

BURNING TREES FOR POWER

THE TRUTH ABOUT WOODY BIOMASS, ENERGY & WILDLIFE



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Executive Summary

Wildlife and biodiversity in southeastern U.S. forests are threatened by increased clearcutting of private lands to supply wood pellet exports to Europe. Forest management regulations in the U.S. differ greatly depending on who owns the forests—private individuals or entities, the state, or the federal government. Privately owned forests are managed and harvested without much restriction or oversight to protect against large-scale clearcutting and loss of biodiversity.¹ For example, most of the biodiversity in the southeastern U.S. is found on private land; yet private landowners are not required to survey for threatened or endangered species and few states in the region have additional legal protections for these imperiled species.² This lack of regulation is significant since over 80 percent of forests in the southeastern U.S. are privately owned.³ This system has allowed the rapid expansion of unregulated wood pellet production in the southeastern U.S. and its export to Europe.⁴

In 2016, wood pellet exports from the U.S. reached 4.9 million metric tons, tripling the 1.6 million tons exported in 2012.⁵ Nearly 85 percent of these exports—approximately 4.1 million metric tons—went to the U.K.⁶ Increasingly high forest harvest levels (7 million green tons in 2016) are needed to support these wood pellet exports to the U.K. According to the U.S. Forest Service, “[i]t is unlikely that biomass requirements for energy would be met through harvest residues and urban wood waste alone.”⁷ Healthy, whole trees are required to meet this level of wood pellet production.⁸ Supplying the U.K.’s demand for wood pellets in 2016 alone required harvesting approximately 303 square kilometers of forests in the southeastern U.S.⁹ At this level of demand, in a little over one year the U.K. will have harvested an area the size of the New Forest in

England (376 sq. km,¹⁰ or more than 50,000 Wembley stadiums) for pellet production.

Bottomland hardwood and other wetland forests in the southeastern U.S. are among North America’s most valuable ecosystems; they remove nutrients and other pollutants from water to maintain the quality of streams, rivers, and estuaries, and sequester and store large amounts of U.S. carbon emissions.¹¹ These forests are also among the U.S.’s most important habitats for wildlife.¹² Despite these valuable ecosystem services, the U.S. Environmental Protection Agency estimates that 60 percent of the original almost 12 million hectares of bottomland forests in the southeastern U.S. have been destroyed.¹³ Unfortunately, some of these highly biodiverse forests are now being clearcut to supply wood for pellet mills in the southeastern U.S.¹⁴

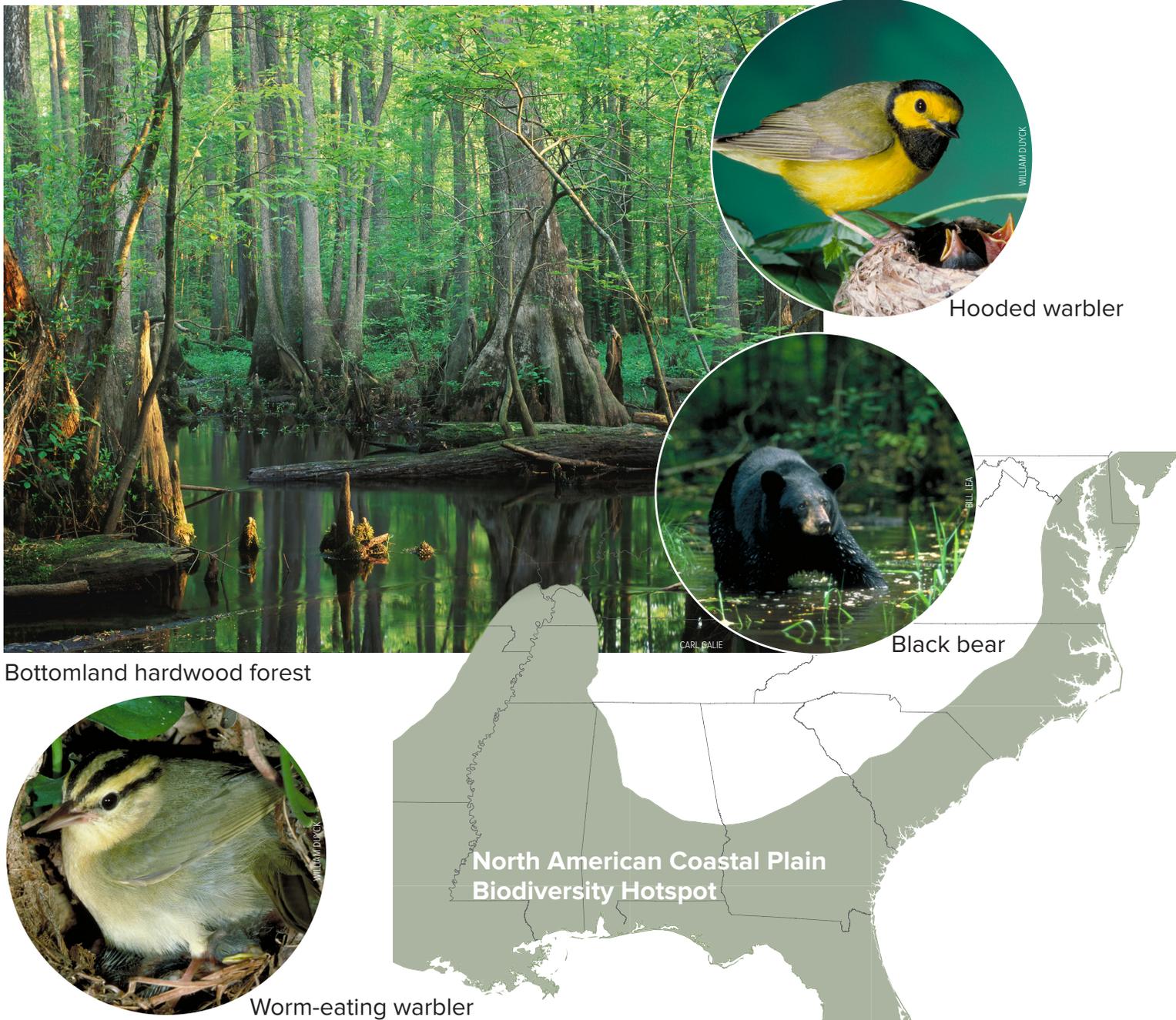
Similarly, the Southeast’s natural longleaf pine forests are extremely diverse and species-rich ecosystems that provide habitat for many endemic species.¹⁵ Biomass sourcing also relies heavily on softwood pulpwood and therefore incentivizes the conversion of natural forests to plantation pine forests.¹⁶ The increasing demand for woody biomass threatens the region’s remaining naturally biodiverse longleaf pine forests. The U.S. Forest Service estimates that the South’s naturally regenerating pine forests will decline by 25 to 58 percent from 2010 to 2060.¹⁷ Meanwhile, by 2060 artificial plantation pine is expected to comprise 24 to 34 percent of the region’s forest area.¹⁸

As a result of the destruction of the region’s natural bottomland hardwood and longleaf pine forests, numerous species dependent on these forests are now classified as rare, declining, and of conservation concern.¹⁹

Global Biodiversity Hotspot

In 2016, the North American Coastal Plain (i.e., the southeastern U.S.) was recognized as the 36th Global Biodiversity Hotspot. A biodiversity hotspot is an area rich in diversity, but which is severely threatened. To qualify as a global biodiversity hotspot an area must have over 1,500 endemic plant species (species found nowhere else) and have lost at least 70 percent of its natural habitat. The southeastern U.S. exceeds these requirements with over 1,800 endemic plant species (over 2,000 total endemic species) and 85.5 percent of natural vegetation, including primarily grasslands, pine savannas, woodlands, marshes, and glades, having been altered or converted.²⁰

The global biodiversity hotspot designation is recognition that “[s]outhern forests are unique, exceptionally diverse,”²¹ and “one of the most biologically rich regions in North America.”²² Unfortunately, the region’s natural longleaf pine and bottomland hardwood forests, which are critical for biodiversity, are also the forests affected the most by biomass production.²³ Wood pellet mills in the Southeast also rely on the region’s abundant upland hardwood forests, and harvests of such forests are expected to increase as the wood pellet industry continues to expand.²⁴ The European Commission recently recognized the “direct negative ecological consequences” of increased harvesting of upland hardwood forests and the potential conversions of these forests to pine plantations.²⁵



Bottomland hardwood forest

Hooded warbler

Black bear

Worm-eating warbler



Natural longleaf pine forest



Monoculture pine plantation

Conversion of Natural Forests to Pine Plantations

The southern U.S. contains 14 critically endangered, 25 endangered, and 11 threatened forests communities.²⁶ These endangered forests fall primarily within seven classes: old-growth forests; spruce-fir forests; wetlands, bogs, and pocosins; bottomland and floodplain forests; glades, barrens, and prairies; longleaf pine forests; and Atlantic white cedar swamps.²⁷ These forests provide diverse habitats and valuable ecosystem services for the

region. Bottomland hardwood forests, in particular, provide “habitat for one of the highest concentrations of endangered species in North America” and support critical ecosystem services, including water filtration, flood prevention, soil protection, and carbon sequestration and storage.²⁸ Native longleaf pine forests are also “renowned for their high levels of diversity, endemism, and species rarity” and the “longleaf-grassland ecosystem is one of the most species-rich ecosystems found outside the tropics.”²⁹

Artificial pine plantations, in contrast, are “notable for their lack of diversity, endemism, and species rarity.”³⁰

Despite their innumerable benefits, the Southeast’s natural forests are rapidly declining—facing pressures from the wood pellet industry, agriculture, traditional forest products industries, and urbanization.³¹ One of the biggest threats to the region’s natural forests is the conversion to pine plantations.³² According to the U.S. Forest Service, bioenergy demand could contribute to an increase in the area of planted pine of 7 to 33 percent from 2010 levels by

2060.³³ Under the medium bioenergy demand scenario, the Forest Service estimates a 19 percent increase in the area of planted pine (approximately 3 million hectares).³⁴ This is an increase in area of planted pine that is more than twice the size of Northern Ireland (1.41 million hectares). The largest losses of natural forests in the Southeast are forecasted in Florida, South Carolina, and North Carolina (58, 35, and 30 percent loss, respectively).³⁵

In particular, the region’s bottomland hardwood forests, already “reduced to a mere fraction of their original extent,” are “now being logged to supply the wood pellet

export industry.”³⁶ Many of the existing and proposed wood pellet mills in the southeastern U.S. are sited within the sourcing range of unprotected natural bottomland hardwood forests.³⁷ Since 2013, reports and independent investigations have discovered that Enviva, the largest exporter of wood pellets from the southern U.S., sources wood for several of its North Carolina and Virginia wood pellet mills from clearcuts of wetland forests in the global biodiversity hotspot area.³⁸ Large-scale clearcutting of mature bottomland hardwood forests negatively affects many vulnerable interior-nesting bird species and water quality.³⁹ In addition to direct logging removals, increased residual removals (i.e., downed wood) in these forests can negatively impact forest regeneration and lead to habitat degradation.⁴⁰ As a result of the mounting pressures facing these natural forests—exacerbated in recent years by the wood pellet export industry—bottomland hardwood forests in the region are projected to decline by 5 to 12 percent from 2010 to 2060, a loss of .68 to 1.61 million hectares.⁴¹

Biomass feedstock is also being sourced from the region’s natural pine forests, which are projected to decline by 25 to 58 percent from 2010 to 2060, a loss of 3 to 5 million hectares.⁴² After an initial harvest, “[f]orest landowners [in the southern U.S.] have shown a strong propensity to convert naturally regenerated forests to planted pines.”⁴³ As a result, by 2010, 19 percent of total forest acres in the South (16 million hectares) was planted pine.⁴⁴ This represents a doubling of the area of planted pine in the region from 1990.⁴⁵ The greatest growth in planted pine in the region is in the Coastal Plain global biodiversity hotspot,

where 17 million hectares of forest is planted pine.⁴⁶ By 2060, the U.S. Forest Service projected that planted pine will comprise 24 to 34 percent of the South’s forest area.⁴⁷

The conversion of natural forests to plantations, specifically monoculture pine plantations, has significant negative impacts on biodiversity. These conversions are “widely recognized as a major risk factor associated with increased bioenergy demand,”⁴⁸ with a study funded by the National Wildlife Federation predicting that high levels of woody biomass harvest will threaten several indicator species in the region through large-scale changes



Clearcut wetland supplying Enviva’s Southampton, Va., wood pellet mill



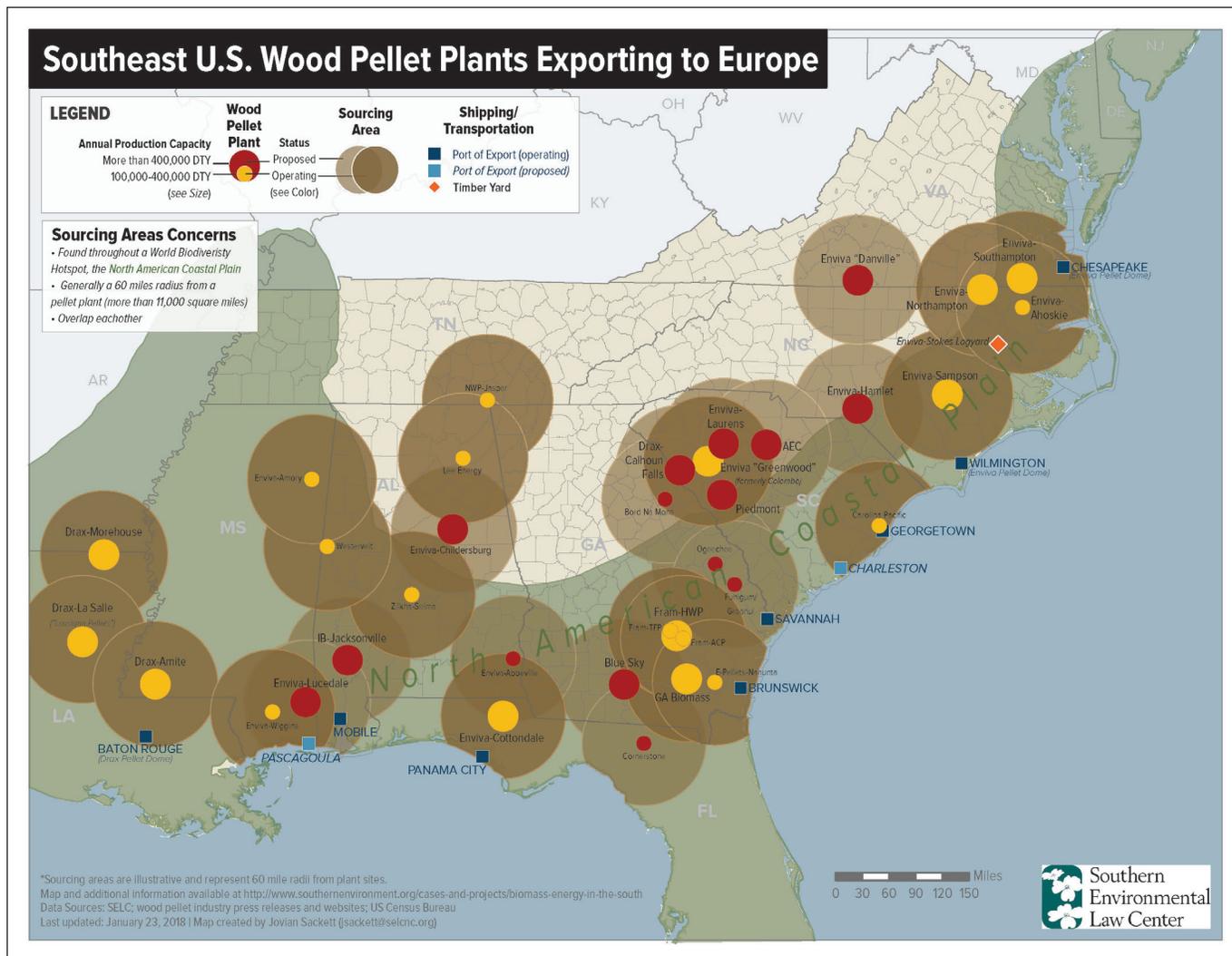
Log pile at Enviva’s Northampton, N.C., wood pellet mill

to the type and extent of forest and farm habitats. After conversion, “the remaining forests [are] composed of more intensively managed forest and less of the bottomland hardwood and longleaf pine habitats that support biodiversity.”⁴⁹ The U.S. Forest Service recognizes that pine plantations are “generally poor wildlife habitat,” especially “when compared with natural pine and hardwood forests.”⁵⁰ The South’s natural longleaf pine forests, in particular, are highly valued for their biodiversity due to high levels of diversity, endemism, and species-richness. Unfortunately, these prized forests are facing “near elimination,” which the U.S. Forest Service acknowledged as “perhaps the greatest ecosystem alteration resulting from intensive forest management and land use conversion in the South.”⁵¹

“The combination of land use change, management intensities, and climate” change has already “result[ed] in a number of changes in the composition and structure of the region’s forests.”⁵² Increased demand for woody biomass will continue to exacerbate the pressures facing these forests by incentivizing the harvest of whole trees

and the conversion of natural forests to monoculture pine plantations.⁵³ In claiming (erroneously) that woody biomass derived from harvesting forests is “carbon neutral,” the wood pellet industry claims its demand will accelerate establishment of pine plantations in the region.⁵⁴ These claims, however, fail to acknowledge the adverse effects of these forest conversions on the region’s biodiversity.⁵⁵

In addition to the large-scale changes in forest types, southern forests are also decreasing in area. A study by the U.S. Forest Service acknowledged a “[n]et forest loss[]” in the southern U.S.⁵⁶ Specifically, “[t]he South is forecasted to lose between [4] million and [9] million [hectares] (7 and 13 percent, respectively) of forests from 1997 to 2060.”⁵⁷ Forest loss is projected to occur throughout the region, but will be concentrated in the southeast, with the highest percentage of loss occurring in the Coastal Plain global biodiversity hotspot.⁵⁸ Of this loss, natural forests within the global biodiversity hotspot area are forecasted to decrease by 2 million hectares until 2025.⁵⁹





Cerulean warbler



Red wolf



Prothonotary warbler

Species Richness

The U.S. Forest Service estimates that the region's forests contain 1,076 native terrestrial vertebrates: 176 mammals, 525 birds, 179 amphibians, and 196 reptiles.⁶⁰ However, the Forest Service also states that forest degradation and fragmentation from urbanization and conversion of natural forests to plantations is restricting the available habitat necessary for these species to maintain the region's rich biodiversity.⁶¹

Species of conservation concern in the southern U.S. include 142 terrestrial vertebrate species, 77 of which are listed as threatened or endangered under the Endangered Species Act, and more than 900 plant species, 141 of which are federally listed.⁶² Particularly in the Southeast, these imperiled, threatened, and endangered species are located within the sourcing range of proposed and operating wood pellet mills.⁶³ According to a 2015 report by the Natural Resources Defense Council, the potential sourcing area for operating and proposed mills "include[s] critical habitat for up to 25 different species that are federally listed as imperiled or endangered."⁶⁴ Habitat loss, the primary threat for these imperiled species, is exacerbated by the rapidly increasing demand for wood pellets for export to Europe, primarily to the U.K. A study funded by the National Wildlife Federation demonstrates the potentially negative impacts of biomass sourcing on native wildlife species. Specifically, "a large number of species of high conservation concern" inhabit natural pine forests and "are known to show adverse effects from landscape-scale conversion of longleaf pine to plantation forestry."⁶⁵

Mammals impacted by wood pellet sourcing include the world's only wild population of red wolves, which roams five northeastern North Carolina counties, overlapping with the presumed sourcing area for several wood pellet mills.⁶⁶ With a wild population of as few as 28, the red wolf is "one of the world's most endangered canids."⁶⁷ Other imperiled mammals within the southeastern U.S. wood pellet sourcing areas include the Louisiana black bear, which until last year was federally listed,⁶⁸ and the coastal plain population of the eastern fox squirrel, which is considered vulnerable in some areas of North Carolina due to conversion and fragmentation of its preferred habitat of mature longleaf pine and hardwood forests.⁶⁹

Bird species, including the Swainson's warbler, prothonotary warbler, cerulean warbler, swallow-tailed kite, and red-cockaded woodpecker, are also in serious peril from habitat loss exacerbated by sourcing woody biomass from forests in the southeastern U.S.⁷⁰ Many of these species prefer mature, natural bottomland hardwood or longleaf



Three-lined salamander



Gopher frog

pine forests, both of which are being destroyed by clear-cutting or conversion to plantation pine to supply biomass feedstock.⁷¹

The southern U.S. also supports exceptionally diverse aquatic species. The region's streams, rivers, and lakes have the highest diversity of freshwater fish in the nation and the largest number of freshwater mussel species on earth.⁷² Likewise, amphibian biodiversity is concentrated in the southeastern U.S. where many species inhabit bottomland hardwood forests.⁷³ For example, "[w]idespread loss of bottomland hardwood forests likely has resulted in the loss of many subpopulations"⁷⁴ of three-lined salamanders, a species of conservation concern in North Carolina that inhabits

forested floodplains, wet shrublands, and bottomland forests.⁷⁵ Clearcutting of bottomland hardwood forests destroys the wetland ecosystem by removing the source of organic matter that provides nutrients for "organisms that form the base of the [ecosystem's] food web."⁷⁶ Additionally, the conversion of natural longleaf pine forests to monoculture pine plantations also threatens amphibian species of conservation concern in the region, such as the gopher frog, a species endemic to the southeastern U.S.⁷⁷

Conclusion

The southeastern U.S. is home to some of the world's most biodiverse forests that act as critical habitat for hundreds of species of conservation concern. Although these forests have been designated as a global biodiversity hotspot, the rapidly expanding wood pellet industry in the region is exacerbating the pressures on these forests by destroying or converting the natural forests and threatening the species that rely on them.

In 2016 alone, the U.K.'s demand for wood pellets from the southeastern U.S. required harvesting approximately 303 square kilometers of the region's highly biodiverse forests. At this rate, the U.K.'s wood pellet demand will require cutting down an area the size of the New Forest in England (376 sq. km.) in a little over one year (an area larger than 50,000 Wembley Stadiums). Projections indicate that the levels of harvest necessary to meet the growing demand for woody biomass will threaten the long-term functioning and sustainability of southeastern U.S. forest habitats. Large-scale clearcutting, old-growth and wetlands logging, and conversion of natural forests to plantations is often unregulated and compromises the biodiversity and ecological integrity of the area. The increased demand for woody biomass in the southeastern U.S. will therefore cause long-term, region-wide alterations to natural forests and loss of critical habitat, further threatening the region's globally significant biodiversity.

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² Clinton N. Jenkins, et al., *US Protected Lands Mismatch Biodiversity Priorities*, 112 PNAS 5081, 5083 (2015), <http://www.pnas.org/content/112/16/5081.full>.

³ NRDC, *In the U.S. Southeast*, *supra* note 1, at 9.

⁴ *Id.* at 3; NWF, *Forestry Bioenergy in the Southeast United States: Implications for Wildlife Habitat and Biodiversity* 13 (Dec. 23, 2013), https://www.southernenvironment.org/uploads/publications/forestry_bioenergy_in_the_SE_U.S..pdf; European Commission, *Environmental Implications of Increased Reliance of the EU on Biomass from the South East U.S.* 104-06 (Dec. 2015), <http://www.aebiom.org/wp-content/uploads/2016/08/DG-ENVI-study-imports-from-US-Final-report-July-2016.pdf>.

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⁶ Flach, Lieberz, & Rossetti, *supra* note 5.

⁷ David N. Wear & John G. Greis (Eds.), USDA Forest Service, *The Southern Forest Futures Project: Technical Report 213* (Aug. 2013), https://www.srs.fs.fed.us/pubs/gtr/gtr_srs178.pdf.

⁸ *Id.*; NRDC, *In the U.S. Southeast*, *supra* note 1, at 3.

⁹ Spencer Phillips, an economist for Key-Log Economics, conducted research and developed an equation for estimating the number of acres of forest that must be harvested to produce the amount of wood pellets for export to Europe in a given year:

$$\text{Harvest (Acres)}_i = \frac{[(\text{dry tonnes Pellet Exports}) \times (\text{green tons furnish} / \text{dry tonnes pellets})] - [\text{green tons residue}]}{\text{Harvest yield (green tons biomass} / \text{acre)}}$$

The number of green tons required to produce the number of wood pellets exported to the U.K. in 2016 was generated by simplifying the above equation to:

$$\begin{aligned} & (\text{dry tonnes of pellet exports}) \times 2.24 (\text{green tons furnish} / \text{dry tonnes pellets}) \times .76 \\ & (4.1 \text{ million} \times 2.24) \times .76 = 6.97 \text{ million green tons} \end{aligned}$$

In this equation, 4.1 million is the amount of dry tonnes of wood pellets exported from the U.S. to the U.K. in 2016. The conversion rate of green tons to dry tonnes of wood pellets (2.24) comes from a 2015 RISI report. Walker, et al., *An Analysis of UK Biomass Power Policy, US South Pellet Production and Impacts on Wood Fiber Markets* 13 (2015), <http://docplayer.net/25281897-An-analysis-of-uk-biomass-power-policy-us-south-pellet-production-and-impacts-on-wood-fiber-markets-prepared-for-the-american-forest-paper.html>. Enviva Wood Pellets, the primary provider of wood pellets to the U.K. (particularly, Drax), claims that 23 to 24 percent of its wood pellets are sourced from mill residue, with 76 percent (.76) coming directly from forest harvests. Taking into account the different forest management types and harvest yields from Table 1 of Phillips' 4/27/2016 memorandum, the weighted average of yields is 93 green tons of biomass per acre of forest. See Spencer Phillips, Memorandum for Dogwood Alliance (www.dogwoodalliance.org) (Apr. 27, 2016), [https://www.southernenvironment.org/uploads/audio/BiomassAcreage_Final_20160427_\(3\).pdf](https://www.southernenvironment.org/uploads/audio/BiomassAcreage_Final_20160427_(3).pdf). Thus, the harvest area needed to supply the U.K.'s wood pellet demand in 2016 is 117 square miles:

$$6.97 \text{ million green tons} / 93 \text{ green tons per acre} = 74,946 \text{ acres (640 acres per square mile)}.$$

¹⁰ Forestry Commission: England, *England's Woods & Forests: The New Forest*, <https://www.forestry.gov.uk/newforest>.

¹¹ See NRDC, *In the U.S. Southeast*, *supra* note 1, at 3-8.

¹² *Id.* at 4.

¹³ See EPA, *Bottomland Hardwoods*, <https://www.epa.gov/wetlands/bottomland-hardwoods> (last updated Oct. 6, 2016).

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¹⁷ USDA, *Southern Forest Futures Project: Technical Report*, *supra* note 7, at 79.

¹⁸ *Id.*

¹⁹ See European Commission, *supra* note 4, at 34-36.

²⁰ Reed Noss, *Announcing the World's 36th Biodiversity Hotspot: The North American Coastal Plain*, CEPF (Feb. 18, 2016), <https://www.cepf.net/stories/announcing-worlds-36th-biodiversity-hotspot-north-american-coastal-plain>; CEPF, *Hotspots Defined*, <https://www.cepf.net/our-work/biodiversity-hotspots/hotspots-defined>.

²¹ USDA, *Southern Forest Futures Project: Summary Report*, *supra* note 16, at 2.

²² NRDC, *In the U.S. Southeast*, *supra* note 1, at 4.

²³ See Brad Rich, *Studies Link Biofuel Demand, Habitat Loss*, Coastal Review (Sept. 28, 2016), <https://www.coastalreview.org/2016/09/studies-link-biofuel-demand-habitat-loss/>.

²⁴ See European Commission, *supra* note 4, at 40, 204; Dogwood Alliance, NRDC, & SELC, *European Imports*, *supra* note 14. Enviva, which has wood pellet mills across the southeast, acknowledges that 61 percent of its source wood is hardwood, with 3 percent from bottomland hardwood forests, 6 percent from upland hardwood forests, and 38 percent from pine/hardwood mixed forests that typically include upland hardwoods. Enviva, *Track & Trace: Q'1 & Q'2 2017*, <http://www.envivabiomass.com/sustainability/track-and-trace/>.

²⁵ See European Commission, *supra* note 4, at 139-40.

²⁶ USDA, *Southern Forest Resource Assessment*, *supra* note 15, at 3.

²⁷ David N. Wear & John G. Greis, USDA Forest Service, *Southern Forest Resource Assessment: Summary Report 64-66* (Oct. 2002), https://www.srs.fs.usda.gov/pubs/gtr/gtr_srs054a.pdf.

²⁸ NRDC, *In the U.S. Southeast*, *supra* note 1, at 4, 6.

²⁹ USDA, *Southern Forest Resource Assessment*, *supra* note 15, at 55, 621; see European Commission, *supra* note 4, at 36.

³⁰ USDA, *Southern Forest Resource Assessment*, *supra* note 15, at 55.

- ³¹ NRDC, *In the U.S. Southeast*, *supra* note 1, at 4.
- ³² See European Commission, *supra* note 4, at 36-39, 205.
- ³³ USDA, *Southern Forest Futures Project: Technical Report*, *supra* note 7, at 223, 226.
- ³⁴ *Id.*; see USDA, *Southern Forest Futures Project: Summary Report*, *supra* note 16, at 28.
- ³⁵ USDA, *Southern Forest Resource Assessment: Summary Report*, *supra* note 27, at 48.
- ³⁶ Letter from William H. Schlesinger, Ph.D., President, Cary Institute of Ecosystem Studies, with 60 cosignatories, to Edward Davey, MP, Secretary of State for Energy and Climate Change, UK, and Professor David MacKay, Chief Scientific Advisor to the Department of Energy and Climate Change, UK (Apr. 24, 2014), <http://im.ft-static.com/content/images/Oee06ecc-d3ae-11e3-8d23-00144feabdc0.pdf> [hereinafter, Scientist Letter].
- ³⁷ NRDC, *In the U.S. Southeast*, *supra* note 1, at 3; European Commission, *supra* note 4, at 191; Southern Environmental Law Center, *Southeast U.S. Wood Pellet Plants Exporting to Europe*, https://www.southernenvironment.org/uploads/maps/SEL_C_WoodPelletExportMap_2018_0123+table.pdf (last updated Jan. 23, 2018).
- ³⁸ Scientist Letter, *supra* note 36; Dogwood Alliance, NRDC, & SELC, *European Imports*, *supra* note 14.
- ³⁹ NWF, *supra* note 4, at 258-59. Although some species prefer early-successional, edge habitats, the relevant species when discussing the biodiversity impacts of clearcutting hardwood forests are those species native to the forests being destroyed, species which tend to prefer mature, unbroken habitat. For example, the loss of mature bottomland hardwood forests in the North American Coastal Plain biodiversity hotspot destroys habitat for 30 bird species of conservation concern. SELC, *Wood Pellet Industry Destroys Forests and Harms Birds of Conservation Concern 3* (2014), https://www.southernenvironment.org/uploads/words_docs/Wood_Pellets_Birds_of_Conservation_Concern_Handout.pdf.
- ⁴⁰ NWF, *supra* note 4, at 258-59.
- ⁴¹ USDA, *Southern Forest Futures Project: Technical Report*, *supra* note 7, at 79.
- ⁴² *Id.*
- ⁴³ USDA, *Southern Forest Futures Project: Summary Report*, *supra* note 16, at 19.
- ⁴⁴ *Id.* at 12.
- ⁴⁵ *Id.*
- ⁴⁶ USDA, *Southern Forest Futures Project: Technical Report*, *supra* note 7, at 82.
- ⁴⁷ *Id.* at 79.
- ⁴⁸ NWF, *supra* note 4, at 15.
- ⁴⁹ Rich, *Studies Link Biofuel Demand, Habitat Loss*, *supra* note 23.
- ⁵⁰ USDA, *Southern Forest Resource Assessment*, *supra* note 15, at 99-100.
- ⁵¹ USDA, *Southern Forest Futures Project: Summary Report*, *supra* note 16, at 14.
- ⁵² USDA, *Southern Forest Futures Project: Technical Report*, *supra* note 7, at 100.
- ⁵³ European Commission, *supra* note 4, at 192-93, 198.
- ⁵⁴ See Duncan Brack, Chatham House, *The Impacts of the Demand for Woody Biomass for Power and Heat on Climate and Forests 1*, 9-10 (Feb. 2017), <https://www.chathamhouse.org/publication/impacts-demand-woody-biomass-power-and-heat-climate-and-forests>.
- ⁵⁵ There is potential for small-scale biomass to play a role in habitat improvement, specifically through “conservation biomass” that has tangible land restoration benefits, such as the restoration of longleaf pine savannas by thinning stands to allow light to reach the forest floor. Still, the amount of pellets that can be sourced from restoration efforts is insufficient to meet current demand for biomass, let alone increased demand.
- ⁵⁶ USDA, *Southern Forest Futures Project: Summary Report*, *supra* note 16, at 20.
- ⁵⁷ *Id.* at 24; see USDA, *Southern Forest Futures Project: Technical Report*, *supra* note 7.
- ⁵⁸ See USDA, *Southern Forest Futures Project: Summary Report*, *supra* note 16, at 23-24.
- ⁵⁹ European Commission, *supra* note 4, at 193.
- ⁶⁰ USDA, *Southern Forest Futures Project: Summary Report*, *supra* note 16, at 45.
- ⁶¹ USDA, *Southern Forest Resource Assessment*, *supra* note 15, at 63.
- ⁶² USDA, *Southern Forest Futures Project: Summary Report*, *supra* note 16, at 45.
- ⁶³ NRDC, *In the U.S. Southeast*, *supra* note 1, at 3; European Commission, *supra* note 4, at 191.
- ⁶⁴ NRDC, *Bioenergy Threatens the Heart of North American Wetland Forests 1* (Oct. 2015), <https://www.nrdc.org/sites/default/files/southeast-biomass-exports-FS.pdf>.
- ⁶⁵ NWF, *supra* note 4, at 48-49.
- ⁶⁶ NRDC, *In the U.S. Southeast*, *supra* note 1, at 17; U.S. Fish & Wildlife Service, *Red Wolf Recovery*, <https://www.fws.gov/redwolf/> (last updated May 25, 2017). In particular, increased traffic in the area from logging vehicles would pose a serious risk to North Carolina’s red wolf population. In 2013 and 2014 alone, the U.S. Fish and Wildlife Service estimates that 6 of the 30 red wolf mortalities were due to vehicle strikes. U.S. Fish & Wildlife Service, *Red Wolf Mortality Table*, <https://www.fws.gov/redwolf/Images/Mortalitytable.pdf> (last updated June 13, 2016).
- ⁶⁷ Memorandum to Regional Director, Southeast Region, Fish & Wildlife Service, U.S. Department of Interior, from Assistant Regional Director for Ecological Services, Southeast Region, Fish & Wildlife Service, U.S. Department of Interior 6 (Sept. 12, 2016), <https://www.fws.gov/redwolf/docs/recommended-decisions-in-response-to-red-wolf-recovery-program-evaluation.pdf> (Recommended Decisions in Response to Red Wolf Recovery Program Evaluation); FWS, *Red Wolf Recovery*, *supra* note 66.
- ⁶⁸ See NRDC, *In the U.S. Southeast*, *supra* note 1, at 17, 20. The Louisiana black bear is a subspecies of the American black bear. Increased harvesting of bottomland hardwood forests also threatens the North Carolina and South Carolina coastal plain populations of the American black bear which prefer large areas of uninhabited woodland, swampland, and lowland hardwoods. See N.C. Wildlife Resources Commission, *Black Bear*, <http://www.ncwildlife.org/Learning/Species/Mammals/Black-Bear#2498419-overviewbr->.
- ⁶⁹ See N.C. Wildlife Resources Commission, *North Carolina Wildlife Profiles: Fox Squirrel*, <http://www.ncwildlife.org/Portals/0/Learning/documents/Species/foxsquirrel.pdf>.
- ⁷⁰ NRDC, *supra* note 1, at 6; Rich, *Studies Link Biofuel Demand, Habitat Loss*, *supra* note 23; USDA, *Southern Forest Resource Assessment*, *supra* note 15, at 117.

⁷¹ See USDA, *Southern Forest Resource Assessment*, *supra* note 15, at 115-23.

⁷² NRDC, *In the U.S. Southeast*, *supra* note 1, at 6.

⁷³ *Id.*; David N. Wear & John G. Greis, USDA Forest Service, *Southern Forest Resource Assessment: Summary of Findings 11* (2002), https://www.srs.fs.usda.gov/pubs/ja/ja_wear006.pdf.

⁷⁴ IUCN, *Red List of Threatened Species: Eurycea guttolineata (Three-lined Salamander)*, <http://www.iucnredlist.org/details/59265/0>.

⁷⁵ NWF, *supra* note 4, at 30-31.

⁷⁶ EPA, *What are Wetland Functions?*, <https://www.epa.gov/wetlands/what-are-wetland-functions> (last updated May 16, 2017).

⁷⁷ IUCN, *Red List of Threatened Species: Lithobates capito (Gopher Frog)*, <http://www.iucnredlist.org/details/58564/0>.



WHY ARE WE BURNING THE FORESTS
THAT CAN PROTECT US FROM CLIMATE CHANGE?

