

**American chaffseed  
(*Schwalbea americana*)**

**5-Year Review:  
Summary and Evaluation**



**U.S. Fish and Wildlife Service  
Southeast Region  
South Carolina Ecological Services Field Office  
Charleston, South Carolina**

**5-YEAR REVIEW**

**Species reviewed: American chaffseed (*Schwalbea americana*)**

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**5-YEAR REVIEW**  
**American chaffseed (*Schwalbea americana*)**

**I. GENERAL INFORMATION**

**A. Methodology used to complete the review**

On June 30, 2017, the Service published a notice in the *Federal Register* (82 FR 29916) announcing the new 5-year review of this plant and requested new information concerning the biology and status of this species. We did not receive any public comments during the 60-day open comment period. We contacted Service Field Offices, Federal and State agency personnel, land managers, and knowledgeable biologists throughout the species range to gather updated information on occurrences, threats, and recovery activities related to this species.

This review was completed by the lead recovery biologist for *Schwalbea americana*, hereafter called *Schwalbea*, in the South Carolina Ecological Services Field Office (SCESFO) of the U.S. Fish and Wildlife Service (Service). Our sources include the final rule listing the species under the Endangered Species Act (Act); the 1995 Recovery Plan; peer reviewed scientific publications; unpublished literature by the Service, State, and/or other experienced biologists; unpublished survey reports; and notes and personal communications from qualified biologists. Comments and suggestions from peer reviewers were incorporated as appropriate (see Appendix A). No part of this review was contracted to an outside party.

**B. Reviewers**

**Lead Region:** Kelly Bibb, Southeast Region, 404-679-7132

**Lead Biologist and Field Office:** April Punsalan, SCESFO, 843-727-4707

**Cooperating Region:** Martin Miller, Northeast Region, 413-253-8615

**Cooperating Field Offices:**

Alicia Protus, New Jersey Ecological Services Field Office, 609-382-5266

Dale Suiter, Raleigh Ecological Services Field Office, 919-856-4520

Dr. Vivian Negron-Ortiz, Panama City Ecological Services Field Office, 850-769-0552

Amy Trahan, Louisiana Ecological Services Field Office, 337-291-3126

**C. Background**

- 1. Federal Register Notice citation announcing initiation of this review:** 82 FR 29916: June 30, 2017.

2. **Species status:** The status of *Schwalbea* has been one of decline. Most states only have 2-3 populations and only three states (NC, SC, and GA) contain more than five populations. Threats to this species, habitat destruction/modification and fire suppression, continue across its range (Glitzenstein et al. 2016, p. 303, Fuller 2016, p. 17).
3. **Recovery achieved:** 2 (26-50% species' recovery objectives achieved).
4. **Listing history:** Original Listing  
FR notice: 57 FR 44703  
Date Listed: September 29, 1992  
Entity listed: Species  
Classification: Endangered
5. **Associated rulemakings:** None
6. **Review History:**  
Recovery Plan: 1995  
5-year reviews: The initial 5-year review for this plant was noticed on January 23, 2008 (73 FR 3991). No changes in status were recommended for this plant at that time it was completed in 2010.  
  
Each year, the Service reviews and updates listed species information for inclusion in the required Recovery Report to Congress. Through 2013, we did a recovery data call that included status recommendations such as "Declining" for this plant. We continue to show that species status recommendation as part of our 5-year reviews. The most recent evaluation for this plant was completed in 2018.
7. **Species' Recovery Priority Number at start of review (48 FR 43098):**  
*Schwalbea* has been assigned a recovery priority number of 7, based on (1) a moderate degree of threat, (2) a high potential for achieving recovery, and (3) the plant's taxonomic standing as a monotypic genus.
8. **Recovery Plan:**  
Name of plan: American Chaffseed (*Schwalbea americana*) Recovery Plan  
Date issued: September 29, 1995

## II. REVIEW ANALYSIS

### A. Application of the 1996 Distinct Population Segment (DPS) policy

The Act defines species as including any subspecies of fish or wildlife or plants, and any distinct population segment of any species of vertebrate wildlife. This definition limits listing DPS to only vertebrate species of fish and wildlife. Because this species is a plant, the DPS policy is not applicable.

## B. Recovery Criteria

1. **Does the species have a final, approved recovery plan containing objective, measurable criteria?** Yes, the plan contains approved downlisting criteria, but not delisting criteria.
2. **Adequacy of recovery criteria**
  - a. **Do the recovery criteria reflect the best available and most up-to-date information on the biology of the species and its habitat?** No. The recovery criteria were written before measurable guidelines were developed for what constitutes a self-sustaining *Schwalbea* population (USFWS 1995, pp. 37-38) because at that time, what constitutes a geographically distinct, self-sustaining *Schwalbea* population was unknown. Preparation for the 2018 5-year review helped define both of these important factors: geographically distinct and self-sustaining by reviewing population trends over two decades and using [NatureServe's Habitat-based Plant Occurrence Delimitation Guidance](#) (NatureServe 2018) to delineate populations.
  - b. **Are the 5 listing factors that are relevant to this species addressed in the recovery criteria?** Yes
3. **List the recovery criteria as they appear in the recovery plan, and discuss how each criterion has or has not been met, citing information. For threats-related recovery criteria, please note which of the 5 listing factors are addressed by that criterion. If any of the 5-listing factors are not relevant to this species, please note that here.**

### Downlisting Criteria

According to the recovery plan, *Schwalbea* will be considered for reclassification from endangered to threatened when the following criteria are met:

*Condition 1. "Long-term protection is achieved for 50 geographically distinct, self-sustaining populations. The population sites must be protected from development and other anthropogenic threats that may interfere with the species' survival. Protection of populations on private lands will be secured through landowner agreements or conservation easements. Protection of Schwalbea on public lands will be secured through the development of management plans or other mechanisms that ensure the long-range protection, management, and monitoring of Schwalbea. Protected sites will be distributed to include, at a minimum, all of the states currently supporting Schwalbea, and at least four populations in the northern portion of the species' range. Site protection agreements will cover the immediate occurrence site and, where possible, enough*

*contiguous unoccupied habitat to allow for dispersal, and natural colonization and expansion of the species.”*

This recovery criterion listed above addresses Listing Factors A (destruction, modification, or curtailment of habitat), D (inadequacy of regulatory mechanisms), and E (other natural or manmade factors). This criterion has not been met. Table 1 provides a summary of protected extant populations per State and illustrates the three different levels of protection: (1) Federal or State land, (2) conservation land, conservation easement or mitigation bank, or (3) safe harbor agreements, for each site. Out of the 41 protected *Schwalbea* populations, 20 populations have >100 individuals, 13 of which have over 200 individuals. Larger populations with >100 individuals have shown greater resiliency, i.e., self-sustaining, in comparison to small populations <100 individuals. To date, 20 populations (protected populations with > 100 individuals, i.e., self-sustaining) meet the recovery criteria listed above. Twenty-six sites have an unknown status with no known surveys conducted in > 10 yrs. Surveys of the 26 unknown *Schwalbea* sites are needed to evaluate whether they are extant and contribute toward achieving this recovery criterion. The majority of sites with an unknown status occur on private lands with limited or no accessibility. There is a low likelihood that these unknown sites remain extant. However, new *Schwalbea* populations are continually being found and additional extensive searches across the species’ range in areas with suitable habitat, i.e., managed with fire, could yield new populations that would allow this criterion to be met.

**Table 1. Summary of Extant American Chaffseed Populations - 2018**

<b>Table1. Range-wide summary of extant <i>Schwalbea americana</i> (American chaffseed) populations</b>					
<b>State</b>	<b>Extant Populations</b>	<b>Populations Considered Protected</b>	<b>Populations on Federal and State Land with a Management Plan</b>	<b>Populations with Conservation Easement or in Mitigation Bank</b>	<b>Populations with Safe Harbor Agreement</b>
Alabama	2	2	0	0	2
Florida	3	3	2	1	0
Georgia	9	8	1	3	4
Louisiana	2	2	0	2	0
Massachusetts	1	1	0	1	0
New Jersey	2*	2	1	1	0
North Carolina	6	6	6	0	0
South Carolina	18*	17	8	5	4
<b>Total</b>	<b>43</b>	<b>41</b>	<b>18</b>	<b>13</b>	<b>10</b>

\*The 18 extant populations for South Carolina includes 8 (re)introduced populations and the 2 populations for New Jersey includes 1 reintroduced population.

*Condition 2. “Management agreements or plans are developed for the 50 protected occurrence sites with the primary objective of ensuring that an ecosystem capable of supporting viable populations of Schwalbea will be permanently maintained. In the case of private ownership, these management agreements could be part of the conservation easement or landowner agreement.”*

This recovery criterion addresses Listing Factors A (destruction, modification, or curtailment of habitat) and E (other natural or manmade factors). This criterion has not been met. Efforts to achieve this recovery criterion are ongoing. Forty-one populations have some level of protection. Eighteen populations occur on either federal or state land that have formal management plans. Thirteen populations occur on lands protected by conservation easements, occur in mitigation banks, or on conservation lands, (one site in Louisiana occurs on land owned by The Nature Conservancy (TNC)). Ten populations have safe harbor agreements that include enhancement management activities for red-cockaded woodpeckers (RCW) that would maintain the sub-climax habitat required by *Schwalbea*. However, as with Criterion 1 above, surveys are needed for the 26 unknown *Schwalbea* sites to evaluate whether sufficient extant sites remain that would allow for this criterion to be met.

**Table 2. Range-wide *Schwalbea americana* (American chaffseed) populations with long-term protection agreements.**

State	Site ID	Site Name	Ownership	Year Last Observed	Last Recorded Population Size
<b>Populations with Current Formal Long-Term Protection Agreements</b>					
FL	FL-0011	Blackwater River State Forest	State - Florida Department of Agriculture and Consumer Services	2017	116 plants
FL	FL-0012	Blackwater River State Forest	State - Florida Department of Agriculture and Consumer Services	2018	279 plants
GA	GA---	Doerun Pitcher Plant Bog Natural Area	State - Georgia Department of Natural Resources	?	>100 plants
NJ	NJ-007	Whitesbog, Brendan T. Byrne State Forest	State-New Jersey Department of Environmental Protection, Division of Parks and Forestry	2018	<100 plants
NC	NC-027	Fort Bragg –MacRidge Impact Area	Federal- Department of Defense	2015	>60 stems
NC	NC-029	Fort Bragg-(Central Section) Parent EO	Federal-Department of Defense	2008	1000+ plants
NC	NC-030	Fort Bragg-(Central Section) Parent EO	Federal- Department of Defense	2008	>5000 plants
NC	NC-014 & NC-016	Fort Bragg-Black Creek and Rays Mill Creek	Federal- Department of Defense	2017; 1995	250 plants

NC	NC-025	Fort Bragg-Rockfish Creek	Federal- Department of Defense	2017	60 plants
NC	NC-024	Fort Bragg-NWA Training Area AA1	Federal- Department of Defense	2014	2 plants
SC	SC-020	Witherbee Road and Roy's Place	Federal-Francis Marion National Forest	2016	228 plants
SC	SC-069	Half Way Creek Road	Federal-Francis Marion National Forest	2016	920 plants
SC	SC-063	Lethcoe Road	Federal-Francis Marion National Forest	2017	22 plants
SC	SC-007	French Quarter Creek Road	Federal-Francis Marion National Forest	2016	4 original, 7 planted
SC	SC-006	Harleston Dam	Federal-Francis Marion National Forest	2016	25 planted; reintroduced
SC	SC-018	Ballfield	Federal-Francis Marion National Forest	2018	25 plants; reintroduced
SC	SC-021, 070	Lynchburg Savanna Heritage Preserve	State-SC Department of Natural Resources	2018	134 plants
SC	SC-	Longleaf Heritage Preserve	State-SC Department of Natural Resources	2015	4 plants, reintroduced
SC	SC-	Woods Bay Heritage Preserve	State-SC Department of Natural Resources	2018	93 plants; reintroduced
<b>Populations with Safe Harbor Agreement (SHA), Conservation Easements, or some other form of protection</b>					
AL	AL-005	Enon and Sehay Plantation	Private; SHA	2016	120 plants
AL	AL---	Enon and Sehay Plantation (Southern colony)	Private; SHA	2016	31 plants
FL	FL-0010	Horseshoe Plantation	Private; Conservation Easement-Tall Timbers	2018	51 plants
GA	GA---	Arcadia Plantation	Private; Conservation Easement-Tall Timbers	2008	800-1000 plants
GA	GA---	Freeman Tract	Private; Safe Harbor Agreement	2008	800 plants
GA	GA---	Ichauway Plantation Macrosite	Private; Joseph W. Jones Ecological Research Center; SHA	1987	10 plants
GA	GA----	Ichauway-Pond 32	Private; Joseph W. Jones Ecological Research Center; SHA	2013	>100 plants
GA	GA---	Ichauway Parmalee	Private; Joseph W. Jones Ecological Research Center; SHA	2013	<100 plants
GA	GA---	Ichauway-Jericho	Private; Joseph W. Jones Ecological Research Center; SHA	2013	<100 plants
GA	GA---	Quail ridge Plantation	Private; Conservation Easement-Tall Timbers	2008	283
LA	LA-001	CC Road Savannahs	The Nature Conservancy	2008	300 plants
LA	LA-002	Cow Creek Savannah	Mitigation Bank	2017	12 plants
MA	MA---	Barnstable	Town of Barnstable Conservation Land Bank	2018	2631 plants
NJ	NJ-020	Franklin Parker Preserve	New Jersey Conservation Foundation	2008	26 plants, reintroduced
SC	SC---	McAlhany Nature Preserve	Charleston Natural History Society	2018	59 plants, reintroduced
SC	SC---	Brumbaker's Property	Private; Conservation Easement	2015	12 plants, reintroduced
SC	SC---	TNC Wambaw	The Nature Conservancy	2015	10 plants, reintroduced
SC	SC---	Porcher's Property	Private; Conservation Easement	2015	3 plants, reintroduced
SC	SC-028, 053, 054	Longlands Plantation 1 -Stony Run and Munn	Private; SHA	2016	3398 plants



SC	SC---	Longlands Plantation 2 -Santee	Private; SHA	2016	62 plants
SC	SC---	Scotswood	Private; SHA	2016	240 plants
SC	SC-011, 019	Oketee	Private; SHA	?	>100 plants

*American chaffseed (Schwalbea americana) trends on protected land with management plans*

Due to frequent fire requirement (1-2 year fire return interval) that American chaffseed needs to maintain stable to increasing populations, many populations on public land have a trend of decreasing and many have been extirpated.

For example, since 1999, the Francis Marion National Forest has lost four American chaffseed populations, including Highway 41, Ballfield, French Quarter Creek, and Cordesville. Three out of nine populations remain on the Francis Marion National Forest, and two are stable (>100 individuals). When reviewing the fire frequency of the extirpated populations and population trends it is clear that American chaffseed declines occurred during periods without fire or when the fire return interval exceeded three years. For example, the extirpated populations mentioned above were burned on a 4-8 year fire return interval.

In New Jersey, the American chaffseed population on State Land is monitored annually and has shown a steady long-term decline from the peak of 764 individuals observed in 2002. In 2017, the population exhibited a decrease to 83 individuals, down from 111 in 2016 (J. Kelly, RVCC, pers. comm. 2017). Threats to this population include herbivory, succession, and roadside maintenance.

Other American chaffseed populations on State and Federal land have displayed similar patterns. For example, the Sandhills State Game Land' American chaffseed population in North Carolina, extant during the last 2008 five-year review, is now considered historical.

Another example of American chaffseed declines include the four populations on Joseph W. Jones Ecological Center (Jones Center) in Baker County, Georgia. Although the Jones Center is not State or Federal Land, the center is known for their longleaf restoration and management. Despite their land management practices, American chaffseed populations have declined. The last survey for the four populations was in 2013. Population numbers were down and each population had fewer than 100 individuals (Lisa Giencke, Joseph W. Jones Ecological Center, pers. comm. 2018). These populations occur in areas managed with fire (average fire return interval 3-5 years) and have SHAs for red-cockaded woodpeckers.

American chaffseed populations that appear stable to increasing occur on land that is burned on a 1-2 year fire return interval. Conducting prescribed burns on a 1-2-year fire return interval is difficult to nearly impossible for State and Federal Land managers (e.g., Francis Marion NF is not allowed to conduct burns annually). The majority of stable to increasing American chaffseed populations occur on private quail plantations.

*Condition 3. “Viable populations of Schwalbea are established at four sites in the northern portion of the species’ range (Massachusetts to Virginia), preferably with genetic material from the only remaining northern population in New Jersey.”*

This criterion remains relevant; efforts to achieve this recovery criterion are ongoing. Re-establishment of *Schwalbea* within the northern portion of its range has been partially accomplished. One population, Franklin Parker Preserve, was successfully reintroduced at a historic site in Chatsworth, Burlington County, New Jersey. Out of the 42 plants introduced at the Franklin Parker Site (3 colonies), 22 were present and 13 flowered in 2017 (Jay Kelly, Raritan Valley Community College (RVCC), pers. comm. 2018). Seedling recruitment occurred in 2011 and 2014, and represents an important milestone toward the long-term sustainability of this population. However, viable populations include populations with >100 individuals. As such, the Franklin Parker Site needs augmentation (planting of additional individuals) or management to increase the population number to a sustainable level.

Current plans are underway for two future reintroductions on state land (Atco and Hampton Gate) in Burlington County, New Jersey. *Schwalbea* seed capsules (<5%) were collected from New Jersey’s Brendan T. Byrne State Forest and Franklin Parker Preserve reintroduction site to continue *ex situ* (off-site) propagation efforts in 2017. Host plants Maryland golden aster (*Chrysopsis mariana*) and soil were collected from the respective sites where outplanting was to occur. Propagation efforts for future reintroductions are underway at Duke Farms and New Jersey Department of Environmental Protection (NJDEP) Forest Nursery. As of January 2018, 182 seeds germinated at Duke Farms, with 95 exhibiting levels of growth suitable for future reintroductions. At NJDEP Forest Nursery, 268 germinated and survived with 211 being eligible for future outplantings (J. Kelly, RVCC, pers. comm. 2018). There is interest in reintroducing this species in Delaware (Bill McAvoy, Delaware State Division of Fish & Wildlife, pers. comm. 2017).

The newly discovered *Schwalbea* population in Massachusetts occurs on protected land and contains approximately 2631 stems and 500 genets (genetically distinct individuals) (Bob Wehrnerehl, Massachusetts Natural Heritage Program (NHP), pers. comm. 2018). As such, the Massachusetts population helps fulfill the above criterion and brings the total number of northern populations to three: two extant, natural populations and one reintroduced population.

*Condition 4. “Biennial monitoring shows that 50 protected populations are viable as well as stable or increasing over a 10-year period. Demographic population data will be required to meet this condition.”*

This criterion remains relevant, but has not been achieved. Less than 50 populations are considered “protected” through either formal or informal agreements. Further, while a few sites are monitored annually or biennially, the majority of sites are not regularly monitored. Only one *Schwalbea* population has demographic population data. From 1993-2017, demographic monitoring data has been collected for the Whitesbog, New Jersey population (J. Kelly, RVCC, pers. comm. 2018). Since 1996, all individuals have been mapped, with spatial coordinates for each plant recorded on a grid system positioned around permanent markers in each colony. Since 1999, aluminum identification tags have been placed at the base of each plant to allow for accurate identification of individuals within the population. Further, since 2001, a second census has been conducted in mid to late September to record new individuals not present during the summer census.

*Condition 5. “Life history and ecological requirements are understood sufficiently to reliably predict the effectiveness of protection, management, and monitoring.”*

This criterion remains relevant. Efforts to achieve this recovery criterion are ongoing. New information is summarized in Section 2.C. below.

#### Delisting Criteria

Recovery criteria to delist American chaffseed were not established within the recovery plan. The recovery plan calls for a delisting objective to be defined when research activities identified under recovery plan tasks 4 (investigate the species biology) and 5 (investigate genetic variability) have been completed. Considerable progress has been made under recovery task 4 (see Section 2.C.) that would allow for development of delisting criteria.

### **C. Updated Information and Current Species Status**

#### **1. Biology and Habitat**

##### **a. New information on the species’ biology and life history:**

##### Parasitism

*Schwalbea* does not autoparasitize its own roots (Gustafson et al. 2017, p. 57). Two to four plants per pot were grown together for one year and examined for

haustoria (root projections that allow the root to attach to the host). No haustoria were found in the 49 plants examined for autoparasitism.

No further research has been conducted on host specificity and/or performance/growth of *Schwalbea* in relation to different host species since the 2008 5-year review. To summarize previous research, *Schwalbea* seedlings perform/grow best when potted with composites, namely *C. mariana*, *Ionactis linariifolia* (stiff-leaved aster), *Symphotrichum dumosum* (long-stalked aster), *Eupatorium spp.*, *Solidago nemoralis* (Eastern gray goldenrod), *S. odora* (licorice goldenrod), and *Hieracium venosum* (veiny hawkweed) in comparison with grasses or without a host species (Kelly 2006, p. 95).

Although *Schwalbea* may not perform well when grown with grasses *ex situ*, it was closely associated with *Schizachyrium scoparium* (little bluestem). Overall, healthy *Schwalbea* populations tend to have a high diversity of native plant species, demonstrating that a mixture of host plants may lead to improved parasite performance (Marvier and Smith 1996, p. 845).

#### Germination

Several studies have illustrated that wet-cold stratification for 1-3 months results in high >70-90% germination rates (Glitzenstein et al. 2016, p. 305; Obee and Cartica 1997, p. 139). However, seeds do not always require cold stratification for germination (Determann et al. 1997, p. 8). Seeds immediately sown post collection germinated to 68% on moist filter paper (Musselman and Mann 1977, p. 311) and 60-90% in petri dishes (Kirkman 1996, pp. 12-13). Seeds start to imbibe water after 1-2 days and begin to germinate within seven days with a full flush of germination occurring after three weeks (J. Kelly, RVCC, pers. comm. 2018). There may be regional differences in seed germination; seeds from Sehoj, Alabama, do not germinate without cold stratification (J. Glitzenstein, Tall Timbers, pers. comm. 2018).

Since the last 2008 5-year review, no *in situ* seed experiments have been conducted. Nevertheless, Van Clef's (2000, pp. 6-7) study demonstrated that *in situ* germination can occur for seeds sown in areas where the top five centimeters of soil, leaf litter, and living plant material is removed. Twenty-eight seedlings emerged in disturbed plots in comparison with only six in undisturbed plots. Seedlings did not survive past week 13 (no supplemental water) (July 28, 1999). These results highlight the need for further experimentation of *in situ* seed addition treatments to achieve successful reintroductions and augmentations across the species range. See the 2008 5-year review for study details, p. 10. These findings support Kirkman et al. (1998, p. 134) observations of *Schwalbea* seedlings occurring in areas with small-scale disturbances with exposed bare soil, such as pocket gopher

activity or earthworm castings. In addition, many populations across this species' range occur in areas with past soil disturbance.

Norden (2002) tested seed germination in the field in a 361m<sup>2</sup> (19 m x 19 m) garden plot. No germination occurred. However, seed germination may have been inhibited by inadequate water availability as the plot was not given supplemental water during the study and drought conditions occurred (Norden 2002, p. 65).

#### Seed banking

*Schwalbea* seeds can remain viable in the seed bank for four years (Kaeser and Kirkman 2012, p. 71) and remain viable while stored in the refrigerator for at least eight years (Norden 2002, p. 9).

#### Seed dispersal

No research has been conducted on seed dispersal since the last 2008 5-year review.

#### Fire

Although Norden and Kirkman (2004c) was published before the last 2008 5-year review, the results were not included in the review. Their work examined individual survivorship and density from 1992-2001 in response to four experimental management techniques (dormant season burn (March), growing season burn (June), growing season mowing (June), and control (no treatment)). Year-to-year fluctuations occurred across all treatment populations suggesting that population response was due to variable environmental conditions, namely rainfall patterns, instead of experimental treatments (p. 131). The recorded largest population size coincided with the year of highest rainfall measurements. Their study highlights the importance of recording and analyzing rainfall and climatic patterns in conjunction with the fire history of a site when examining population demography.

To date, Kirkman's 1992-2001 fire research at Joseph W. Jones Ecological Research Center at Ichauway in Baker County, Georgia demonstrated the critical role fire plays on the growth and reproduction of *Schwalbea*. To summarize: in the absence of fire (1) *Schwalbea* will transition from a reproductive individual to a vegetative individual (Kirkman et al. 1998, p. 134); (2) there is a higher incidence of seedling/new recruit mortality (Kirkman 1996, p. 9); and (3) lower recruitment overall (Kirkman et al. 1998, p. 134). In contrast, with prescribed fire or post fire (1) rapid stem elongation occurs from undeveloped buds at the stem base (Kirkman et al. 1998, p. 131); (2) regardless of season, flowering response is induced; (3) density of reproductive individuals remains stable (Kirkman et al. 1998, p. 126); and (4) higher recruitment rates occur in comparison to mowed and unburned plots (Kirkman et al. 1998, p. 125).

Although research has not been conducted on the effects of an April prescribed fire on the growth and flowering response of *Schwalbea* (Kirkman's work examined effects of May growing season burns), growth and flower production appears stunted by an early April prescribed fire (J. Glitzenstein, Tall Timbers, personal comm. 2017). In addition, late summer burns (July-August) may have a negative impact on small *Schwalbea* populations due to lowering photosynthates stored in roots and by increasing transpiration rates during drought or low rainfall years.

Annual population monitoring in New Jersey has also shown a positive response of *Schwalbea* flowering for 1-2 growing seasons following winter burns (J. Kelly, RVCC, pers. comm. 2017). Further, following a winter burn conducted in 2015, there was a positive response in flowering output and density of potential composite host plants: *C. mariana*, *S. dumosum*, *I. linariifolia*, *S. nemoralis*, *H. venosum*, *Liatris graminifolia* (J. Kelly RVCC, pers. comm. 2018).

#### Historical/disturbance ecology

Across *Schwalbea*'s range, populations occur in areas subjected to past disturbance (Kelly 2006, p. 196; Glitzenstein 2008, p. 4). Historical occurrences, some dating back to the 1800s, in the New Jersey Pine Barrens, were concentrated in human-disturbed areas such as railroad crossings, roadsides, ditches, and canal banks (Kelly 2006, p. 196). In addition, the occurrence of *Schwalbea* on old disked strips, roadbeds, and fire plow lines in South Carolina suggests a positive relationship between old disturbance and recruitment. However, *Schwalbea* does not occur in recently disked strips or disturbed quail food plots (Glitzenstein 2008, p. 4). The time required for *Schwalbea* to colonize a site post disturbance remains unknown. Disturbance to some degree does appear to create a combination of soil, host species, and moisture conditions that creates suitable habitat for *Schwalbea* (Kelly 2006, p. 197).

Other observations from previous research (Kirkman et al. 1998, p. 134; Van Clef's 2000, pp. 6-7) indicate an association of seedling recruitment with microhabitat disturbance (described above).

#### **b. Abundance, population trends, demographic features, or demographic trends:**

##### Abundance and trends

When *Schwalbea* was listed as an endangered species in 1992, 19 extant occurrences were known from the following States: New Jersey (1), North Carolina (1), South Carolina (11), Georgia (4), Florida (1), and Mississippi (1). At the completion of the recovery plan in 1995, extensive searches for this species that occurred in the Southeast, namely North and South Carolina, increased the number of extant occurrences to 72: New Jersey

(1), North Carolina (18), South Carolina (42), Georgia (10), and Florida (1).

The last comprehensive review of this species status occurred in 2008. At that time, 53 occurrences were extant (30% of sites extant) in 2008: New Jersey (2), North Carolina (11), South Carolina (33), Georgia (4), Alabama (1), Florida (1), and Louisiana (1).

It is important to note that in the 1995 recovery plan and 2008 5-year review, the terms population and occurrence were used interchangeably. Since some *Schwalbea* populations have multiple element occurrences or sites per population, the number of populations across the species range was over-reported in some cases. In order to standardize population numbers across state boundaries, NatureServe's (2018) population delimitation guidelines were used for all *extant* populations across *Schwalbeas*' range in this five-year review. Historic and unknown occurrences were not delimited.

Currently, there are 43 extant populations across the species range: Massachusetts (1), New Jersey (2), North Carolina (6), South Carolina (18), Georgia (9), Alabama (2), Florida (3), and Louisiana (2).

### State Population Summaries

#### Alabama

*Schwalbea* was first collected in Alabama in 1868 by Charles Mohr. His classic 1901 work "Plant Life of Alabama" (1901) mentions *Schwalbea* and makes reference of its abundance in the state during the 1800s (Schotz 2016, p. 1). At the time of listing, three historic populations were known from Baldwin, Geneva, and Mobile Counties (USFWS 1995, p. 7). Al Schotz surveyed all three historic populations in 1999. Sites were severely fire suppressed and contained no plants. Thus, they were presumed extirpated (Schotz 2016, p. 1).

In June 1999, Alfred Schotz discovered five *Schwalbea* plants at Splinter Hill Bog, a mosaic of seepage slopes and upland pine woodlands in Baldwin County. This population has not been relocated since its original discovery. The population potentially was destroyed during logging operations (Schotz 2016). Extensive surveys should be done in the future since the site is still managed with fire (Scott Wiggers, USFWS, pers. comm. 2017). The Enon-Sehoy populations are within a safe harbor agreement for red-cockaded woodpecker.

Currently, there are two *Schwalbea* populations in Bullock County, Alabama. Both occur on the Enon-Sehoy Plantation. Enon-Sehoy

Plantation complex includes 25,000 acres of open pine woodland dominated by longleaf, shortleaf, and loblolly pines (Schotz 2016, p. 3). In 2016, the population originally discovered in 2008 by Jeff Glitzenstein, Jason Martin, and Jim Bates, had five colonies with 120 individuals (Schotz 2016, p. 6) and the newly discovered population, 3.8 km south, had 31 plants. Despite the new discovery of a population on Enon-Sehoy Plantation, *Schwalbea* has declined at this plantation from 2010-2016 from approximately 450 individuals to 120 individuals. Soil disturbance, i.e., roller chopping, may occur at a frequency greater than *Schwalbea* can tolerate. Conversations with the land manager have taken place and plans to install fencing around the populations are underway. Birmingham Botanical Gardens is safeguarding the Enon-Sehoy Plantation population; 29 *Schwalbea* plants were recorded in 2018 (J. Glitzenstein, Tall Timbers, pers. comm. 2018).

#### Connecticut

There are no extant *Schwalbea* populations in Connecticut. There are two historic occurrences reported in the recovery plan from Middlesex and New London Counties (USFWS 1995, p.7).

#### Delaware

Currently, there are no extant occurrences in Delaware (B. McAvoy, Delaware State Division of Fish & Wildlife, pers. comm. 2017). Only one historic population is known from Delaware. The population was destroyed by the widening of the Chesapeake and Delaware Canal, and by agriculture and road development (USFWS 1995, p. 7). Suitable habitat in the C & D Conservation Area in south-central New Castle County exists (B. McAvoy, Delaware State Division of Fish & Wildlife, pers. comm. 2017). The State of Delaware is interested in reintroducing this species (B. McAvoy, Delaware State Division of Fish & Wildlife, pers. comm. 2017).

#### Florida

Currently, there are three extant populations in Florida. In 2018, Grace Howell, Land Management Specialist for Alachua Conservation Trust in Florida, discovered one new population in Blackwater River State Forest (BRSF) in Santa Rosa County. This population contains 279 individuals. The other population at BRSF, discovered by Jason Ksepka in 2013, occurs in an ecotone of mature longleaf pine and a very high-quality pitcherplant bog in Okaloosa County. The Okaloosa County population at BRSF occurs near one of the many seepage slopes on the forest in a well-managed RCW tract (Michael Jenkins, Florida Department of Agriculture and Consumer Services, pers. comm. 2016). The BRSF has a ten-year resource management plan that mentions *Schwalbea*. The BRSF populations occur in areas managed on an average 2-year fire rotation. As more monitoring occurs at BRSF, more/new individuals are recorded. The



monitoring protocol includes placing a pin flag near every individual, recording closest plant species, and flower presence/absence, collecting pin flags at the end of survey, and tallying results. When first discovered in 2013, 25 individuals were recorded. In 2017, two new colonies or sections were found, which brought the total population number to 116 individuals. Herbivory from beetles and caterpillars has been noted as an issue/threat (M. Jenkins, Florida Department of Agriculture and Consumer Services, pers. comm. 2017). Herbivores identified by Dave Almquist at the Florida Natural Area Inventory include striped leaf beetle (*Kuschelina* sp.), a *Chrsomelid* leaf beetle sp., and buckeye caterpillars (*Junonia coenia*). The buckeye caterpillar and striped beetle caused the greatest damage to leaves and plants (M. Jenkins, Florida Department of Agriculture and Consumer Services, pers. comm. 2017).

*Schwalbea* plant associates at BRSF include *Gaylussacia dumosa* (Southern dwarf huckleberry), *G. frondosa* (dangleberry), *Rhynchospora distans* (narrow-fruited fascicled beaksedge), *S. scoparium* (little bluestem), *Bigelowia nudata* (rayless goldenrod), *Arundinaria tecta* (switch cane), *Sceptridium biternatum* (Southern grapefern), *Eryngium yuccifolium* (rattlesnake-master), *Serenoa repens* (saw palmetto), *Ilex glabra* (gallberry), *Aristida stricta* (wiregrass), *Pinus palustris* (longleaf pine), *Pinguicula* spp. (butterworts), *Drosera* spp. (sundews), *Eriocaulon* spp. (pipeworts), and *Bidens mitis* (Coastal Plain tickseed-sunflower).

The third *Schwalbea* population occurs on Horseshoe Plantation in Leon County. This population occurs on a private plantation that manages intensely for quail and practices techniques such as “harrowing” a field or establishing quail food plots. The harrow breaks up and smooths the soil surface. The *Schwalbea* population at Horseshoe Plantation is small and has declined throughout the years (J. Glitzestein, Tall Timbers, pers. comm. 2018). In 1994, there were only 12-15 plants and in 2006 only six plants were recorded. Tall Timbers holds a conservation easement for Horseshoe Plantation.

### Georgia

There are nine extant *Schwalbea* populations in Georgia. Four populations occur at the Joseph W. Jones Ecological Center in Baker County. The last survey for the four populations was in 2013. Population numbers were down and each population had fewer than 100 individuals (Lisa Giencke, Joseph W. Jones Ecological Center, pers. comm. 2018). These populations occur in areas managed with fire (average fire return interval 3-5 years) and have SHAs for red-cockaded woodpeckers.

Out of the nine extant Georgia populations, only one occurs on state land-Doerun Pitcherplant Bog population. The Doerun Pitcherplant Bog population appears stable with an average of 80-100 individuals. The

Doerun population consists of three colonies. In 2013-2014, there were 82 individuals and in 2007-2008 there were 103 individuals.

Four extant populations: Quail Ridge, Arcadia, Freeman Tract, Jefford's Plantation, occur on privately owned quail plantations in Georgia. The Jefford's Plantation population is the only one that does not have any level of protection. Jefford's Plantation contains the largest *Schwalbea* population (1600-2000 individuals) in Georgia. Quail Ridge and Arcadia both have Tall Timbers Conservation Easements. The Quail Ridge population is highly variable depending on rainfall and fire prescription. For instance, in 2007, a drought occurred and the site had not burned in 3-4 years, and contained only 31 individuals. In contrast, following a burn in 2008, there were 283 individuals (Wilson Baker, Biological Consultant, pers. comm. 2017). Arcadia contains nine colonies with approximately 800-1000 individuals. The Freeman Tract population consists of five colonies spread across 600 acres of longleaf pine forest and contains approximately 800 individuals. This site has a SHA but there are no RCW's onsite so the landowner could discontinue the agreement at any time. Landowners may be amendable to a conservation easement (W. Baker, Biological Consultant, pers. comm. 2017).

#### Kentucky

Two historic records are known from sandstone knobs within the Daniel Boone National Forest located in McCreary County. *Schwalbea* has not been observed in Kentucky since 1935. An extensive search conducted in 2008 at historic sites yielded no individuals (David Taylor, USFS, pers. comm. 2018). The historic sites are located in areas not easily burned and contain a lot of brushy undergrowth (D. Taylor, USFS, pers. comm. 2018). Historically, in the 1920s, burning was more common, especially in the southern parts of McCreary County, than present day. The woods were burned to allow green up for livestock (D. Taylor, USFS, pers. comm. 2018). An association against prescribe fire formed in Kentucky and was successful in reducing the amount of prescribe fire across the state (D. Taylor, USFS, pers. comm. 2018).

#### Louisiana

Currently, there are two extant populations, Cow Creek Savannah and CC Road Savannah, in Allen Parish, Louisiana. The Cow Creek Savannah population, first discovered in 2008, had 35 plants, 20 fertile, in 2010 and 13 plants, 12 fertile, in 2017. The population is located within the Calcasieu mitigation bank: <http://calcasieubank.com/>. The mitigation bank is steadily increasing in size (Reid 2017, p. 2) and currently contains 1,486 acres of wet longleaf pine habitat. The site, managed on a 2-year fire return interval, contains some cattle grazing.

The CC Road Savannah Preserve *Schwalbea* population, first discovered in 1996, occurs on pimple mounds or “mima mounds”, domelike circle mounds composed of loose soil. Population numbers fluctuate: 2009-1703 plants, 2003-300 plants, and 2001-160 plants (William deGravelles, TNC, pers. comm. 2018). There appears to be a decrease in the number of individuals due to feral hogs and a longer fire return interval (not burned since June 2015) (deGravelles 2017, p. 1). The population was doing very well with an approximately 2.2 fire return interval. TNC and the Service partnered together to fund a prescribed fire in spring 2018. To reduce threats caused by feral hogs, TNC installed a hog fence around approximately nine acres to encircle the *Schwalbea* population.

#### Maryland

The historic status of *Schwalbea* has not changed since the last 2008 five-year review (Chris Frye, Maryland DNR, pers. comm. 2017). Two historic *Schwalbea* populations are known in Maryland, one population from Worchester County near Ocean City, and one population from Anne Arundel County.

#### Massachusetts

In 2018, Massachusetts’s botanists discovered a new *Schwalbea* population in a Sandhill grassland in Barnstable County. This population contains 2631 stems and approximately 500 genets (B. Wehrnerehl, pers. comm. 2018). The population occurs in an open area managed by fall mowing. Further, the site appears to have been disturbed or soil moved 20-30 years ago and may have been scraped with a blade/scarified approximately three years ago (B. Wehrnerehl, Massachusetts NHP, pers. comm. 2018). The fire history remains unknown, but apparently, there were fires historically in the area (B. Wehrnerehl, Massachusetts NHP, pers. comm. 2018). The Town of Barnstable owns the site and are open to future fire management, including prescribed fire and continued mowing. The status of the 10 historic occurrences recorded from Barnstable, Bristol, Dukes, Franklin, Nantucket, Norfolk, Plymouth, and Worcester Counties remains unchanged (USFWS 1995, p. 9).

#### Mississippi

The historic status of *Schwalbea* in Mississippi has not changed since the last 2008 five-year review. Two historic populations are known from Covington and Jackson Counties (USFWS 1995, p. 9).

#### New Jersey

Currently, New Jersey has two populations, Whitesbog (natural) and Franklin Parker Roadside population (reintroduced). The Whitesbog population has been relative stable since annual demographic monitoring began in 1991, but has exhibited steady long-term decline from the peak of 764 individuals observed in 2002. In 2017, the population exhibited a

decrease to 83 individuals, down from 111 in 2016 (J. Kelly, RVCC, pers. comm. 2017). Threats to this population include herbivory, succession, and roadside maintenance. The NJDEP Division of Parks and forestry plan to conduct a prescribe burn in 2018 and reduce woody succession by mechanical methods (J. Kelly, RVCC, pers. comm. 2017).

The Franklin Parker Roadside reintroduced population contains 26 *Schwalbea* plants (J. Kelly, RVCC, pers. comm. 2017). Of these plants, 13 flowered in 2017, yielding a total of 202 flowers (J. Kelly, RVCC, pers. comm. 2017).

#### New York

The historic status of *Schwalbea* in New York has not changed since the last 2008 five-year review. One historic population is known from Albany County where the species was last observed in 1865 (USFWS 1995, p. 10).

#### North Carolina

Currently, there are six extant and eight historic or extirpated populations in North Carolina. All six populations occur on Fort Bragg across Hoke and Cumberland Counties. The Sandhills State Game Land' *Schwalbea* population, extant during the last 2008 five-year review, is now considered historic. This population was small at discovery, with only 35 individuals recorded in 1997. The site was burned on a two-year return interval. Signs of drought stress in 1998 were reported in the NCNHP element occurrence form in addition to two growing season (6-25-97 and 5-98) burns. In 2001, no plants were found and 2005, four plants were recorded. The state game lands population may have declined due to drought stress combined with early growing season burns, i.e., May and June. A reintroduction may be considered for this site.

#### South Carolina

Currently, there are 18 extant, 11 extirpated or historic, and 10 unknown *Schwalbea* populations in South Carolina. Six *Schwalbea* populations (Witherbee Road, Half Way Creek Road, Lethcoe Road, French Quarter Creek, Ballfield (reintroduced), Harleston Dam Road (introduced)) occur on the Francis Marion National Forest. Only two populations, Witherbee Road and Half Way Creek Road, appear stable with greater than 100 individuals consistently recorded per population each year. The FMNF *Schwalbea* populations are managed on an average 2-3 year fire return interval.

Two *Schwalbea* populations, Lynchburg Savanna Heritage Preserve (HP) and Woods Bay (introduced), occur on state land. Lynchburg Savanna HP, managed with an average 2-year fire return interval and predominately-late growing season fires, contained approximately 200

individuals in 2016. The remaining extant populations occur on private quail plantations in Williamsburg and Jasper Counties. Longlands Plantation has the largest *Schwalbea* population rangewide, with approximately 8,000 individuals reported in 2016 (J. Glitzenstein, Tall Timbers, pers. comm. 2017). Longlands Plantation has an annual fire prescription and very light or infrequent roller chopping. The plantation, which is enrolled in an SHA, is 18,890 acres and contains 15,000+ acres of RCW habitat. *Lespedeza bicolor* (bicolor lespedeza) occurs across the plantation and poses a low to moderate threat to *Schwalbea*. “No mechanical equipment” signs posted around several large colonies across the plantation help protect the plant from direct disturbance related to mowing or roller chopping activities.

Scotswood Plantation contains approximately 300-400 *Schwalbea* individuals (J. Glitzenstein, Tall Timbers, pers. comm. 2017). This site has an annual fire prescription and a SHA. Oketee Plantation in Jasper County appears or reportedly has a stable population of *Schwalbea* due to an annual fire prescription. However, no monitoring has occurred at this population in several years due to lack of access to the site. Although there are 10 unknown *Schwalbea* populations in South Carolina, there is a high likelihood that many of the populations are either extirpated or historic. Unprotected and unmanaged *Schwalbea* populations across the species’ range generally become extirpated or historic.

The South Carolina Botanical Garden is safeguarding the Francis Marion National Forest populations (Wetherbee Road and Ballfield populations). Ninety-three plants were reported in 2018 (J. Glitzenstein, Tall Timbers, pers. comm. 2018).

#### Tennessee

The historic status of *Schwalbea* in Tennessee has not changed since the last 2008 five-year review. Two historic populations are known from Tennessee with one each in Coffee and Fentress Counties (USFWS 1995, p. 12).

#### Texas

The historic status of *Schwalbea* in Texas has not changed since the last 2008 five-year review. One population was reported to occur in east Texas (USFWS 1995, p. 12). However, no voucher specimens exist in any major Texas herbaria (Texas Parks & Wildlife, 2018).

#### Virginia

The historic status of *Schwalbea* has not changed since the last 2008 five-year review. One historic occurrence is recorded from an area between Sussex and Greensville Counties, where the species was last observed in 1937 (USFWS 1995, p. 13).

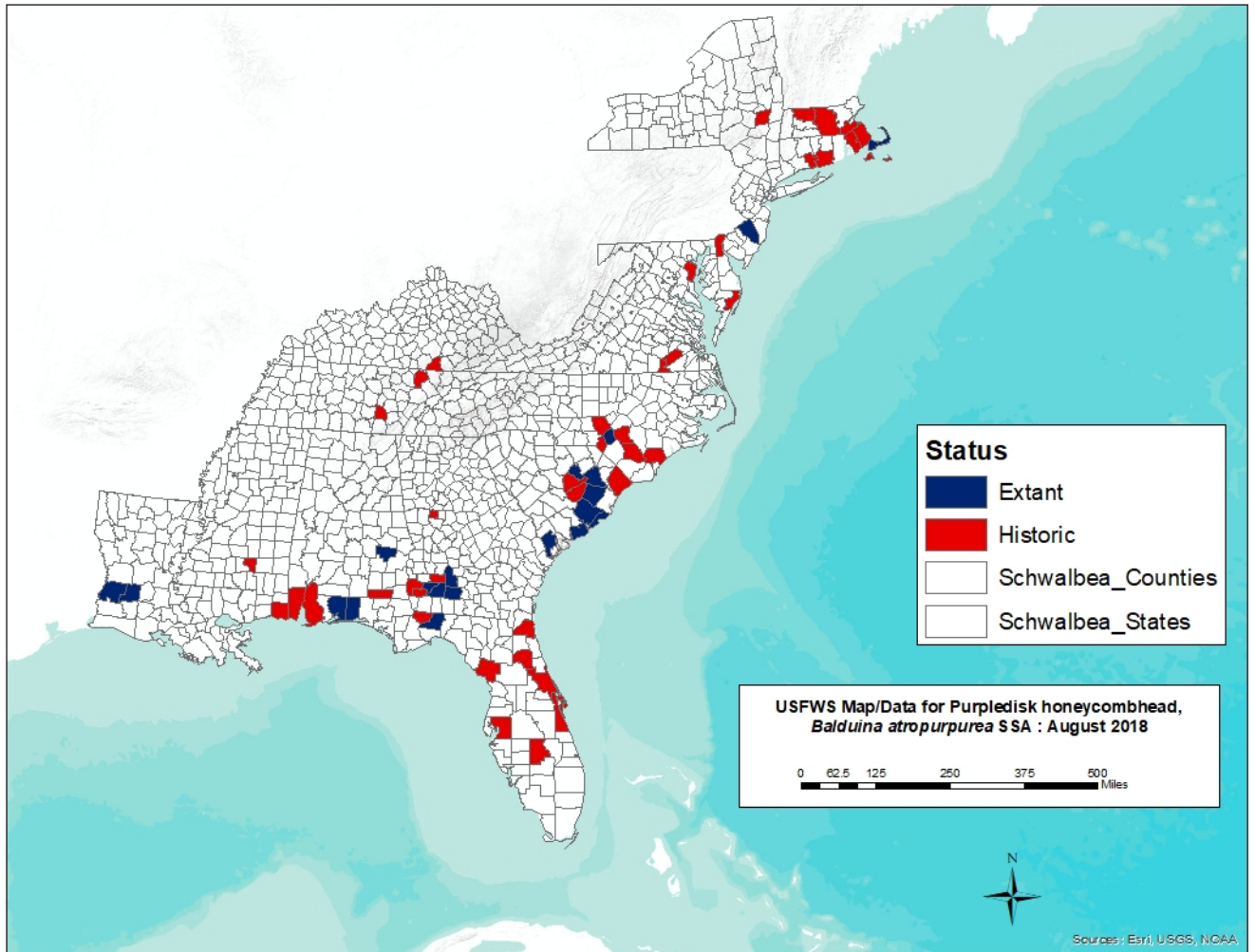


Figure 1: Range-wide *Schwalbea americana* (American chaffseed) county map displaying historic and extant records.

**c. Genetics, genetic variation, or trends in genetic variation:**

No new genetic research has been completed or published since the last 2008 five-year review. Research to date has illustrated that *Schwalbea* contains low genetic diversity within populations and across its range overall (Godt and Hamrick 1998, p. 91). Out of 13 populations sampled, 15 loci were resolved, three loci were polymorphic and no polymorphism was detected in 7 of the 13 populations sampled (Godt and Hamrick 1998, p. 91). The South Carolina populations, namely the Francis Marion National Forest, Half Way Creek Road population contained the highest genetic diversity (Godt and Hamrick 1998, p. 91). Currently, Brandi Cannon, Masters Student at Columbia University, is conducting genetic research on *Schwalbea* and examining the genetic diversity of the species

in the northern and southern populations. Research questions include (1) what are the patterns of genetic variation throughout *Schwalbea*'s range? and (2) do the small isolated northern populations contain unique alleles?

**d. Taxonomic classification or changes in nomenclature:**

There have been no changes in the taxonomic classification or nomenclature of *Schwalbea*.

**e. Spatial distribution, trends in spatial distribution, or historic range:**

Since the last 2008 five-year review, five new populations have been identified, one in Massachusetts (Barnstable County), two in Florida (Blackwater River State Forest), one in Alabama (Sehoy and Enon Plantation), and one in Louisiana (CC Roads Mitigation Bank). Overall, *Schwalbea* populations unmanaged with prescribed fire and/or on unprotected land generally decline and become extirpated overtime. Across the species' range, the most stable populations occur on well-managed (i.e., 1-2 year fire return interval), protected land. For further details in regards to the species range, see Section 2.b.

**f. Habitat or ecosystem conditions:**

Habitat and Plant Associates

In 2016, Jeff Glitzenstein (Botanist, Tall Timbers), completed Carolina Vegetation Survey (CVS) plots for eleven *Schwalbea* populations across South Carolina, Georgia, Florida, and Alabama. Twenty-one *Schwalbea* CVS plots were analyzed across a large portion of *Schwalbea*'s range. Preliminary analyses were completed; see results below.

There were a total of 395 plant species across the 21 plot dataset. The complete list of *Schwalbea* associates ranges from very mesic/wet to very dry/xeric plant species. The best indicator list encompasses a considerable range but most of the plant species are moist to mesic flatwoods species (J. Glitzenstein, Tall Timbers, pers. comm. 2018). The top 20 *Schwalbea* indicator plant species include *Arnica acaulis* (leopard's-bane), *Rhynchospora harveyi* (Harvey's beaksedge), *Solidago tortifolia* (leafy pineywoods goldenrod), *Oenothera fruticosa* (Southern sundrops), *Coreopsis verticillata* (threadleaf coreopsis), *Aletris aurea* (golden colic-root), *Polygala mariana* (Maryland milkwort), *Potentilla canadensis* (running five-fingers), *Buchnera floridana* (Savanna bluehearts), *Hypoxis wrightii* (bristleseed stargrass), *Erigeron strigosus* (daisy fleabane), *Eupatorium hyssopifolium* (hyssopleaf eupatorium), *Calopogon pallidus* (pale grass-pink), *Asclepias longifolia* (longleaf milkwort), *Desmodium obtusum* (stiff tick-trefoil), *Lechea pulchella* var. *ramosissima*, *Tephrosia*

*spicata*, *Quercus phellos* (willow oak), *Mitreola sessilifolia* (small-leaved miterwort), and *Strophostyles umbellata* (perennial sand bean).

#### Habitat Conditions

In addition to the CVS plots mentioned above, hemispherical photographs taken in dense *Schwalbea* patches were used to estimate the total percent of sky visible (gap fraction) in each photo (i.e., percent of sky not covered by vegetation). Gap fraction ranged overall from 30-83%: Scotswood Plantation, SC (83%), Blackwater State Forest, FL (67%), Longlands Plantation, SC (63%), Lynchburg Savanna HP, SC (54%), Sehoy Plantation, AL (54%), FMNF-Witherbee, SC (43%), FMNF-Halfway Creek Road, SC (31%), and Doerun, GA (30%). Further, soil samples collected at each CVS plot demonstrated that surface soils for the Williamsburg County populations had a higher clay and silt content in comparison to the Francis Marion National Forest populations in South Carolina.

Other important habitat factors to mention include the occurrence of *Schwalbea* populations across the species' range in areas with past disturbance, such as old firebreaks, roadbeds, roadsides, and dump piles. The occurrence of *Schwalbea* in areas of past disturbance in conjunction with the clumping distribution within populations suggests that recruitment may depend on several interlinked factors, including host recruitment, light, moisture, and nutrient availability, following disturbance.

#### Fire Effects on Habitat Condition

Prescribed fire remains the most important tool for managing habitat for *Schwalbea*. In fact, the healthiest *Schwalbea* populations occur on quail plantations with an annual fire prescription. A review of the 1999-2016 Francis Marion National Forest Prescribed Burning and Monitoring Trends data, revealed that populations burned on an average 2-year fire return interval appear more stable throughout time in comparison to populations that are burned predominately on a 3-year or longer fire return interval. The fire return interval becomes very critical for small, less resilient populations. For small populations (<50 individuals), the frequency and seasonality of burn becomes critically important. A 1 to 2 year fire return interval during the dormant season (November-March) would be the safest method for managing a small *Schwalbea* population and habitat. As mentioned above, a growing season fire, especially during times of water stress, can have a negative impact on small *Schwalbea* populations (April Punsalan, pers. observations).

#### Climate Change

Because this species tends to occur in mesic ecotones between longleaf pine savannas and longleaf pine flatwoods, climate change effects such as



an increase in global temperature and drought frequency, will have a negative impact on *Schwalbea* populations.

**g. Other:**

Propagation and (Re) Introductions

The propagation of *Schwalbea* can occur with (Determann et al. 1997, p. 10, Kelly 2006, p. 92), or without a host plant (Gustafson et al. 2017, pp. 57-58) (Table 4). *Schwalbea* appears to grow best with host plant species, primarily composites: *Pityopsis graminifolia* (narrow-leaf silvergrass), *C. mariana*, *I. linariifolia*, *S. dumosum*, *Eupatorium* spp., *S. nemoralis*, *S. odora*, and *H. venosum*, than without host plant species (Determann et al. 1997, p. 10; Kelly 2006, p. 92). *Schwalbea* grew significantly larger when grown with composites across three parameters: stem number, stem height, and leaf length, versus grasses and woody species (Kelly 2006, p. 95). For instance, *Schwalbea* stems reached 19 cm height when grown with composites, but only grew 4.2 cm in height without hosts (control)

**Table 4. *Schwalbea americana* (American chaffseed) reintroduction and safeguarding projects/studies with significant results.**

Study	Host Species	Experimental Factors	Significant Results
Determann et al. (1997)	<i>Ilex glabra</i>	Propagation and safeguarding techniques	*Seeds germinated without cold stratification, within 1-wk, p. 9; *Seeds needed only light and moisture to germinate, p. 11; *Without a host, seedlings did not grow beyond a small stage, p. 10; *Stem cuttings root within a few weeks, p. 11
Fuller (2016)		Growth Analysis (fertilized vs. unfertilized)	Fertilized <i>Schwalbea</i> grew 4.60 mm taller than unfertilized, p. 61
Fuller (2016)	<i>Pityopsis graminifolia</i>	Growth Analysis (fertilizer only vs. fertilizer-host)	Fertilizer application to <i>Schwalbea</i> seedlings grown with a host species did not produce significant results, p. 61.
Glitzenstein et al. (2016)	No host	Reintroduction (survivorship and timing of planting)	Reintroduction success depended upon timing and weather, i.e., April reintroduction and high precipitation events resulted in greater seedling success, p. 306.
Gustafson et al. (2017)	No host	Organic seagoing fish emulsion vs. hydrolyzed fish fertilizer; Bareroot plant experiment	*Application of seagoing fish emulsion resulted in high mortality, p. 57. *One-year old bareroot plants survived storage at 4°C, p. 57.

**2. Five-Factor Analysis**

- a. The present or threatened destruction, modification, or curtailment of its habitat or range:** Habitat destruction and adverse modification of suitable habitat for *Schwalbea* continue to be major threats for this species. Development along the coast continues to threaten *Schwalbea* by (1) direct loss of habitat and (2) indirect threats due to urbanization resulting in fire suppression from either local air pollution regulations or safety concerns. Fire suppression continues to threaten this species on both private and public lands. Conversion of longleaf flatwoods and savannas to commercial pine plantations and agriculture fields continue to threaten this species. Although new *Schwalbea* populations are being discovered, the number of extant populations declined by approximately 25% since the last 2008-five year review.
- b. Overutilization for commercial, recreational, scientific, or educational purposes:** Not known to threaten this species.
- c. Disease or predation:** There are no known diseases that threaten this species. Herbivory continues to serve as a minor threat to the species, herbivores include the striped leaf beetle (*Kuschelina* sp.), *Chrysomelid* leaf beetle sp., and Buckeye caterpillar (*Junonia coenia*) larvae (M. Jenkins, Florida Department of Agriculture and Consumer Resources, pers. comm. 2017; Bob Dellinger, U.S. Forest Service, pers. comm. 2017). The Lethcoe, FMNF population suffered from herbivory when fresh new growth sprouted following a prescribed fire.
- d. Inadequacy of existing regulatory mechanisms:** Because the Act only grants protection to plants when a Federal nexus is involved (e.g., federal permit required, federally funded projects), existing regulatory mechanisms are inadequate to protect *Schwalbea*. *Schwalbea* receives protection from state rare plant protection laws in Massachusetts, New Jersey, North Carolina, South Carolina, Georgia, and Florida.
- e. Other natural or manmade factors affecting its continued existence:** Small population size was noted as a threat in the last 2008 five-year review and remains a threat today. Populations that appear stable throughout time contain at least 100 individuals. Currently, 20 populations contain 100 or more individuals. Small populations are highly vulnerable to extirpation, especially in the absence of prescribed fire. Small populations may be less resilient to environmental changes related to climate change.

Since *Schwalbea* is mostly (can occur outside of ecotone areas in longleaf flatwoods) an ecotone species occurring in transitional areas between uplands and freshwater wetlands, an increase in drought frequency and

decrease in precipitation events could threaten smaller, less resilient populations.

#### D. Synthesis

At one time, *Schwalbea* occurred along the entire Eastern Seaboard (with exception of Maine and New Hampshire) and Gulf Coast, from Massachusetts south to Florida and from Florida west to Texas, and the inland states Kentucky and Tennessee. The status of this species from 1995 to present day has been one of decline. The range of *Schwalbea* has greatly constricted with the species only occurring in eight states along the Eastern seaboard and Gulf Coast. Further, most states only have 2-3 populations and only three states (NC, SC, and GA) contain more than five populations. Threats to this species, habitat destruction/modification and fire suppression, continue along the coast. The high fire frequency (1-2 year fire return interval) required for healthy, self-sustaining populations is hard for land managers to maintain in the Southeast. The remaining stronghold's or reservoirs for *Schwalbea* include Department of Defense Property (Fort Bragg, NC) and quail plantations in South Carolina and Georgia (Table 2).

There are 41 protected *Schwalbea* populations, out of these, 20 are self-sustaining. Thus, 30 additional protected, self-sustaining populations are needed to recover the species. *Ex situ* propagation has allowed the reintroduction of 10 populations in the northern and southern portions of the species range. However, none of the reintroduced populations contain >100 individuals. Existing quail plantations in the Southeast, especially in South Carolina, Georgia, Alabama, and Florida, which manage with a fire return interval of 1-2 years, could harbor unknown *Schwalbea* populations. The status of this species could change in the future if private landowners and managers become interested in this species by realizing that the occurrence of *Schwalbea* denotes high quality longleaf flatwood and savanna habitat and that there is no regulatory oversight for plants on private land.

Research needs to be conducted *ex situ* and *in situ* on the germination ecology and recruitment of this species. Although a lot of research has been conducted on the life history and fire response of this species, gaps still remain, including germination ecology, population trends in response to precipitation/drought events, early prescribed growing season fire effects, i.e., April, and late growing season fire effects, i.e., July-August, during times of drought.

Overall, none of the recovery criteria for reclassification have been achieved to date. The continual decline of this species due to habitat destruction and fire suppression continue to threaten this species with extinction throughout a significant portion of its range.

### III. RESULTS

**A. Recommended Classification:**

  X   **No change is Needed**

**IV. RECOMMENDATIONS FOR FUTURE ACTIONS**

1. Research and determine if *in situ* recruitment and reintroduction can occur under different levels of soil disturbance and watering regimes.
2. Continually search for new populations in areas managed for quail and/or RCW or any areas with a 1-2 year fire return interval within the species' historic range.
3. Survey unknown and historic populations and if present negotiate landowner agreements or conservation easements.
4. Develop an easy and repeatable *Schwalbea* survey form and methodology for range-wide use in order to tract/monitor recovery populations annually.
5. Research the germination ecology of *Schwalbea* in regards to moisture and light requirements and seedling recruitment / host attachment to understand *Schwalbea*'s regeneration strategy.
6. Research fire seasonality effects, especially early April and late July/August fires, in conjunction with rainfall patterns/climatic fluctuations.
7. Continue population reintroductions within the historic range and introductions into protected areas with 1-3 year fire return intervals.
8. Expand the extent of *Schwalbea* in the northern portion of the current range.

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**Appendix A: Range-wide historic *Schwalbea americana* (American chaffseed) occurrence records.**

<b>State</b>	<b>EO #</b>	<b>Site Name</b>	<b>County</b>	<b>EO Status</b>	<b># of Plants and Last Observed</b>
AL	AL-001	"Seminole"	Baldwin	Historic	unknown
AL	AL-002	Ca. 3.5 miles W of Geneva along railroad.	Geneva	Historic	unknown
AL	AL-003	Low pine barrens. Dog River meadows.	Mobile	Historic	unknown
CT	CT-002	no info	Middlesex	Historic	
CT	CT-001	3 miles north of Flanders	New London	Historic	unknown
DE	DE-001	Chesapeake & Delaware Canal	New Castle	Historic	
FL	FL-009?	no info	Brevard	Historic	
FL	FL-008?	near Jacksonville	Duval	Historic	
FL	FL-001	NNW of Gretna	Gadsden	Historic	unknown
FL	FL-003?	Bonnet Lake	Higlands	Historic	unknown

FL	FL-005?	12 miles above mouth of Manatee River	Hillsborough	Historic	
FL	FL-010	Horseshoe Plantation	Leon	Historic	2006 - 5 plants; 1998 - 15 plants; 1994 - 12-15 plants
FL	FL-004?	Rosewood	Levy	Historic	unknown
FL	FL-002	IFAS fish hatchery	Putnam	Historic	unknown
FL	FL-007?	Pelatka	Putnam	Historic	
FL	FL-006?	near Seville	Volusia	Historic	
GA	GA-008 (8809)	Pineland Plantation	Baker	Historic	unknown
GA	GA----	Ichauway King Site	Baker	Historic	1994 - 600+ plants
GA	GA----		Baker	Historic	
GA	GA----	Ichauway-record not in the database	Baker	Historic	1994 - 12 plants
GA	GA-007	No site name	Baldwin	Historic	unknown
GA	GA-005 (11102)	Nilo Plantation (Pond Site)	Dougherty	Historic	1994 - 1100+ Plants; 2007-108 plants

GA	GA-006 (5496)	Nilo Plantation (Big Cypress Lake East)	Dougherty	Historic	1989 - > 100 stems
GA	GA-002 (1160)	Killarney Pine Barrens	Early	Historic	unknown
GA	GA-003 (7206)	Donaldsonville	Miller	Historic	unknown
GA	GA-001 2289)	Indian Grave Mountain	Pike	Historic	unknown
GA	GA----		Worth	Historic	1994 - 200+ plants
KY	KY-001	Natural Arch-Daniel Boone National Forest	McCreary	Historic	unknown
KY	KY-002	Morehead Ranger District-Daniel Boone National Forest	McCreary	Historic	unknown
LA	LA-H01	Calcasieu Parish		Historic	
LA	LA-H02	Rapides Parish - record considered invalid		Historic	
MA	MA-003	Camp Burgess	Barnstable	Historic	
MA	MA-007	Falmouth	Barnstable	Historic	
MA	MA-005	Potomska	Bristol	Historic	

MA	MA-002	West of Great Tisbury Pond	Dukes	Historic	
MA	MA-010	Montague	Franklin	Historic	
MA	MA-001	Bloomingdale Swamp	Nantucket	Historic	
MA	MA-006	South Weymouth	Norfolk	Historic	
MA	MA-004	no info	Plymouth	Historic	
MA	MA-008	Hubbardston	Worcester	Historic	
MA	MA-009	Southbridge	Worcester	Historic	
MD	MD-002	Stocketts Run Natural Area	Anne Arundel	Historic	
MD	MD-001	Ocean City	Worcester	Historic	
MS	MS-001			Historic	
MS	MS-002			Historic	
NC	NC-010	Road to Carvers	H	Historic	

NC	NC-002	McCain Natural Area-McFarland Tract	Hoke	Historic	
NC	NC-009	Hog Island	Moore	Historic	1988-Legrand counted 10 stems that probably represented 4-5 plants; 1993- 6 plants
NC	NC-011	Aberdeen	Moore	Historic	
NC	NC-003	SE of Harrell's Store	Pender	Historic	
NC	NC-004	N of Burgaw	Pender	Historic	
NC	NC-001	Western Sandhills Megasite - Upper Hills Creek Sandhills	Scotland	Historic	
NC	NC-026	Western Hills Megasite - Laurel Hill Annual Burn, Sandhills Game Land	Scotland	Historic	1997-35 plants; 1998-20 plants with immature fruits and 9 vegetative; 2000-no plants found; 2001-no plants found; 2005-four plants found, one flowering and three vegetative (Sorrie 2005)
NC	NC-020	no info		Historic	
NJ	NJ-001	see NJ files		Historic	
NJ	NJ-002			Historic	
NJ	NJ-003			Historic	
NJ	NJ-004			Historic	

NJ	NJ-005			Historic	
NJ	NJ-006			Historic	
NJ	NJ-008			Historic	
NJ	NJ-009			Historic	
NJ	NJ-010			Historic	
NJ	NJ-011			Historic	
NJ	NJ-012			Historic	
NJ	NJ-013			Historic	
NJ	NJ-014			Historic	
NJ	NJ-015			Historic	
NJ	NJ-016			Historic	
NJ	NJ-017			Historic	

NJ	NJ-018			Historic	
NJ	NJ-019			Historic	
NY	NY-001	Albany, Karner (area formerly known as Centre Station)	Albany	Historic	no info
SC	SC----	Craven Road	Berkeley	Historic	1994- 10 plants in a 20 x 20 meter area / stable
SC	SC--065	Green Bay Road	Berkeley	Historic	1994- 30 - 40 plants
SC	SC-008	Highway 402 (aka Cordesville)	Berkeley	Historic	2008 - 0 plants; 2004 - 1 plant; 1999 - 10 plants; 1994- 78 small plants - increasing
SC	SC-009	Three Mile Head Road (aka Witherbee Road)	Berkeley	Historic	2010-51 plants; 2008 - 298 plants; 2004 - 581 plants; 2001 - 770 plants; 1999 -467 plants; 1994- 220+ plants /increase since first observed; 1993 - 700 plants
SC	SC-016	Koppers Company	Berkeley	Historic	1992-no plants; 1993-5 plants, four in flower; 1994- 3 plants/ declining
SC	SC-017	Highway 41	Berkeley	Historic	2016- 0 plants; 2008 - 0 plants; 2004 - 3 plants; 1999 - 3 plants; 1997 - 10 plants; 1994-69 plants: increase after growing season burn; 1993 - 42 plants; 1992 - 46 plants; 1991 - 27 plants
SC	SC-030	Fish Hook Road (French Quarter Creek Road) Near Road	Berkeley	Historic	1993 = 12 plants; 1992- 30+ plants/stable
SC	SC-010	Forest Route 211	Charleston	Historic	1992- Unable to relocate

SC	SC--001	Ahles and Haesloop	Charleston	Historic	
SC	SC--032	Clarendon County Line	Clarendon	Historic	1994- 17 Plants/ stable
SC	SC-014	Olanta	Florence	Historic	Unable to relocate in 1985 or 1993
SC	SC-015-5287	Florence SC. 46 (roadside)	Florence	Historic	Unable to relocate in 1985 or 1993
SC	SC-004	Conway SC 544	Horry	Historic	Unable to relocate in 1985 or 1994
SC	SC-005	Socastee Savanna	Horry	Historic	1993 - unable to relocate; 1985-40 plants found in two colonies
SC	SC-024-3921	Louisville Road (north)	Horry	Historic	
SC	SC-059-2845	Louisville Road (south)	Horry	Historic	1994-58 plants
SC	SC-012	3.65 miles Northeast of Pineland	Jasper	Historic	1994- unable to relocate
SC	SC-012	4.2 miles Northeast of Pineland	Jasper	Historic	1994- unable to relocate
SC	SC--066	State Highway 327	Lee	Historic	1994- 10 plants
SC	SC-002	Sumter (S.C. 53 and I-95)	Sumter	Historic	1993- hundreds/ stable



SC	SC-058	Cades	Williamsburg	Historic	1994- 1000+ /stable
SC	SC-025	Clarkson Flatwoods (Heineman Savanna)	Williamsburg	Historic	1993- 9 plants; 150 plants/ stable
SC	SC-023, 050	St. Mary's A.M.E. Church	Williamsburg	Historic	1993- 9 plants in 5x5 meter area/ stable
SC	SC-	South of Heinman Railroad	Williamsburg	Historic	1993 & 1994 - unable to locate plants; 1987- 100 plants in 80x20 meter area
SC	SC--048	Friendfield #1/Black River Site	Williamsburg	Historic	1993- 300+ plants/ stable
SC	SC-	Friendfield #2/ Black River Site	Williamsburg	Historic	1993-500+ Plants/ stable, 2008- 20 plants
SC	SC-041	Hobcaw Hunt Club- McKight Swamp	Williamsburg	Historic	
SC	SC-035- 3682	Hobcaw Hunt Club- Chaney Swamp	Williamsburg	Historic	1994- 80-120 plants/ stable
SC	SC-037	Indiantown	Williamsburg	Historic	1994- 70-80 plants/ stable
SC	SC--071	Friendfield #3/Black River Plantation/Site	Williamsburg	Historic	1994- 500-1,000 plants/ stable
SC	SC-036	Trio	Williamsburg	Historic	1994 -ca. 50 plants/ stable
SC	SC-038- 9289	SC-16 (Roadside)	Williamsburg	Historic	1994 -ca. 30-55 plants/ stable

SC	SC-033	Salters	Williamsburg	Historic	1994 -1,000+ plants/ stable
SC	SC-034	Hobcaw Hunt Club-Lane site	Williamsburg	Historic	1994 -30-50 plants/ stable
SC	SC-040-3571-H	Ox Swamp	Williamsburg	Historic	1994 - 80-85 plants/ stable
SC	SC-042	Highway 375 (Powerline ROW)	Williamsburg	Historic	1994 - 7 plants
SC	SC-003	Blakely (Blakey Depression Meadow)	Williamsburg	Historic	2008-few plants;1993- 1000+ plants; 1985 - 6,000+ stable
SC	SC-013	Heineman Railroad Track Site	Williamsburg	Historic	1985-1440 plants,1994- 6 plants/ declining
SC	SC-057	Heineman Savanna	Williamsburg	Historic	
TN	TN-001			Historic	
TN	TN-002			Historic	
TX	TX-001			Historic	
VA	VA-001	Historic site somewhere between Sussex and Greensville	Sussex / Greensville	Historic	

**5-YEAR REVIEW**  
**American Chaffseed (*Schwalbea americana*)**

Current Classification Endangered

Recommendation resulting from the 5-Year Review

  X   No change is needed

Review Conducted By: April Punsalan, South Carolina Ecological Services Office, Charleston, SC


FIELD OFFICE APPROVAL:

Lead Field Supervisor, U.S. Fish and Wildlife Service

Approve THOMAS MCCOY Digitally signed by THOMAS MCCOY  
Date: 2019.06.13 16:40:20 -04'00' Date June 13, 2019  
Thomas D. McCoy

COOPERATING REGIONAL OFFICE APPROVAL:

*Acting Assistant Regional Director, Ecological Services*  
Regional Director, U.S. Fish and Wildlife Service

Approve  Date 6-27-19

**Appendix A. Summary of peer review for the 5-year review of American chaffseed (*Schwalbea americana*)**

- A. Peer Review Method:** Peer review was coordinated by the Service's Raleigh Ecological Services Field Office, North Carolina. Four peer reviewers knowledgeable about the biology and ecology of *Schwalbea* were selected by the Service to peer review the draft 5-year review. Individual responses were received from all four reviewers.

**Peer Reviewers:** Dr. Jay Kelly, Raritan Valley Community College, Biology Department, Branchburg, New Jersey; Robin Mackie, Forest Botanist, Francis Marion and Sumter National Forests, Columbia, South Carolina; Dr. Jeff Glitzenstein, Botanist/Research Fellow, Tall Timbers, Tallahassee, Florida; Michael Jenkins, Plant Conservation Program Biologist, Florida Forest Service, Florida Department of Agriculture and Consumer Resources, Tallahassee, Florida.

- B. Peer Review Charge:** See attached text from the peer review invitation letter.
- C. Summary of Peer Review Comments/Report:** All reviewers reported that the 5-year review accurately assessed the current status of the species. Two reviewers provided updates (i.e., number of individuals) on several occurrences in South Carolina and Florida. One reviewer provided an update on safeguarding efforts at South Carolina Botanical Garden and Birmingham Botanical Garden. Further, the reviewer recommended adding Kaeser and Kirkman's 2012 publication on seed longevity. One reviewer suggested adding more information on the management of woody vegetation by mowing and hand removal. One reviewer suggested combining two populations due to the contiguous longleaf habitat that occurred between the two populations. One reviewer suggested distinguishing between germination and recruitment when discussing *in situ* experiments. Further, one reviewer recommended adding the data in regards to personal observations made 1-2 years post dormant season fire on the flowering response of *Schwalbea* and other composites.
- D. Response to Peer Review:** Updated information received from the peer reviewers was incorporated into the 5-year review: number of individuals within populations, number of populations, safeguarding efforts, personal observations after prescribed fire events, and benefits of woody vegetation manual removal. Further, language within the 5-year review was refined to ensure that scientific findings were not over or understated.

## Peer Review Invitation Letter Text

On June 30, 2017, the U.S. Fish and Wildlife Service published a notice in the *Federal Register* (82 FR 29916) announcing a five-year review of 23 federally listed species, including American chaffseed (*Schwalbea americana*). The purpose of five-year reviews is to ensure that the classification of species as threatened or endangered is accurate and reflects the best available information.

Following current Service policy and guidelines on the process to conduct independent peer review, we are assisting our Charleston, SC Field Office to complete peer review of the science in the 5-year review for American chaffseed. You have provided data used to review the status of American chaffseed and/or are knowledgeable about it. Therefore, in order to ensure that the best available information has been used to conduct this five-year review, we now request your peer review of the attached document. Specifically, we ask for comments on:

- Have we assembled the best available scientific and commercial information?
- Is our analysis of this information correct and properly applied?
- Can you identify any additional new information on American chaffseed that has not been considered in this review?

Please note that we are not seeking your opinion of the legal status of this species, but rather that the best available data and analyses were considered in reassessing its status.

As part of the peer review process, we must evaluate the potential for conflicts of interest with the subject species or the action. We therefore ask that you fill out the enclosed Conflict of Interest form and return it to this office with any notes, comments, or questions that you are willing to provide as your review.

We appreciate your interest in furthering the conservation of rare plants and animals by becoming directly involved in the review process of our Nation's threatened and endangered species. Your review and comments will become a part of the administrative record for this species, and you can be certain that your information, comments, and recommendations will receive serious consideration.

We hope that you view this peer review process as a worthwhile undertaking. Please give me a call (919-856-4520 x18) or send me an e-mail ([dale\\_suiter@fws.gov](mailto:dale_suiter@fws.gov)) if you have any questions on this peer review. We have enclosed additional guidance to help you in this evaluation. Please share your response by email or letter by **September 15, 2018**. Thank you in advance for your assistance.