growth is considered best in rich, deep, well-drained sands [13,51], although the Southeastern Exotic Pest Plant Council reports "vigorous" golden bamboo growth and spread in moist, deep loams [43]. In southwestern Louisiana, golden bamboo occurs in prairies with poorly drained silt loam to clay soils [14]. Although

golden bamboo may persist on a variety of soils, stem diameter and height are likely reduced in fine textured and/or poorly drained soils [13].

SUCCESSIONAL STATUS:
Successional studies in habitats invaded by golden bamboo were lacking as of the writing of this review (2009). Golden bamboo growth is considered best in full sun conditions, but plants may persist in shade [33]. In the hottest climates, shade may improve golden bamboo growth [43].

Several sources indicate that golden bamboo's presence and spread are associated with disturbances. Although golden bamboo is rare in Seminole County, Florida, it is reported on disturbed sites [56]. Rapid spread by rhizomes can be stimulated by disturbances [36,50].

FIRE EFFECTS AND MANAGEMENT

SPECIES: Phyllostachys aurea

- FIRE EFFECTS
- FUELS AND FIRE REGIMES
- FIRE MANAGEMENT CONSIDERATIONS

FIRE EFFECTS:
Immediate fire effect on plant: Golden bamboo is top-killed by fire [38].

Postfire regeneration strategy [45]:
Rhizomatous herb, rhizome in soil
Ground residual colonizer (on site, initial community)

Fire adaptations and plant response to fire: As of 2009, fire studies in golden bamboo stands or habitats were lacking. Based on information from a review and a personal communication, golden bamboo sprouts following cutting and fire [38,50]. Without additional fire studies, it is unknown whether or not golden bamboo could be killed by high-severity fire. In Georgia, a researcher reports burning in a golden bamboo stand where stems were cut and left on site. In the burned area, golden bamboo sprouted and recolonized the site (personal communication [38]). Because seed production is extremely rare, seedling establishment on burned sites is unlikely.

FUELS AND FIRE REGIMES:
Altered fire frequency, severity, or behavior in habitats invaded by golden bamboo was not described in the available literature (2009). David Taylor, a botanist for the Daniel Boone National Forest in Kentucky, reports that fire spread is unlikely in bottomland habitats where golden bamboo grows, unless the area experiences an extreme drought. In extreme drought conditions, Taylor suggests golden bamboo may fuel a "fire storm". In an experiment, dry golden bamboo leaves and stems burned "hot" (personal communication [47]).

Although fire behavior and severity in golden bamboo stands have not been studied or reported in detail, pictures below suggest that stand and fuel structure can vary by time since cutting and/or site conditions. Although the golden bamboo stand in the picture on the left lacks basal leaves, fire is likely to carry through these stands if there are dead stem and leaves present on the ground. Flames typically reach the leafy canopy, producing "spectacular" fires. Stems make popping sounds as the moisture in the nodes is heated and expands to split open the nodes [38].

Golden bamboo stand at least 10 years old that was cut to the ground at least 5 years before this photo was taken. Loss of basal leaves and surface litter accumulations are typical in dense stands [38].

Golden bamboo stand at least 20 years old that was cut to the ground 3 years before this photo was taken. Smaller leafier plants are likely the result of recent cutting [38].

Both photos taken in late spring or early summer

Photos © Chuck Bargeron, University of Georgia, Bugwood.org

See the Fire Regime Table for further information on fire regimes of vegetation communities in which golden bamboo may occur.

FIRE MANAGEMENT CONSIDERATIONS:

Preventing postfire establishment and spread: Golden bamboo seedling establishment is unlikely on burned sites, because golden bamboo rarely produces seed. However, sources indicate that golden bamboo spreads rapidly from rhizomes following disturbances [36,50]. If established golden bamboo clones occur in or near burned areas, increased clone size or rhizome spread should be expected.

Preventing invasive plants from establishing in weed-free burned areas is the most effective and least costly management method. This may be accomplished through early detection and eradication, careful monitoring and follow-up, and limiting dispersal of invasive plant seed into burned areas. General recommendations for preventing postfire establishment and spread of invasive plants include:

- Incorporate cost of weed prevention and management into fire rehabilitation plans
- Acquire restoration funding
- Include weed prevention education in fire training
- Minimize soil disturbance and vegetation removal during fire suppression and rehabilitation activities
- Minimize the use of retardants that may alter soil nutrient availability, such as those containing nitrogen and phosphorus
- Avoid areas dominated by high priority invasive plants when locating firelines, monitoring camps, staging areas, and helibases
- Clean equipment and vehicles prior to entering burned areas
- Regulate or prevent human and livestock entry into burned areas until desirable site vegetation has recovered sufficiently to resist invasion by undesirable vegetation
- Monitor burned areas and areas of significant disturbance or traffic from management activity
- Detect weeds early and eradicate before vegetative spread and/or seed dispersal
- Eradicate small patches and contain or control large infestations within or adjacent to the burned area
- Reestablish vegetation on bare ground as soon as possible
- Avoid use of fertilizers in postfire rehabilitation and restoration
- Use only certified weed-free seed mixes when revegetation is necessary

For more detailed information on these topics see the following publications: [2,5,18,52].

Use of prescribed fire as a control agent: Prescribed fire alone is unlikely to control golden bamboo, since

stems sprout after fire [38], and rhizome growth is stimulated by disturbances [36,50]. Fire may be useful in preparing a site for herbicide treatments [38].

MANAGEMENT CONSIDERATIONS

SPECIES: Phyllostachys aurea

- FEDERAL LEGAL STATUS
- OTHER STATUS
- IMPORTANCE TO WILDLIFE AND LIVESTOCK
- OTHER USES
- IMPACTS AND CONTROL

FEDERAL LEGAL STATUS:
None

OTHER STATUS:
Information on state-level noxious weed status of plants in the United States is available at Plants Database.

Because primary literature and original research on golden bamboo are lacking, the following summary relied heavily on information presented in other reviews [1,8,13,25,28,33,36,43,44,50,51]. Information in these reviews often lacked supporting documentation and details. Additional research on golden bamboo is necessary before the information in this and other reviews can be properly assessed for accuracy and completeness.

IMPORTANCE TO WILDLIFE AND LIVESTOCK:
Birds and small mammals are reported to feed on bamboo seed (Tribe *Bambuseae*). High levels of seed predation are considered a reason for mass synchronous seeding by bamboos [25]. However, seed production by golden bamboo is rare [12,13].

OTHER USES:
Young golden bamboo shoots are occasionally utilized as food by humans [13], but more often mature golden bamboo stems are used in construction. Golden bamboo stems have been used to make canes, fishing poles, fishing nets, ski poles, javelins, irrigation pipes, musical instruments, furniture, and umbrella and fan handles [3,8,13].

IMPACTS AND CONTROL:
Impacts: Most predictions and descriptions of golden bamboo's impacts on native vegetation and riparian areas are anecdotal (e.g., [16,28,42]). Although many suggest that impacts are likely because of aggressive growth and spread, detailed study and documentation are lacking.

In many areas, golden bamboo is still primarily restricted to urban areas and original planting sites. Because of golden bamboo's rapid growth, it has often been used as a visual and noise barrier in landscapes [33]. However, many states recognize golden bamboo as a threat to native habitat structure and function because growth and spread of established clones can be extensive. In 2009, the Florida Exotic Pest Plant Council ranked golden bamboo a Category II invasive plant, which is a nonnative plant that has increased in abundance or frequency but has not altered plant communities extensively [15]. As of 2006, the Georgia Exotic Pest Plant Council considered golden bamboo a "moderate" problem based on its invasion of native plant communities and displacement of native plant species [16]. In 2008, golden bamboo was listed as a "severe threat" to the "composition, structure, or function of natural areas in South Carolina" [42].

Spread of established golden bamboo clones has resulted in a loss of native vegetation in Hawaii [44] and Texas. In Texas, golden bamboo may also disrupt riparian ecosystem processes [28]. Although grown in Hawaii for many years, golden bamboo was not noticed in native plant communities until 1992 when it spread from a roadside planting in

Kailua, Oahu. The clone came to occupy more than an acre of a hillside and excluded most other native vegetation [44]. In Texas, escaped golden bamboo plants are most common in the Lower Galveston Bay watershed near Houston's urban and residential communities. The Texas Invasive Plant Pest Council (TIPPC) reports that established golden bamboo clones have "aggressive" growth rates and sprouting abilities. Spread can be rapid in all directions from the point of establishment. Although documentation and details are lacking, the TIPPC suggests that golden bamboo clones can displace native vegetation, alter habitat structure, and impact litter-feeding stream invertebrates. Golden bamboo is also thought to attract cockroaches in urban areas [28]. For additional information about the introduction and spread of golden bamboo in its US range, see the discussion on Local spread.

Control: Control of nonnative species is most effective when it employs a long-term, ecosystem-wide strategy rather than a tactical approach focused on an individual species [34]. When targeting a nonnative species for control, the potential for other invasive species to fill their void must be considered, regardless of the control method [6]. Because golden bamboo grows and spreads most rapidly after a clone is established [28,44], control is likely most effective on new populations or plantings [31].

Fire: For information on the use of prescribed fire to control this species, see Fire Management Considerations.

Prevention: Increasing public awareness, limiting nursery sales, and constructing barriers around established clumps may be useful in preventing golden bamboo establishment and spread. As of 2008, golden bamboo was still available for sale from garden centers and nurseries. The Center for Aquatic and Invasive Plants recommends designing a program that educates the public about golden bamboo's aggressive growth habit, discourages its planting and use in landscaping, and cautions people about its ability to spread into and negatively affect native vegetation [33]. Spread of established plants from landscape plantings may be prevented or slowed by digging a 3-foot (1 m) deep barrier around golden bamboo clumps [28].

It is commonly argued that the most cost-efficient and effective method of managing invasive species is by preventing their establishment and spread through the maintenance of "healthy" natural communities [34,41,49] and by continual monitoring [26]. Maintaining the integrity of the native plant community and mitigating the factors that enhance ecosystem invasibility are likely to be more effective than managing solely to control the invader [21].

Weed prevention and control can be incorporated into many types of management plans, including those for logging and site preparation, grazing allotments, recreation management, research projects, road building and maintenance, and fire management [52]. See the Guide to noxious weed prevention practices [52] for specific guidelines in preventing the spread of weed seeds and propagules under different management conditions.

Cultural control: No information is available on this topic (2009).

Physical or mechanical control: Repeated cutting or mowing in golden bamboo stands may kill plants by exhausting rhizome nutrient stores. It is recommended that stems be cut close to the ground. Cutting or mowing should be repeated throughout the growing season and will likely be necessary for several years [28,33,50].

Biological control: As of 2009, no insects or pathogens have been released to control golden bamboo, and reports of biological control investigations were lacking.

Many factors must be considered and evaluated before biological controls are released. Refer to these sources: [54,55] and the Weed control methods handbook [48] for background information and important considerations for developing and implementing biological control programs.

Chemical control: Cutting golden bamboo stems prior to herbicide applications may increase herbicide effectiveness. Applications are recommended when sprouts are leafing out and outdoor temperatures exceed 65 °F (18 °C) [33]. Herbicides may be most effective when applied to the wounded bases of cut stems [36]. Information on herbicides that may be effective in controlling golden bamboo can be found in the following references: [10,33].

While herbicides are effective in gaining initial control of a new invasion or a severe infestation, rarely do they provide a complete or long-term weed management solution [7]. See the Weed control methods handbook [48] for considerations on the use of herbicides in natural areas and detailed information on specific chemicals.

Integrated management: No information is available on this topic (2009).

APPENDIX: FIRE REGIME TABLE

SPECIES: Phyllostachys aurea

The following table provides fire regime information that may be relevant to golden bamboo habitats. Follow the links in the table to documents that provide more detailed information on these fire regimes. As of 2009, escaped golden bamboo plants were not common throughout its planted range. In time, however, escaped plants may become more widespread. It is likely that golden bamboo escapes will first invade those communities adjacent to planting sites. For fire regime information on communities not listed here, see the complete FEIS Fire Regime Table.

Fire regime information on vegetation communities in which golden bamboo may occur. This information is taken from the LANDFIRE Rapid Assessment Vegetation Models [30], which were developed by local experts using available literature, local data, and/or expert opinion. This table summarizes fire regime characteristics for each plant community listed. The PDF file linked from each plant community name describes the model and synthesizes the knowledge available on vegetation composition, structure, and dynamics in that community. Cells are blank where information is not available in the Rapid Assessment Vegetation Model.

California South-central US Southern Appalachians Southeast

California

- California Grassland
- California Shrubland
- California Woodland

Vegetation Community (Potential Natural Vegetation Group)	Fire severity*	Fire regime characteristics			
		Percent of fires	Mean interval (years)	Minimum interval (years)	Maximum interval (years)
California Grassland					
California grassland	Replacement	100%	2	1	3
Herbaceous wetland	Replacement	70%	15		
	Mixed	30%	35		
California Shrubland					
Coastal sage scrub-coastal prairie	Replacement	8%	40	8	900
	Mixed	31%	10	1	900
	Surface or low	62%	5	1	6

California Woodland					
California oak woodlands	Replacement	8%	120		
	Mixed	2%	500		
	Surface or low	91%	10		

South-central US

- South-central US Grassland
- South-central US Woodland
- South-central US Forested

Vegetation Community (Potential Natural Vegetation Group)	Fire severity*	Fire regime characteristics			
		Percent of fires	Mean interval (years)	Minimum interval (years)	Maximum interval (years)
South-central US Grassland					
Bluestem-sacahuista	Replacement	70%	3.6	1	
	Mixed	30%	7.7	2	
Oak savanna	Replacement	3%	100	5	110
	Mixed	5%	60	5	250
	Surface or low	93%	3	1	4
South-central US Woodland					
Oak-hickory savanna	Replacement	1%	227		
	Surface or low	99%	3.2		
Oak woodland-shrubland-grassland mosaic	Replacement	11%	50		
	Mixed	56%	10		
	Surface or low	33%	17		
South-central US Forested					
Gulf Coastal Plain pine flatwoods	Replacement	2%	190		
	Mixed	3%	170		
	Surface or low	95%	5		
West Gulf Coastal plain pine (uplands and flatwoods)	Replacement	4%	100	50	200
	Mixed	4%	100	50	
	Surface or low	93%	4	4	10
	Replacement	3%	100	20	200

West Gulf Coastal Plain pine-hardwood woodland or forest upland	Mixed	3%	100	25	
	Surface or low	94%	3	3	5
Southern floodplain	Replacement	42%	140		
	Surface or low	58%	100		
Southern floodplain (rare fire)	Replacement	42%	≥1,000		
	Surface or low	58%	714		

Southern Appalachians

- Southern Appalachians Grassland
- Southern Appalachians Woodland
- Southern Appalachians Forested

Vegetation Community (Potential Natural Vegetation Group)	Fire severity*	Fire regime characteristics			
		Percent of fires	Mean interval (years)	Minimum interval (years)	Maximum interval (years)
Southern Appalachians Grassland					
Eastern prairie-woodland mosaic	Replacement	50%	10		
	Mixed	1%	900		
	Surface or low	50%	10		
Southern Appalachians Woodland					
Appalachian shortleaf pine	Replacement	4%	125		
	Mixed	4%	155		
	Surface or low	92%	6		
Southern Appalachians Forested					
Bottomland hardwood forest	Replacement	25%	435	200	≥1,000
	Mixed	24%	455	150	500
	Surface or low	51%	210	50	250
Mixed mesophytic hardwood	Replacement	11%	665		
	Mixed	10%	715		
	Surface or low	79%	90		
Appalachian oak-hickory-pine	Replacement	3%	180	30	500
	Mixed	8%	65	15	150
	Surface or low	89%	6	3	10

Appalachian Virginia pine	Replacement	20%	110	25	125
	Mixed	15%	145		
	Surface or low	64%	35	10	40
Appalachian oak forest (dry-mesic)	Replacement	6%	220		
	Mixed	15%	90		
	Surface or low	79%	17		

Southeast

- Southeast Grassland
- Southeast Woodland
- Southeast Forested

Vegetation Community (Potential Natural Vegetation Group)	Fire severity*	Fire regime characteristics			
		Percent of fires	Mean interval (years)	Minimum interval (years)	Maximum interval (years)
Southeast Grassland					
Southeast Gulf Coastal Plain Blackland prairie and woodland	Replacement	22%	7		
	Mixed	78%	2.2		
Southern tidal brackish to freshwater marsh	Replacement	100%	5		
Gulf Coast wet pine savanna	Replacement	2%	165	10	500
	Mixed	1%	500		
	Surface or low	98%	3	1	10
Southeast Woodland					
Longleaf pine/bluestem	Replacement	3%	130		
	Surface or low	97%	4	1	5
Longleaf pine (mesic uplands)	Replacement	3%	110	40	200
	Surface or low	97%	3	1	5
Longleaf pine-Sandhills prairie	Replacement	3%	130	25	500
	Surface or low	97%	4	1	10
Pond pine	Replacement	64%	7	5	500
	Mixed	25%	18	8	150
	Surface or low	10%	43	2	50

Atlantic wet pine savanna	Replacement	4%	100		
	Mixed	2%	175		
	Surface or low	94%	4		
Southeast Forested					
Coastal Plain pine-oak-hickory	Replacement	4%	200		
	Mixed	7%	100		
	Surface or low	89%	8		
Maritime forest	Replacement	18%	40		500
	Mixed	2%	310	100	500
	Surface or low	80%	9	3	50
Mesic-dry flatwoods	Replacement	3%	65	5	150
	Surface or low	97%	2	1	8
Southern floodplain	Replacement	7%	900		
	Surface or low	93%	63		

*Fire Severities—
Replacement: Any fire that causes greater than 75% top removal of a vegetation-fuel type, resulting in general replacement of existing vegetation; may or may not cause a lethal effect on the plants.
Mixed: Any fire burning more than 5% of an area that does not qualify as a replacement, surface, or low-severity fire; includes mosaic and other fires that are intermediate in effects.
Surface or low: Any fire that causes less than 25% upper layer replacement and/or removal in a vegetation-fuel class but burns 5% or more of the area [19,29].

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