

# FIVE STAGES OF INVASION OF INVASIVE BAMBOOS

## *PHYLLOSTACHYS* SPP.

### AND THE LEVEL OF DESTRUCTION WITH EACH STAGE

INSTITUTE OF INVASIVE BAMBOO RESEARCH

BY CARYN RICKEL DECEMBER 2012

**INTRODUCTION:** Invasive bamboos *Phyllostachys* spp. are among the fastest growing plants on earth.<sup>1</sup> In fact the Hiroshima bomb did not kill *Phyllostachys*.<sup>2</sup> It flourished just days later. Invasive bamboos *Phyllostachys* spp. grows astonishingly fast, quickly forming a monoculture and replacing native plants.<sup>3</sup> *Phyllostachys* spp. grows more aggressive each successive year.<sup>4</sup> Spread is rapid in all directions.<sup>5</sup> When one realizes it is a problem it is almost too late.<sup>6</sup> The spread of underground rhizomes on a mature grove are relentless.<sup>7</sup> What may start from a single rhizome purchased on eBay,<sup>8</sup> a single willowy stalk bought from an online site such as Craigslist,<sup>9</sup> or YouTube<sup>10</sup> or a single

---

<sup>1</sup> He Huang et al., 2011, Applied Mechanics and Materials, 71-78, 1250 <http://www.scientific.net/AMM.71-78.1250>

<sup>2</sup> Rickel, Caryn .2012. <http://www.cga.ct.gov/2012/ENVdata/Tmy/2012HB-05122-R000222-Caryn%20Rickel%20Seymour---Invasive%20Bamboo%20Research%20Specialist%2015-TMY.PDF>

<sup>3</sup> Ward, J. 2011. Golden should read Yellow Groove July 2011 Field Assessment various case studies. <http://www.cipwg.uconn.edu/pdfs/2011%20minutes/AnnualReport/RunningBambooStatus.pdf>

<sup>4</sup> Lewis Bamboo.2012.<http://www.lewisbamboo.com/growing-bamboo.html>

<sup>5</sup> 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 <http://www.fs.fed.us/database/feis/plants/graminoid/phyaur/all.html>

<sup>6</sup> Texas Invasives: Assessed 2012. [http://www.texasinvasives.org/plant\\_database/detail.php?symbol=PHAU8](http://www.texasinvasives.org/plant_database/detail.php?symbol=PHAU8)

Nelson, Kathleen. 2012.Letter to the Environment Committee- New Milford, CT <http://www.cga.ct.gov/2012/ENVdata/Tmy/2012HB-05122-R000222-Invasive%20Species%20Advisory%20Committee---Kathleen%20Nelson-TMY.PDF>

<sup>7</sup> Smith, Mark J. 2011. Administrator of Weed Control Maryland Dept. of Agriculture - Letter dated Feb.-2-2011 <https://docs.google.com/viewer?a=v&pid=sites&srcid=ZGVmYXVsdGRvbWVfbnxbnZhc2l2ZWJhbWJvb3Jlc2VhcmNofGd4OmZmMWM5ZGEwZjBhZTM5YQ>

<sup>8</sup> Selling rhizomes on ebay: Assessed 2012. [http://www.ebay.com/itm/BAMBOO-RHIZOMES-RUNNING-ROOTS-GREEN-YELLOW-DORMANT-2-of-6-inch-long-/120881000531?pt=LH\\_DefaultDomain\\_0&hash=item1c2511b053](http://www.ebay.com/itm/BAMBOO-RHIZOMES-RUNNING-ROOTS-GREEN-YELLOW-DORMANT-2-of-6-inch-long-/120881000531?pt=LH_DefaultDomain_0&hash=item1c2511b053)

<sup>9</sup> Selling Yellow Groove on Connecticut Craigslist: <http://hartford.craigslist.org/grd/3421742208.html>

<sup>10</sup> Selling Yellow Groove on YouTube: <http://www.youtube.com/watch?v=XyWQ-NWG8HI>

plant shared from a neighbor turns into a full blown giant timber bamboo forest and a homeowner's worst nightmare.

**Assumptions:** *Phyllostachys* invasive bamboos invade rapidly underground via reproductive tissues called rhizomes.<sup>11</sup> The rhizome web which is interconnected is one organism.<sup>12</sup> One infestation can invade 9.3 miles.<sup>13</sup> The height and thickness of the culms increases each successive year as well as the length of the rhizomes. The underground rhizome web is likened to horticultural concrete below ground. The rhizome web metastasizes to new habitat as the organism invades further each year.<sup>14</sup>

**Methodology:** Starting in 2010, I documented approximately 250 invasions of *Phyllostachys aureosulcata* McClure (1945) - yellow groove and *Phyllostachys bissetii* McClure (1956) - bisset bamboo in Connecticut. This data collection is part of my research in keeping the database spreadsheet of invasions for the State of Connecticut. For each case study I collected the age of the planting, source, and images. The data was then entered onto EDDMapS.<sup>15</sup> (Early Detection and Distribution Mapping System) These data points constituted the basis of the analysis that is used to project the speed of invasion and spread.

---

<sup>11</sup> 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  
<http://www.fs.fed.us/database/feis/plants/graminoid/phyaur/all.html>

<sup>12</sup> Mike McGrath's audio.2012.Guests Dr. Richard Mack, and Melissa Smith  
<https://soundcloud.com/onebuccaneer/mike-mcgrath-audio>

Personal communication: Greg Braun Mr. Bamboo of Terry Hills, NSW-Email dated 1/17/12  
Renew Bamboo Assessed 2012. <http://www.renewbamboo.com/index.php/component/k2/item/53-bambooanatomy>

<sup>13</sup> 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  
<http://www.fs.fed.us/database/feis/plants/graminoid/phyaur/all.html>

<sup>14</sup> Martin, Mike.2008. JNCI J Natl Cancer Inst 100 (2): 88-89.<http://jnci.oxfordjournals.org/content/100/2/88.full>

<sup>15</sup> EDDMapS.2012.Early Detection & Distribution Mapping System  
<http://www.eddmaps.org/profile.cfm?user=2610>

On each field assessment I documented the age of each planting in order to examine the expected spread of *Phyllostachys* spp. by assigning the data points into one of five categories. These are classified as the ***five stages of invasion***.

My observations in the field indicate the growth and spread in the first five years is nowhere near the size and spread in years 5 - 10. Years 10 - 15 are dramatically larger in size and spread than the previous five years. After year 15, the size and rate of spread is astonishing in comparison to the previous invasions. After the 25<sup>th</sup> year the thickness of the culms and spread of rhizomes is rapid in the takeover of the soil and surrounding areas.<sup>16</sup>

**Discussion:** I carefully noted the age by tracking the original planter of each planting to compare and develop a unique system to determine the extent of an infestation.

***The five stages of invasion are classified as:***

***Stage 1, Stage 2, Stage 3, Stage 4, and Too Late.***

\*\*\*

**Stage 1:** The infestation is less than 5 years old and has not invaded under structures yet. In most cases this is confined to one property. Eradication is difficult but doable.

**Stage 2:** The infestation is between 5 - 10 years old. Invasion is large and often still confined to one property. Eradication is very difficult and in most cases will damage structures to include landscape and hardscape.

---

<sup>16</sup> Invasive.org. 2012. Center for Invasive Species and Ecosystem Health  
<http://www.invasive.org/browse/AutThumb.cfm?aut=75441>

**Stage 3:** The infestation is between 10 - 15 years old. Invasion is large and is in a critical phase here. The spread of rhizomes is deep and relentless. Bamboo is dense and on multiple properties. Spread is under structures and other native plants and trees. Eradication will require great effort and planning. Diligence is required for several years to gain success.

**Stage 4:** The infestation is over 15 years in age. This will appear as very thick bamboo. The culms and cut stumps are thick with very destructive rhizomes. In most cases the bamboo has spread from multiple properties and even adjoining streets. The bamboo is under structures and may be invading natural areas. Rhizomes will be under vegetation including trees and rocks along wetland areas. The infestation has formed a monoculture and has naturalized into adjoining areas. A dense monoculture at this age is invading at a rapid speed underground. Complete eradication is not likely without great damage to surrounding structures including all vegetation. This would be the equivalent of a ground zero to destroy the invasive bamboo. Use of pesticides will come with the associated risks to human health and the environment.

**Too Late:** This is the stage where the infestation has fully naturalized into a large area. To eradicate an infestation of this size would require the destruction of all plant life and structures in order to remove the bamboo forest. This would be the equivalent of cancer metastasizing in a body. You would need to destroy the surroundings in order to destroy the *Phyllostachys* organism. Eradication would not be practical in this stage. The economic damage or costs associated with an infestation in this stage would be large.

**Conclusion:** The five stages of invasion are shown below in a picture documentary as with *Phyllostachys* invasive bamboos seeing is believing.



Oxford, CT 2011 Image by Caryn Rickel

***Stage 1 invasion:*** small infestation on left. This will invade this entire wooded area and invade all along the Housatonic riverbank seen in the background.



Shelton, CT 2011    Image by Caryn Rickel

***Stage 2 invasion:*** Rhizomes invading far, bamboo is running. Infestation is still confined to one property owner. Major effort to eradicate.

**Early Detection and Distribution Mapping System:**

<http://www.eddmaps.org/distribution/pdfs/2019680.pdf>



Fairfield, CT Image by Caryn Rickel

***Stage 3 invasion:*** Invasion is large and is in a critical phase here. Bamboo has invaded under tall pines and is heading for the wetland area in back. Bamboo has invaded two properties and rhizomes are shooting out along town's sidewalk along road and under rock wall. Eradication will require intense planning and effort.

**Early Detection and Distribution Mapping System:**

<http://www.eddmaps.org/distribution/point.cfm?id=2483638>



Orange, CT 2012 Image by Caryn Rickel

***Stage 4 invasion:*** Property fully invaded. Bamboo has formed a monoculture and has invaded under trees, rocks, and towns drainage ditch. Long rhizomes are roping all though the soil and drainage ditch. Bamboo appears to have invaded septic field extensively. Bamboo has escaped all along the roadside and under old rock wall. Eradication is not likely without great damage to structures including vegetation.

**Early Detection and Distribution Mapping System:**

<http://www.eddmaps.org/distribution/point.cfm?id=2642210>



Too Late For This Forest In Newtown, CT

Newtown, CT 2011 Image by Caryn Rickel

***Too Late invasion:*** Too late for this forest in Newtown, CT. This infestation originated from a single yellow groove plant given as a house warming gift purchased from a roadside vendor in 1989. The plant was originally planted by the foundation of the home. The bamboo fully invaded the one acre property and then invaded down the embankment forming a monoculture in the adjoining forest area. Bamboo leaves were ice damaged from the harsh winter and are a golden hue in the higher areas in the background.

**Early Detection and Distribution Mapping System:**

<http://www.eddmaps.org/distribution/point.cfm?id=2017846>