SFE Fact Sheet 2019-2

Terrestrial Invasive Plants and Fire

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Invasive plants complicate management on lands where fire is used to maintain native communities. Invasive species can make it difficult to achieve prescribed fire objectives (for example, by changing fire intensity and fuel continuity), especially when they are resilient to fire.

Stages of Invasion

Invasive plants can be affected by fire at one or more stages of the invasion process: 1) colonization by seed or vegetative propagules, 2) survival and reproduction, 3) growth or increase in density by spreading vegetatively or by seed (low density, but increasing), and 4) dominance, in which a species is not only very abundant but also suppresses other species.

Invasive plants vary in their sensitivity to fire during the invasion process. Some species are sensitive to fire management at all stages. Both seeds and non-sprouting adult plants experience high mortality after fire such that the species is unable to reproduce, spread, and become dominant in fire-frequented environments. In other cases, invasive species are resilient to occasional fire. Fire can stimulate germination in these species and promote spread, but fires that occur too frequently or before plants begin to reproduce can kill adult plants, deplete the seed bank, and prevent dominance at a site. Some species are unaffected or even promoted by fire. These species are often the most difficult to control, because they tend to survive fire by resprouting followed by rapid growth and sometimes abundant seed production that allows them to quickly gain dominance. Fire-plant relationships can change over time and are influenced by the environmental context, including the native community assemblage, soil fertility and hydrology, and presence of pests and pathogens.

Invasive plants are a concern in fire management when they influence fire regimes. Some species, such as cogongrass (*Imperata cylindrica*), produce abundant biomass that greatly increases fuel loading and generates intense fires. Other species, such as Chinese tallow (*Triadica sebifera*), shade out understory fine fuels or produce dense litter that holds moisture and suppresses fire. Typically, the effects that plants have on the fire regime will increase as their density increases.

The following table summarizes our current knowledge of the fire ecology of several common invasive plants in fire-frequented habitats of the southeastern US.

Species	Growth form	Environments it invades	Effects on fire	Post-fire response	Additional characteristics
Tree of heaven (*Ailanthus altissima*)	Tree	Disturbed forests, edges, open areas	No effect, but could produce toxic smoke when burned	• Established plants resprout from base and roots • High postfire seedling establishment from many winddispersed seeds that germinate on open ground	• Seedlings can establish on burned and unburned sites • Grows best in high nutrient and open canopy conditions • Chemicals in leaves, bark, and seeds inhibit growth of nearby plants
Callery pear (*Pyrus calleryana*)	Tree	Disturbed forests, old fields, open areas	No particular effect	• Seedlings 2 years and older resprout • Fire kills seeds and seedlings up to 1 year old	• Thought to be sterile but different varieties in close proximity can crosspollinate
Chinese tallow (*Triadica sebifera*)	Tree	Streams, floodplains, uplands	Lack of fuel under dense stands so fire does not spread	• Resprouts vigorously from base and roots • Canopy is not flammable	• Small trees are more vulnerable to fire, so they are unlikely to invade frequently burned areas • Annual spring burning can reduce seedling growth • Thick bark in older trees protects them from fire • Shortlived seed bank
Sericea lespedeza (*Lespedeza cuneata*)	Shrub	Bottomlands, grasslands	No particular effect	• Resprouts from root crown • Regenerates from large seedbank in soil • Populations promoted by fire	• More vulnerable to late summer fires • Winter fires promote seed germination • Seeds are viable for up to 20 years
Brazilian pepper (*Schinus terebinthifolia*)	Shrub	Disturbed areas, moist to dry sites	Dense closed-canopy stands limit fine fuels so fire does not spread	• Seeds have limited heat tolerance • Resprouts from aboveground stems and root crown • Burned individuals might produce fewer seeds	• More vulnerable to fire at small sizes and at low densities • Less likely to colonize frequently burned sites, especially those that are undisturbed, but can colonize recently burned areas
Chinese privet (*Ligustrum sinense*)	Shrub	Riparian and upland habitats	Moist conditions under dense stands reduce fire spread and intensity	• Resprouts from root crowns or roots	• Seedlings are more vulnerable than adults
Cogongrass (*Imperata cylindrica*)	Grass	Disturbed areas, moist to dry sites	Increases fire intensity and spread	• Quickly resprouts from rhizomes • Able to outcompete native species after fire	• Produces abundant seeds that establish in a variety of conditions, especially disturbed areas • Burns intensely at any time of year • Heavy litter accumulation
Kudzu (*Pueraria montana* var. *lobata*)	Vine	Forest edges, disturbed areas, moist to dry soils	• Ladder fuels increase crown fire potential • High moisture content reduces fire intensity and spread during summer • Dry fuels in winter could burn intensely	• Resprouts from subsurface root crown after fire • Soil heating could promote seed germination	• Quickly develops a deep taproot and spreads via belowground rhizomes • Dense kudzu litter inhibits germination of other plants
Air potato (*Dioscorea bulbifera*)	Vine	Open or disturbed areas and in riparian zones	• Ladder fuels increase crown fire potential	• Resprouts from tubers • Larger bulbils have higher survival after fire	• Abundance increased after 3 years of annual March fires in sandhills (prior to vine emergence) • Longer bulbil viability when buried under litter
Old world climbing fern (*Lygodium microphyllum*)	Vine	Moist habitats and swamps	• Ladder fuels increase crown fire potential • Pieces of fern could break off and start spot fires	• Resprouts rapidly after fire	• Spores spread by wind

What is the stage of invasion?

- Early - Most plants are young/not reproductive
- **Late - Plants are established and reproducing**

What is the size of invasion?

- Small - Few plants scattered across the landscape
- **Large - Invasive dominating or nearly dominating across the landscape**

How does the invasive species affect fire?

- No effect
- **Negative - invasive decreases fire frequency and intensity**
- Positive - invasive increase fire frequency and intensity

How does the invasive species regenerate after fire?

- Reseeder – regeneration is by seed only; adult plants do not survive fires
- **Resprouter – regeneration is primarily by resprouting from root crowns**
- **Reseeder/Resprouter – both regeneration methods are common after fire**

How does fire affect the invasive species?

- No effect
- Negative - fire decreases density of invasive species
- Negative, but depends on burn season - fire decreases density of invasive species when sensitive (i.e., when plants are reproducing
- **Positive - fire increases density of invasive species**

Do other methods need to be considered instead of or in addition to prescribed fire?

- Zero bold questions, No - But proceed with caution and continue monitoring invasive density and spread
- **One or more bold answers, Yes - Consider controlling invasive prior to or in conjunction with fire**

If one or more questions have a bold answer, carefully consider the benefits of applying prescribed fire prior to reducing invasion size and extent.

Key Management Considerations

Fire management can target fire-resilient species as seeds or as adults. Fire can be used to kill some seeds on the soil surface or those still on reproducing plants. Mature plants that resprout after fire are rarely killed by a single fire. Often very frequent (annual) fires can slow population spread but will likely not eliminate invasive species unless populations are low-density or composed of mainly young plants. When densities are high, mechanical or chemical removal methods should be considered (e.g., mature kudzu vines), especially if the invasive is known to alter the fire regime by increasing (e.g., cogongrass) or decreasing (e.g., Brazilian pepper) intensity and spread.

Burning when populations are sensitive to fire will also reduce recovery after fire. For instance, it is recommended, when possible, to burn when plants are flowering or producing seeds to reduce seed production and germination after fire. Ultimately, outcomes will depend on habitat type, coexisting species, and stage of invasion. Each invasion should be carefully and individually considered before management actions are taken.

Additional Resources

More specific resources for invasive plant management recommendations can be found by contacting your local/state Cooperative Extension office and by searching on the US Forest Service TreeSearch search engine (**https://www.fs.usda.gov/treesearch/**).

High Cogongrass Infestation

Low Cogongrass Infestation

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For more information on the Southern Fire Exchange,
visit **www.southernfireexchange.org** or email **contactus@southernfireexchange.org**.

For additional information on the reciprocal effects of invasive plants and fire, see **https://www.feis-crs.org/feis/**

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