

**From:** [Reid, Rebekah N](#)  
**To:** [Marshall, Michael E](#)  
**Cc:** [Becker, Drew N](#)  
**Subject:** Re: heart leaf SSA  
**Date:** Wednesday, November 29, 2017 2:23:31 PM  
**Importance:** High

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I'll be in touch.

Rebekah Reid

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Asheville Ecological Services Field Office  
160 Zillicoa St.  
Asheville, NC 28801  
phone: 828-258-3939 x238  
cell: 828-782-0090

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On Wed, Nov 29, 2017 at 1:56 PM, Marshall, Michael <[michael\\_marshall@fws.gov](mailto:michael_marshall@fws.gov)> wrote:  
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**To:** [Reid, Rebekah N](#)  
**Cc:** [Becker, Drew N](#)  
**Subject:** Re: heart leaf SSA  
**Date:** Friday, December 1, 2017 8:42:56 AM  
**Importance:** High

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**To:** [Marshall, Michael E](#)  
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**Subject:** Re: heart leaf SSA  
**Date:** Friday, December 1, 2017 10:02:53 AM  
**Importance:** High

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**Subject:** Re: heart leaf SSA  
**Date:** Wednesday, December 6, 2017 8:08:01 AM  
**Importance:** High

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**Date:** Friday, December 8, 2017 7:46:34 AM  
**Importance:** High

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Hi Rebekah,

Just got back in the office this morning, so sorry for the delay. I'll let Drew chime in, but in my mind, the contribution to science is not necessarily relevant to the dear interested part letter, but one criteria. We basically want to give a heads up to any potentially interested or affected partner, so the land owners that you mention, in my opinion, would get one of these letters.

And, thanks a bunch for getting that GIS data to me!

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cell: 828-782-0090

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Drew

**Drew Becker**

Recovery Coordinator  
U.S. Fish and Wildlife Service  
Southeast Region  
[1875 Century Boulevard](#)  
[Atlanta, GA 30345](#)  
404-679-7226  
[drew\\_becker@fws.gov](mailto:drew_becker@fws.gov)

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**From:** [Becker, Drew N](#)  
**To:** [Marshall, Michael E](#)  
**Cc:** [Reid, Rebekah N](#)  
**Subject:** Re: heart leaf SSA  
**Date:** Friday, December 8, 2017 7:51:25 AM  
**Importance:** High

---

I agree Mike. Welcome back.

Drew

**Drew Becker**  
Recovery Coordinator  
U.S. Fish and Wildlife Service  
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1875 Century Boulevard  
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And, thanks a bunch for getting that GIS data to me!

Thanks,

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Thanks.

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**From:** [Reid, Rebekah N](#)  
**To:** [Becker, Drew N](#)  
**Cc:** [Marshall, Michael E](#)  
**Subject:** Re: heart leaf SSA  
**Date:** Monday, December 11, 2017 7:33:08 AM

---

Thanks for the clarification. I'll add them to the list.

Rebekah Reid

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**From:** [Marshall, Michael E](#)  
**To:** [Reid, Rebekah N](#)  
**Cc:** [Becker, Drew N](#); [Stephanie DeMay](#)  
**Subject:** GIS data followup  
**Date:** Thursday, December 14, 2017 9:03:20 AM  
**Importance:** High

---

Good morning Rebekah,

I have cced Stephanie DeMay on this email. We will be working together on a number of SSAs, and I thought a glance into our conversations would be useful as she begins to work on other species SSAs.

I have a question about the EO data you provided. I'll paste a quote from the 2016 rangewide report for context:

*During 2015-2016, NCNHP reviewed all NC EOs of *Hexastylis naniflora*, making mapping revisions where necessary, to improve all records in accordance with NatureServe mapping protocols. As of August 2016, NCNHP has 27 parent EOs and another 64 stand-alone EOs of *Hexastylis naniflora*. "Principal or standalone EOs can be thought of as proxies for populations in the absence of species-specific information on pollination and dispersal distances. For purposes of this review, we regard these 27 parent and 64 extant stand-alone EO records as 91 populations of the species in North Carolina.*

*As of 2016, SCDNR has not yet aggregated its records for the species into principal and stand-alone EOs. As a result, the 59 records currently mapped for the species in South Carolina often include several records in sufficiently close proximity to one another that they should be considered a single population. Applying a buffer of 2 km (the default and minimum separation distance according to NatureServe's data standard) to these records reveals a maximum of 22 spatially discrete aggregations of sites in South Carolina. These aggregations separated by 2 km are regarded as 22 populations for the purposes of this review (USFWS 2010).*

Populations will be our unit of resilience, and in that vein, I'm interested in focusing on the 113 pops identified across the range.

For North Carolina, I'm having difficulty resolving the provided data into these 91 populations...for the point file, there are 48 records....for the polygon file there are 214 records. I'm trying to figure out how to work with a shapefile that represents the 27 parent and 64 extant stand alone records that result in the 91 populations. Any thoughts?

For South Carolina...I see the 59 records that have yet to be aggregated. I'm thinking it won't be difficult to aggregate them myself into the identified 22 populations using the 2 km buffer rule. Has this been done already, or should I proceed with doing so myself?

Thanks!

Mike

--

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**To:** [Marshall, Michael E](#)  
**Cc:** [Becker, Drew N](#); [Stephanie DeMay](#)  
**Subject:** Re: GIS data followup  
**Date:** Thursday, December 14, 2017 10:47:00 AM  
**Importance:** High

---

Mike,

I left you a message. I think it would be easier to discuss some of this over the phone and then I can summarize in an email so that Drew and Stephanie are in the loop. In the meantime, I've added a few things to the Drive folder that should be helpful.

As you noticed, SCNHP and NCNHP compile their data differently. NC groups their EOs in to populations so multiple EOs can have a parent EO in common. South Carolina doesn't do that. I've added/updated some files to Drive to try and address this.

- HENAINSC - This is additional GIS data that includes the SC EO points and 2km buffer polygons that group the points into 18 populations.
- HENA SCNHP EO Data Summary with RNR Notes (12.11.17) - This is a spreadsheet that groups the EO points by buffer polygons they have in common to define a population. In column A, you will see how they group together. As a side note, I'm still working on updating this spreadsheet. Updates are in blue and I've noted possible additional EOs. There could be additional populations or those EO could fall into one of the existing 18.
- What I'm seeing in the 5-YR Review which is what I think is referenced by NCNHP is *"SCDNR has not yet aggregated its records for the species into principal and stand-alone EOs. As a result, the 57 EO records currently mapped for the species in this state often include several records in sufficiently close proximity to one another as to be better regarded as a single population. Applying a buffer of 2km (the default and minimum separation distance according to NatureServes' data standard) to these records reveals a maximum of 18 spatially discrete aggregations of sites in the state of South Carolina. These aggregations separated by 2km are regarded as 18 populations for purposes of this review."* Table B.1 on page 30 also supports this. I'm not sure how NCNHP got to 22 populations, we may have to ask.

For NC, I came up with 98 populations based on data I pulled from NCNHP in August. For NC the point data are source features they use to make the polygon data. If a surveyor sends point or lat/long data, NCNHP will buffer the point. All of the points should be associated with a polygon but not every polygon necessarily has a point (in this case the surveyor would have mapped a polygon not individual points). So, the point data would in essence be duplicate data. Two files to note:

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Hopefully, that provides a little clarification and not confusion. Let's talk more and if I need to pull in NCNHP just let me know. They have a wonderful GIS/data analyst.

Thanks!

Rebekah Reid

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On Thu, Dec 14, 2017 at 9:03 AM, Marshall, Michael <[michael\\_marshall@fws.gov](mailto:michael_marshall@fws.gov)> wrote:  
Good morning Rebekah,

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**From:** [Frank Holleman](#)  
**To:** [Reid, Rebekah N](#)  
**Subject:** Raintree Subdivision  
**Date:** Thursday, December 14, 2017 2:09:52 PM  
**Importance:** High

---

Rebekah,

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Think it would be good for you to tour each of these sites and see how the plants are doing. If you get a chance to do that, I'll be glad to try to go with you.

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(919) 967 1450  
[fholleman@selcnc.org](mailto:fholleman@selcnc.org)

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**From:** [Reid, Rebekah N](#)  
**To:** [Frank Holleman](#)  
**Subject:** Re: Raintree Subdivision  
**Date:** Thursday, December 14, 2017 2:35:22 PM  
**Importance:** High

---

Hi Frank,

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Thanks.

Rebekah Reid

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**From:** [Frank Holleman](#)  
**To:** [Reid, Rebekah N](#)  
**Subject:** RE: Raintree Subdivision  
**Date:** Thursday, December 14, 2017 2:37:12 PM  
**Importance:** High

---

Was the protected area itself transferred to SPACE by the HOA, or was the conservation easement held by the Nature Conservancy assigned to SPACE, so that SPACE holds the easement, but the property is still owned by the HOA?

**From:** Reid, Rebekah [mailto:[rebekah\\_reid@fws.gov](mailto:rebekah_reid@fws.gov)]  
**Sent:** Thursday, December 14, 2017 2:35 PM  
**To:** Frank Holleman  
**Subject:** Re: Raintree Subdivision

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**From:** [Reid, Rebekah N](#)  
**To:** [Frank Holleman](#)  
**Subject:** Re: Raintree Subdivision  
**Date:** Thursday, December 14, 2017 2:39:26 PM  
**Importance:** High

---

Here is what was in the email from Kristen Austin: " The Nature Conservancy transferred our conservation easement at Raintree Creek, which has the *H. naniflora* population, May 2009 to Spartanburg Area Conservancy ('SPACE'). They now hold the easement and monitor the property."

Rebekah Reid

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**From:** [Frank Holleman](#)  
**To:** [Reid, Rebekah N](#)  
**Subject:** RE: Raintree Subdivision  
**Date:** Thursday, December 14, 2017 2:40:35 PM  
**Importance:** High

---

Yes, so SPACE holds the easement, but the property is still owned by the Homeowners Association, or some other entity.

**From:** Reid, Rebekah [mailto:[rebekah\\_reid@fws.gov](mailto:rebekah_reid@fws.gov)]  
**Sent:** Thursday, December 14, 2017 2:39 PM  
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**From:** [Marshall, Michael E](#)  
**To:** [Reid, Rebekah N](#); [Becker, Drew N](#)  
**Cc:** [Stephanie DeMay](#)  
**Subject:** Re: GIS data followup  
**Date:** Monday, December 18, 2017 11:35:35 AM  
**Importance:** High

---

Good morning all,

As discussed previously, I'm suggesting we get this species kicked off fairly soon after the holidays....I've provided a doodle poll for folks to indicate their availability to participate in a kick-off call.....once Rebekah identifies the 1-3 experts that should be on the technical team, we can forward them that doodle poll as well. Rebekah....if you already have a good idea of these folks, you can either forward them the doodle poll, or send me their email contact and I can draft an invite email.

<https://doodle.com/poll/7uez87hkggczm3pa>

On that call we ought to have all potential "Team" members, including the Core Team and Technical Team. Here's my initial thought on who should be on that call and their respective roles....your thoughts would be welcome:

**Core Team:** conduct SSA (writing and analysis; day to day email contact and support; document review)

*Mike Marshall*--primary author; data synthesis; data analysis; elicitation questions; SSA framework support; document review; bi-weekly calls

*Rebekah Reid*--secondary author; data, literature, and expert gathering; document review; bi-weekly calls

**Technical Team:** Expert input and Document Review (species input; document review at section milestones (e.g. species biology; current condition; future condition; final SSA); answer elicitation questions)

*State Biologist(s)*--need to identify and reach out to schedule first call

*Other Expert* (Academia; NGO; other state and/or federal partner)--need to identify and reach out to schedule first call

**Project Manager:** Ensure timeliness and responsibility for post-SSA stages (rule writing; recovery plan; 5-year review)

*Drew Becker*--participate in bi-weekly calls; obtain updates from Core Team on progress towards milestones

Once we kick this SSA off with a call, we start our 21 week timeline....I will write up an updated project timeline once we hammer down the date of the kick-off call.

I've cced Stephanie here, as this will likely be our first SSA kick-off of 2018, and thought it might be a good idea to sit in on the call to get a flavor of the kick-off meeting, roles and responsibilities, etc....same framework will apply to most of the other species we will conduct SSAs for.

Thanks!

Mike

On Thu, Dec 14, 2017 at 10:47 AM, Reid, Rebekah <[rebekah\\_reid@fws.gov](mailto:rebekah_reid@fws.gov)> wrote:  
Mike,

I left you a message. I think it would be easier to discuss some of this over the phone and then I can summarize in an email so that Drew and Stephanie are in the loop. In the meantime, I've added a few things to the Drive folder that should be helpful.

As you noticed, SCNHP and NCNHP compile their data differently. NC groups their EOs in to populations so multiple EOs can have a parent EO in common. South Carolina doesn't do that. I've added/updated some files to Drive to try and address this.

- HENAinSC - This is additional GIS data that includes the SC EO points and 2km buffer polygons that group the points into 18 populations.
- HENA SCNHP EO Data Summary with RNR Notes (12.11.17) - This is a spreadsheet that groups the EO points by buffer polygons they have in common to define a population. In column A, you will see how they group together. As a side note, I'm still working on updating this spreadsheet. Updates are in blue and I've noted possible additional EOs. There could be additional populations or those EO could fall into one of the existing 18.
- What I'm seeing in the 5-YR Review which is what I think is referenced by NCNHP is *"SCDNR has not yet aggregated its records for the species into principal and stand-alone EOs. As a result, the 57 EO records currently mapped for the species in this state often include several records in sufficiently close proximity to one another as to be better regarded as a single population. Applying a buffer of 2km (the default and minimum separation distance according to NatureServes' data standard) to these records reveals a maximum of 18 spatially discrete aggregations of sites in the state of South Carolina. These aggregations separated by 2km are regarded as 18 populations for purposes of this review."* Table B.1 on page 30 also supports this. I'm not sure how NCNHP got to 22 populations, we may have to ask.

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**To:** [Marshall, Michael E](#)  
**Cc:** [Becker, Drew N](#); [Stephanie DeMay](#)  
**Subject:** Re: GIS data followup  
**Date:** Monday, December 18, 2017 2:52:29 PM  
**Importance:** High

---

Thanks, Mike.

I've reached out to the North Carolina Natural Heritage Program. The person I want as one of our experts is out until February but I've inquired if someone could stand in for the first few meetings until she is back. One other person I would like on the technical team has recently done a complete career change and I don't know if he'd be interested anymore. I'm looking in to it.

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<https://doodle.com/poll/7uez87hkggczm3pa>

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**From:** [Buchanan, Misty](#)  
**To:** [Reid, Rebekah N](#)  
**Cc:** [Mason, Suzanne](#); [Amoroso, Jame](#)  
**Subject:** RE: [External] Re: Hexastylis naniflora status assessment  
**Date:** Monday, December 18, 2017 3:59:20 PM  
**Importance:** High

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I don't know if he would be interested..I haven't heard a peep from James since he left the NHP (except on Facebook). He definitely remains one of the world's experts, though.

## Misty Buchanan

Deputy Director for Natural Heritage  
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121 W. Jones St, MSC 1651 Raleigh, NC 27699-1651  
919 707 8107 office

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---

**From:** Reid, Rebekah [mailto:rebekah\_reid@fws.gov]  
**Sent:** Monday, December 18, 2017 3:50 PM  
**To:** Buchanan, Misty <misty.buchanan@ncdcr.gov>  
**Cc:** Mason, Suzanne <suzanne.mason@ncdcr.gov>; Amoroso, Jame <jame.amoroso@ncdcr.gov>  
**Subject:** [External] Re: Hexastylis naniflora status assessment

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Thank you, Misty.

I know James Padgett is no longer with NHP but is he interested in Hexastylis at all anymore? Or, is he completely out of the business?

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On Mon, Dec 18, 2017 at 3:42 PM, Buchanan, Misty <[misty.buchanan@ncdcr.gov](mailto:misty.buchanan@ncdcr.gov)> wrote:

Hi Rebekah,

Thank you for your call about the *Hexastylis naniflora* status update. Jame Amoroso and Suzanne Mason would both like to participate in the meetings as long as Laura is out on leave.

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**Date:** Monday, December 18, 2017 4:01:50 PM  
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If you think it would be OK, I would like to contact him. Do you have a good email or phone number for him?

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**From:** [Marshall, Michael E](#)  
**To:** [Reid, Rebekah N](#)  
**Cc:** [Becker, Drew N](#); [Stephanie DeMay](#)  
**Subject:** Re: GIS data followup  
**Date:** Tuesday, December 19, 2017 7:26:17 AM  
**Importance:** High

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Hi Rebekah,

That all sounds great. As far as having to have each state represented on the Technical team....all we can do is ask. At the end of the day, I think it would be nice to have someone from North Carolina and one or both of the ASU folks....if South Carolina has someone willing to participate, that would be excellent, but not required.

When reaching out to these folks I'm thinking best to highlight 1) we are conducting an SSA for the species 2) what an SSA is 3) why we are conducting one for the species 4) a request they join our technical team 5) what their role would be as a technical team member (e.g. answering some elicitation questions and providing review and feedback on the document several times as we write it and 6) request they join our kick off call with a link for the doodle poll to indicate their availability.

If you'd rather me reach out to them, just send me the contacts...however, I'd be more than happy if you would like to make the request! ;)

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Friday --> off

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**From:** [Amoroso, Jame](#)  
**To:** [Reid, Rebekah N](#); [Buchanan, Misty](#)  
**Cc:** [Mason, Suzanne](#)  
**Subject:** RE: [External] Re: Hexastylis naniflora status assessment  
**Date:** Tuesday, December 19, 2017 10:08:22 AM  
**Attachments:** [image003.png](#)  
**Importance:** High

---

Hi Rebekah,

As Misty mentioned, James is active on Facebook as James Edward Padgett (Pastor Eddie Padgett), so a message there would get to him. I don't think he would object to being contacted.

Alternatively, his work address and phone are:  
New Home United Methodist Church  
544 Moriah School Road  
Casar, NC 28150 (828) 429-2908

**Jame Amoroso**  
Conservation Information Specialist

121 W Jones St MSC 1651 Raleigh, NC 27699-1651  
919 707 8621 *office*  
[Jame.Amoroso@ncdcr.gov](mailto:Jame.Amoroso@ncdcr.gov)

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---

**From:** Reid, Rebekah [mailto:[rebekah\\_reid@fws.gov](mailto:rebekah_reid@fws.gov)]  
**Sent:** Monday, December 18, 2017 4:02 PM  
**To:** Buchanan, Misty <[misty.buchanan@ncdcr.gov](mailto:misty.buchanan@ncdcr.gov)>  
**Cc:** Mason, Suzanne <[suzanne.mason@ncdcr.gov](mailto:suzanne.mason@ncdcr.gov)>; Amoroso, Jame <[jame.amoroso@ncdcr.gov](mailto:jame.amoroso@ncdcr.gov)>  
**Subject:** Re: [External] Re: Hexastylis naniflora status assessment

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If you think it would be OK, I would like to contact him. Do you have a good email or phone number for him?

Rebekah Reid



US Fish and Wildlife Service  
Asheville Ecological Services Field Office  
160 Zillicoa St.  
Asheville, NC 28801  
phone: 828-258-3939 x238  
cell: 828-782-0090

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On Mon, Dec 18, 2017 at 3:59 PM, Buchanan, Misty <[misty.buchanan@ncdcr.gov](mailto:misty.buchanan@ncdcr.gov)> wrote:

I don't know if he would be interested...I haven't heard a peep from James since he left the NHP (except on Facebook). He definitely remains one of the world's experts, though.

## Misty Buchanan

Deputy Director for Natural Heritage  
Division of Land and Water Stewardship

[121 W. Jones St.](#), MSC 1651 Raleigh, NC 27699-1651  
919 707 8107 office

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---

**From:** Reid, Rebekah [mailto:[rebekah\\_reid@fws.gov](mailto:rebekah_reid@fws.gov)]  
**Sent:** Monday, December 18, 2017 3:50 PM  
**To:** Buchanan, Misty <[misty.buchanan@ncdcr.gov](mailto:misty.buchanan@ncdcr.gov)>  
**Cc:** Mason, Suzanne <[suzanne.mason@ncdcr.gov](mailto:suzanne.mason@ncdcr.gov)>; Amoroso, Jame <[jame.amoroso@ncdcr.gov](mailto:jame.amoroso@ncdcr.gov)>  
**Subject:** [External] Re: Hexastylis naniflora status assessment

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Thank you, Misty.

I know James Padgett is no longer with NHP but is he interested in Hexastylis at all anymore? Or,

is he completely out of the business?

Rebekah Reid

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On Mon, Dec 18, 2017 at 3:42 PM, Buchanan, Misty <[misty.buchanan@ncdcr.gov](mailto:misty.buchanan@ncdcr.gov)> wrote:

Hi Rebekah,  
Thank you for your call about the *Hexastylis naniflora* status update. Jame Amoroso and Suzanne Mason would both like to participate in the meetings as long as Laura is out on leave. Thanks again for including us.

## Misty Buchanan

Deputy Director for Natural Heritage  
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NORTH CAROLINA

# Natural Heritage Program

SCIENCE GUIDING CONSERVATION



NC DEPARTMENT  
OF NATURAL AND  
CULTURAL RESOURCES

**From:** [Reid, Rebekah N](#)  
**To:** [Amoroso, Jame](#)  
**Subject:** Re: [External] Re: Hexastylis naniflora status assessment  
**Date:** Wednesday, December 20, 2017 7:44:13 AM  
**Attachments:** [image003.png](#)

---

Thank you, Jame.

I was able to contact him through Facebook. I did get confirmation that he saw my message.

Rebekah Reid

US Fish and Wildlife Service  
Asheville Ecological Services Field Office  
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Asheville, NC 28801  
phone: 828-258-3939 x238  
cell: 828-782-0090

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On Tue, Dec 19, 2017 at 10:08 AM, Amoroso, Jame <[jame.amoroso@ncdcr.gov](mailto:jame.amoroso@ncdcr.gov)> wrote:

Hi Rebekah,

As Misty mentioned, James is active on Facebook as James Edward Padgett (Pastor Eddie Padgett), so a message there would get to him. I don't think he would object to being contacted.

Alternatively, his work address and phone are:

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[Jame.Amoroso@ncdcr.gov](mailto:Jame.Amoroso@ncdcr.gov)

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**Sent:** Monday, December 18, 2017 4:02 PM  
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**Cc:** Mason, Suzanne <[suzanne.mason@ncdcr.gov](mailto:suzanne.mason@ncdcr.gov)>; Amoroso, Jame <[jame.amoroso@ncdcr.gov](mailto:jame.amoroso@ncdcr.gov)>  
**Subject:** Re: [External] Re: Hexastylis naniflora status assessment

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## Misty Buchanan

Deputy Director for Natural Heritage

Division of Land and Water Stewardship

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919 707 8107 *office*

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**From:** Reid, Rebekah [mailto:[rebekah\\_reid@fws.gov](mailto:rebekah_reid@fws.gov)]  
**Sent:** Monday, December 18, 2017 3:50 PM  
**To:** Buchanan, Misty <[misty.buchanan@ncdcr.gov](mailto:misty.buchanan@ncdcr.gov)>  
**Cc:** Mason, Suzanne <[suzanne.mason@ncdcr.gov](mailto:suzanne.mason@ncdcr.gov)>; Amoroso, Jame <[jame.amoroso@ncdcr.gov](mailto:jame.amoroso@ncdcr.gov)>  
**Subject:** [External] Re: Hexastylis naniflora status assessment

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On Mon, Dec 18, 2017 at 3:42 PM, Buchanan, Misty <[misty.buchanan@ncdcr.gov](mailto:misty.buchanan@ncdcr.gov)> wrote:

Hi Rebekah,

Thank you for your call about the *Hexastylis naniflora* status update. Jame Amoroso and Suzanne Mason would both like to participate in the meetings as long as Laura is out on leave.

Thanks again for including us.

## **Misty Buchanan**

Deputy Director for Natural Heritage

Division of Land and Water Stewardship

[121 W. Jones St](#), MSC 1651 Raleigh, NC 27699-1651

919 707 8107 *office*

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NORTH CAROLINA

# Natural Heritage Program

SCIENCE GUIDING CONSERVATION



NC DEPARTMENT  
OF NATURAL AND  
CULTURAL RESOURCES

**From:** [Bassette, Tim](#)  
**To:** [Reid, Rebekah N](#)  
**Cc:** [Gray, Jared S](#); [Cox, Marissa R](#)  
**Subject:** RE: [External] Hexastylis naniflora Technical Team  
**Date:** Thursday, December 21, 2017 1:12:23 PM  
**Attachments:** [image001.png](#)  
**Importance:** High

---

Rebekah,

I am honored to serve on the Hexastylis naniflora Technical Team. I have placed my availability for the initial conference call during the beginning of January.

Tim Bassette

Tim Bassette  
Environmental Program Consultant  
Biological Surveys Group  
Environmental Analysis Unit  
North Carolina Department of Transportation

919-707-6104 office  
919-819-9010 mobile  
[tpbassette@ncdot.gov](mailto:tpbassette@ncdot.gov)

1598 Mail Service Center  
Raleigh, NC 27699-1598



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---

**From:** Reid, Rebekah [[mailto:rebekah\\_reid@fws.gov](mailto:rebekah_reid@fws.gov)]  
**Sent:** Tuesday, December 19, 2017 2:31 PM  
**To:** Bassette, Tim  
**Subject:** [External] Hexastylis naniflora Technical Team

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Tim,

This is an email to follow-up on my phone call from earlier in the day. We will be conducting a Species Status Assessment (SSA) for Hexastylis naniflora and we hope to kick-off the process in the first couple of weeks in January. The SSA framework is intended to generate a highly integrated, explicit, and scientifically based approach to evaluate the biological and conservation status of a species. The SSA document is intended to inform

all aspects of the Endangered Species Act, including regulatory and policy decisions, but be developed independently from any such decision. In the case of *Hexastylis naniflora*, the SSA will inform a status change or development of a Recovery Plan.

As a member of the technical team, we would ask that you answer some elicitation questions, provide review and feedback on the document several times as it is drafted, and provide additional input during calls as your time allows.

Your participation will be welcome and valuable throughout the process. The kick-off call will include further introduction to the SSA and a discussion of rolls and responsibilities. Here is a link to the Doodle Poll for the kick-off call: <https://doodle.com/poll/7uez87hkgeczm3pa>. Please let us know if any of these dates will work for you.

Thank you and please do not hesitate to contact me with any questions.

Rebekah Reid

US Fish and Wildlife Service  
Asheville Ecological Services Field Office  
160 Zillicoa St.  
Asheville, NC 28801  
phone: 828-258-3939 x238  
cell: 828-782-0090

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**From:** [Reid, Rebekah N](#)  
**To:** [Bassette, Tim](#)  
**Cc:** [Gray, Jared S](#); [Cox, Marissa R](#)  
**Subject:** Re: [External] Hexastylis naniflora Technical Team  
**Date:** Thursday, December 21, 2017 1:19:30 PM  
**Attachments:** [image001.png](#)

---

Thank you, Tim!

Looking forward to having you on the team.

Rebekah Reid

US Fish and Wildlife Service  
Asheville Ecological Services Field Office  
160 Zillicoa St.  
Asheville, NC 28801  
phone: 828-258-3939 x238  
cell: 828-782-0090

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On Thu, Dec 21, 2017 at 1:12 PM, Bassette, Tim <[tpbassette@ncdot.gov](mailto:tpbassette@ncdot.gov)> wrote:

Rebekah,

I am honored to serve on the Hexastylis naniflora Technical Team. I have placed my availability for the initial conference call during the beginning of January.

Tim Bassette

Tim Bassette

Environmental Program Consultant

Biological Surveys Group

Environmental Analysis Unit

North Carolina Department of Transportation

919-707-6104 office

919-819-9010 mobile

[tpbassette@ncdot.gov](mailto:tpbassette@ncdot.gov)

1598 Mail Service Center

Raleigh, NC 27699-1598



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**From:** Reid, Rebekah [mailto:[rebekah\\_reid@fws.gov](mailto:rebekah_reid@fws.gov)]  
**Sent:** Tuesday, December 19, 2017 2:31 PM  
**To:** Bassette, Tim  
**Subject:** [External] Hexastylis naniflora Technical Team

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As a member of the technical team, we would ask that you answer some elicitation questions, provide review and feedback on the document several times as it is drafted, and provide additional input during calls as your time allows.

Your participation will be welcome and valuable throughout the process. The kick-off call will include further introduction to the SSA and a discussion of rolls and responsibilities. Here is a link to the Doodle Poll for the kick-off call: <https://doodle.com/poll/7uez87hkggczm3pa>. Please let us know if any of these dates will work for you.

Thank you and please do not hesitate to contact me with any questions.

Rebekah Reid

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**From:** [Reid, Rebekah N](#)  
**To:** [Marshall, Michael E](#)  
**Cc:** [Becker, Drew N](#); [Stephanie DeMay](#)  
**Subject:** Re: GIS data followup  
**Date:** Friday, December 22, 2017 11:10:20 AM

---

Mike,

I'm going to be out of the office until Jan. 2 and wanted to provide a quick update. I contacted several people about participation on the Technical Team. Below is a list of those people that expressed interest:

- Suzanne Mason (NC Natural Heritage Program) - [suzanne.mason@ncdcr.gov](mailto:suzanne.mason@ncdcr.gov)
- Jame Amoroso (NC Natural Heritage Program) - [jame.amoroso@ncdcr.gov](mailto:jame.amoroso@ncdcr.gov)
- Matt Estep (Appalachian State University) - [estepmc@appstate.edu](mailto:estepmc@appstate.edu)
- Tim Bassette (NC Department of Transportation) - [tpbassette@ncdot.gov](mailto:tpbassette@ncdot.gov)

Tim very much would like to be a part of the team but indicated that there may be a conflict of interest if NCDOT participates; he's checking on it. I explained what the SSA is (i.e. it's a science document, not a decision document) and offered for him and anyone making the conflict of interest decision to sit in on our first call to gather additional information before making a final decision.

I contacted the SC Heritage Trust Program but have not gotten a response to date. I was able to find James Padgett through Facebook. I received confirmation that he saw my message but have not gotten a response to date.

For those that expressed interested, I've included their email addresses in case you needed to send out the final meeting date before I returned on the 2nd. I'll have email access via my phone and will keep an eye out for anything urgent.

Happy Holidays, Happy New Year (Drew and Steph, too), and wishing you an uneventful trip to Texas!

Rebekah Reid

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On Tue, Dec 19, 2017 at 7:26 AM, Marshall, Michael <[michael\\_marshall@fws.gov](mailto:michael_marshall@fws.gov)> wrote:

Hi Rebekah,

That all sounds great. As far as having to have each state represented on the Technical team....all we can do is ask. At the end of the day, I think it would be nice to have someone

from North Carolina and one or both of the ASU folks....if South Carolina has someone willing to participate, that would be excellent, but not required.

When reaching out to these folks I'm thinking best to highlight 1) we are conducting an SSA for the species 2) what an SSA is 3) why we are conducting one for the species 4) a request they join our technical team 5) what their role would be as a technical team member (e.g. answering some elicitation questions and providing review and feedback on the document several times as we write it and 6) request they join our kick off call with a link for the doodle poll to indicate their availability.

If you'd rather me reach out to them, just send me the contacts...however, I'd be more than happy if you would like to make the request! ;)

Thanks,

Mike

On Mon, Dec 18, 2017 at 2:52 PM, Reid, Rebekah <[rebekah\\_reid@fws.gov](mailto:rebekah_reid@fws.gov)> wrote:

Thanks, Mike.

I've reached out the to North Carolina Natural Heritage Program. The person I want as one of our experts is out until February but I've inquired if someone could stand in for the first few meetings until she is back. One other person I would like on the technical team has recently done a complete career change and I don't know if he'd be interested anymore. I'm looking in to it.

Am I correct in that we also need a State representative from SC? While compiling updates for SC, I received an email from one of their Heritage botanists that they haven't "been involved with the species in some time." I can reach out again if we definitely need someone from SC.

Based on the info you've read so far, would you like academia as a part of the technical team? The logical choice would be Zack Murrell or Matt Estep from ASU; however, I'm unsure of the amount of time they would have to devote to the process and they may be better suited for targeted conversations regarding the specific work they have done with the species.

Rebekah Reid

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On Mon, Dec 18, 2017 at 11:35 AM, Marshall, Michael <[michael\\_marshall@fws.gov](mailto:michael_marshall@fws.gov)> wrote:

Good morning all,

As discussed previously, I'm suggesting we get this species kicked off fairly soon after the holidays....I've provided a

doodle poll for folks to indicate their availability to participate in a kick-off call.....once Rebekah identifies the 1-3 experts that should be on the technical team, we can forward them that doodle poll as well. Rebekah....if you already have a good idea of these folks, you can either forward them the doodle poll, or send me their email contact and I can draft an invite email.

<https://doodle.com/poll/7uez87hkggczm3pa>

On that call we ought to have all potential "Team" members, including the Core Team and Technical Team. Here's my initial thought on who should be on that call and their respective roles....your thoughts would be welcome:

**Core Team:** conduct SSA (writing and analysis; day to day email contact and support; document review)

*Mike Marshall*--primary author; data synthesis; data analysis; elicitation questions; SSA framework support; document review; bi-weekly calls

*Rebekah Reid*--secondary author; data, literature, and expert gathering; document review; bi-weekly calls

**Technical Team:** Expert input and Document Review (species input; document review at section milestones (e.g. species biology; current condition; future condition; final SSA); answer elicitation questions)

*State Biologist(s)*--need to identify and reach out to schedule first call

*Other Expert* (Academia; NGO; other state and/or federal partner)--need to identify and reach out to schedule first call

**Project Manager:** Ensure timeliness and responsibility for post-SSA stages (rule writing; recovery plan; 5-year review)

*Drew Becker*--participate in bi-weekly calls; obtain updates from Core Team on progress towards milestones

Once we kick this SSA off with a call, we start our 21 week timeline....I will write up an updated project timeline once we hammer down the date of the kick-off call.

I've cced Stephanie here, as this will likely be our first SSA kick-off of 2018, and thought it might be a good idea to sit in on the call to get a flavor of the kick-off meeting, roles and responsibilities, etc.....same framework will apply to most of the other species we will conduct SSAs for.

Thanks!

Mike

On Thu, Dec 14, 2017 at 10:47 AM, Reid, Rebekah <[rebekah\\_reid@fws.gov](mailto:rebekah_reid@fws.gov)> wrote:  
Mike,

I left you a message. I think it would be easier to discuss some of this over the phone and then I can summarize in an email so that Drew and Stephanie are in the loop. In the meantime, I've added a few things to the Drive folder that should be helpful.

As you noticed, SCNHP and NCNHP compile their data differently. NC groups their EOs in to populations so multiple EOs can have a parent EO in common. South Carolina doesn't do that. I've added/updated some files to Drive to try and address this.

- HENAinSC - This is additional GIS data that includes the SC EO points and 2km buffer polygons that group the points into 18 populations.
- HENA SCNHP EO Data Summary with RNR Notes (12.11.17) - This is a spreadsheet that groups the EO points by buffer polygons they have in common to define a population. In column A, you will see how they group together. As

a side note, I'm still working on updating this spreadsheet. Updates are in blue and I've noted possible additional EOs. There could be additional populations or those EO could fall into one of the existing 18.

- What I'm seeing in the 5-YR Review which is what I think is referenced by NCNHP is *"SCDNR has not yet aggregated its records for the species into principal and stand-alone EOs. As a result, the 57 EO records currently mapped for the species in this state often include several records in sufficiently close proximity to one another as to be better regarded as a single population. Applying a buffer of 2km (the default and minimum separation distance according to NatureServes' data standard) to these records reveals a maximum of 18 spatially discrete aggregations of sites in the state of South Carolina. These aggregations separated by 2km are regarded as 18 populations for purposes of this review."* Table B.1 on page 30 also supports this. I'm not sure how NCNHP got to 22 populations, we may have to ask.

For NC, I came up with 98 populations based on data I pulled from NCNHP in August. For NC the point data are source features they use to make the polygon data. If a surveyor sends point or lat/long data, NCNHP will buffer the point. All of the points should be associated with a polygon but not every polygon necessarily has a point (in this case the surveyor would have mapped a polygon not individual points). So, the point data would in essence be duplicate data. Two files to note:

- HENA NCNHP Scorecard (08.28.2017) - This shows how NCNHP groups there EOs. Anything X.000 is a parent EO or stand-alone EO. Anything X.YYY is a subEO where X is the parent EO. For example, 1.000 is a stand-alone EO...93.034 is a subEO of parent EO 93. In this case 93 represents the population (all sub-pops) as a whole and not a sub-pop or population of its own. Another example, EOs 93.000, 93.034, and 90.035 are two sub-pops (034 and 035) that make up the whole population (93)...it's two sets of plants not three.
- HENA NCNHP EO Data Summary with RNR Notes (09.28.17) - The original spreadsheet had some of the columns hidden. I've exploded them in this version. Column A numbers the population 1-X based on NCNHPs scorecard and numbering system.
- The difference between 91 and 98 could be mapping adjustment (NCNHP is always trying to improve their mapping) or the data I pulled is a little bit newer and additional populations or sub-pops were found. We can ask if neither of those scenarios resolve the issue. This spreadsheet is also a work in progress...

Hopefully, that provides a little clarification and not confusion. Let's talk more and if I need to pull in NCNHP just let me know. They have a wonderful GIS/data analyst.

Thanks!

Rebekah Reid

US Fish and Wildlife Service  
Asheville Ecological Services Field Office  
[160 Zillicoa St.](#)  
[Asheville, NC 28801](#)  
phone: 828-258-3939 x238  
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On Thu, Dec 14, 2017 at 9:03 AM, Marshall, Michael <[michael\\_marshall@fws.gov](mailto:michael_marshall@fws.gov)> wrote:

Good morning Rebekah,

I have cced Stephanie DeMay on this email. We will be working together on a number of SSAs, and I thought a glance into our conversations would be useful as she begins to work on other species SSAs.

I have a question about the EO data you provided. I'll paste a quote from the 2016 rangewide report for context:

*During 2015-2016, NCNHP reviewed all NC EOs of *Hexastylis naniflora*, making mapping revisions where necessary, to improve all records in accordance with NatureServe mapping protocols. As of August 2016, NCNHP has 27 parent EOs and another 64 stand-alone EOs of *Hexastylis naniflora*. "Principal or standalone EOs can be thought of as proxies for populations in the absence of species-specific information on pollination and dispersal distances. For purposes of this review, we regard these 27 parent and 64 extant stand-alone EO records as 91 populations of the species in North Carolina.*

*As of 2016, SCDNR has not yet aggregated its records for the species into principal and stand-alone EOs. As a result, the 59 records currently mapped for the species in South Carolina often include several records in sufficiently close proximity to one another that they should be considered a single population. Applying a buffer of 2 km (the default and minimum separation distance according to NatureServe's data standard) to these records reveals a maximum of 22 spatially discrete aggregations of sites in South Carolina. These aggregations separated by 2 km are regarded as 22 populations for the purposes of this review (USFWS 2010).*

Populations will be our unit of resilience, and in that vein, I'm interested in focusing on the 113 pops identified across the range.

For North Carolina, I'm having difficulty resolving the provided data into these 91 populations...for the point file, there are 48 records....for the polygon file there are 214 records. I'm trying to figure out how to work with a shapefile that represents the 27 parent and 64 extant stand alone records that result in the 91 populations. Any thoughts?

For South Carolina...I see the 59 records that have yet to be aggregated. I'm thinking it won't be difficult to aggregate them myself into the identified 22 populations using the 2 km buffer rule. Has this been done already, or should I proceed with doing so myself?

Thanks!

Mike

--

Mike Marshall  
SSA Program Specialist  
U.S. Fish and Wildlife Service Region 4  
[1875 Century Boulevard, Suite 200](#)  
[Atlanta, GA 30345](#)  
[Office: 404-679-7157](#)  
Cell: 512-461-6217

**Work Schedule 1st Week**

Monday-Thursday --> In Office 7:00-4:30  
Friday --> In Office 7:00-3:30

**Work Schedule 2nd Week**

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Friday --> off

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**From:** [Marshall, Michael E](#)  
**To:** [Reid, Rebekah N](#); [Becker, Drew N](#); [Stephanie DeMay](#); [suzanne.mason@ncdcr.gov](mailto:suzanne.mason@ncdcr.gov); [jame.amoroso@ncdcr.gov](mailto:jame.amoroso@ncdcr.gov); [estepmc@appstate.edu](mailto:estepmc@appstate.edu); [tpbassette@ncdot.gov](mailto:tpbassette@ncdot.gov)  
**Subject:** HENA SSA Kick-off meeting  
**Date:** Tuesday, December 26, 2017 9:35:52 AM  
**Importance:** High

---

Good morning all,

First, I hope everyone had a wonderful holiday season! And, hoping as I write this email, most of you are still enjoying a well deserved holiday break!

I believe Rebekah has contacted all of you regarding participation in the HENA Species Status Assessment (SSA). My name is Mike Marshall, and I will be giving my best effort in synthesizing the best available science for the species into this important report. In an effort to synthesize all of the science, I will be leaning on all of you as species experts.

I have checked on the doodle poll, and it appears that there is only one time slot that works for everyone so far, and that is Monday January 8th at noon, for one hour. I'd like for everyone to put that on their calendars please. I will send out a phone line and webex link for the kickoff call. On that call, I'd like to give a brief presentation on what an SSA is, why we are doing one for this species, and what everyone's role would look like under the SSA process. For the technical team, this would mainly be an occasional brief elicitation questionnaire, perhaps a data request, and a few asks for your review of the various sections of the SSA.

Critical to the SSA process is the involvement of the states and other species experts....the Service does not want to do the SSA in a vacuum, and to that end, I want to say Thank You So Much for being willing to be involved! I'm excited to work with this species, and to work with all of you! If you have any questions, please do not hesitate to contact me. I'll be available by email or my cell, as found in my signature line.

Thanks so much!

Mike

--

Mike Marshall  
SSA Program Specialist  
U.S. Fish and Wildlife Service Region 4  
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Atlanta, GA 30345  
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**From:** [Reid, Rebekah N](#)  
**To:** [Tim Bassette](#)  
**Subject:** HENA Site Suitability Analysis  
**Date:** Monday, January 8, 2018 2:41:59 PM  
**Importance:** High

---

Hi Tim,

The ASU write-up from July 2015 (NCDOT Project 2012-2111) mentions a site suitability analysis on page 39. Did you all receive the model in GIS format? If you did, is that something you can share?

Thank you.

Rebekah Reid

US Fish and Wildlife Service  
Asheville Ecological Services Field Office  
160 Zillico St.  
Asheville, NC 28801  
phone: 828-258-3939 x238  
cell: 828-782-0090

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**From:** [Bassette, Tim](#)  
**To:** [Reid, Rebekah N](#)  
**Subject:** RE: [External] HENA Site Suitability Analysis  
**Date:** Monday, January 8, 2018 4:02:43 PM  
**Attachments:** [image001.png](#)  
**Importance:** High

---

Rebekah,

Unfortunately, we never received the GIS site suitability model from ASU. I just talked by phone to Zach Murrell from App State and he is looking into it – said it would take him a couple days to hunt it down for us, at which time he will call me back.

Tim

Tim Bassette  
Environmental Program Consultant  
Biological Surveys Group  
Environmental Analysis Unit  
North Carolina Department of Transportation

919-707-6104 office  
919-819-9010 mobile  
[tpbassette@ncdot.gov](mailto:tpbassette@ncdot.gov)

1598 Mail Service Center  
Raleigh, NC 27699-1598



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---

**From:** Reid, Rebekah [[mailto:rebekah\\_reid@fws.gov](mailto:rebekah_reid@fws.gov)]  
**Sent:** Monday, January 08, 2018 2:42 PM  
**To:** Bassette, Tim  
**Subject:** [External] HENA Site Suitability Analysis

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Hi Tim,

The ASU write-up from July 2015 (NCDOT Project 2012-2111) mentions a site suitability analysis on page 39. Did you all receive the model in GIS format? If you did, is that something you can share?

Thank you.

Rebekah Reid

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---

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**From:** [Reid, Rebekah N](#)  
**To:** [Bassette, Tim](#)  
**Subject:** Re: [External] HENA Site Suitability Analysis  
**Date:** Tuesday, January 9, 2018 7:15:57 AM  
**Attachments:** [image001.png](#)

---

Thank you. I think Matt Estep is going to look into it as well.

Rebekah Reid

US Fish and Wildlife Service  
Asheville Ecological Services Field Office  
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Asheville, NC 28801  
phone: 828-258-3939 x238  
cell: 828-782-0090

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On Mon, Jan 8, 2018 at 4:02 PM, Bassette, Tim <[tpbassette@ncdot.gov](mailto:tpbassette@ncdot.gov)> wrote:

Rebekah,

Unfortunately, we never received the GIS site suitability model from ASU. I just talked by phone to Zach Murrell from App State and he is looking into it – said it would take him a couple days to hunt it down for us, at which time he will call me back.

Tim

Tim Bassette

Environmental Program Consultant

Biological Surveys Group

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North Carolina Department of Transportation

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**From:** Reid, Rebekah [mailto:[rebekah\\_reid@fws.gov](mailto:rebekah_reid@fws.gov)]  
**Sent:** Monday, January 08, 2018 2:42 PM  
**To:** Bassette, Tim  
**Subject:** [External] HENA Site Suitability Analysis

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Thank you.

Rebekah Reid

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**From:** [Becker, Drew N](#)  
**To:** [Kloer, Philip B](#); [Peeples, Gary](#)  
**Cc:** [Marshall, Michael E](#); [Stephanie DeMay](#); [Reid, Rebekah N](#)  
**Subject:** heart leaf SSA  
**Date:** Tuesday, January 9, 2018 8:54:31 AM  
**Importance:** High

---

Hi Gary and Phil,

It is my understanding that Gary you may have some time to work on outreach materials associated with the heart leaf SSA and potential rule. After talking with Phil I think we can use all the help we can get! Perhaps the two of you should discuss who is doing what? Thanks again for your help Gary and support for Rebekah engaging in this project.

Drew

**Drew Becker**  
Recovery Coordinator  
U.S. Fish and Wildlife Service  
Southeast Region  
1875 Century Boulevard  
Atlanta, GA 30345  
404-679-7226  
[drew\\_becker@fws.gov](mailto:drew_becker@fws.gov)

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On Fri, Jan 5, 2018 at 10:39 AM, Marshall, Michael <[michael\\_marshall@fws.gov](mailto:michael_marshall@fws.gov)> wrote:

Good morning Rebekah,

I've attached the most recent draft of the HENA project plan with your previous comments integrated, as a pdf. Could you please sign, and have the project supervisor sign and send back to me....then I can forward along for other signatures, including my own.

Thanks a bunch!

Mike

--

Mike Marshall  
SSA Program Specialist  
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1875 Century Boulevard, Suite 200  
Atlanta, GA 30345  
Office: 404-679-7157  
Cell: 512-461-6217

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**From:** [Reid, Rebekah N](#)  
**To:** [Marshall, Michael E](#); [Endries, Mark](#); [Stephanie DeMay](#); [Becker, Drew N](#)  
**Subject:** Updated Spreadsheets  
**Date:** Wednesday, January 31, 2018 3:32:14 PM  
**Importance:** High

---

Hi,

I've added updated spreadsheets to the GoogleDrive folder. They include updates based on the Jan. 2018 heritage data and additions of "last observed" and EO "rank date". If we need additional data or different formatting just let me know.

Here is a summary of EO data over time:

- 1989 - Listing Rule - 24 extant populations, NC = 12 and SC = 12
- 2010 - 5YR Review - 275 EOs, 108 populations, NC = 90 and SC = 18
- 2016 - NHP Report - 239 (or 293) EOs, 113 populations, NC = 91 and SC = 22
- 2018 - Rebekah looked at Jan. 2018 data - 292 EOs, 114 populations, NC = 98 and SC = 16

I'm not sure how extirpated (X), historic (H) or failed-to-find (F) records were account for in previous reports. I got a total of 304 EOs with 12 of those X, H, or F (= 292). Additionally, I got a total of 118 populations with 4 of those X, H, or F (= 114). NHP calculated 22 populations in SC using a 2km buffer, I did a 2km buffer using GIS and got a total of 18 populations (minus 2 that are H = 16). SC numbers may change anyway - I left a message for them regarding delineating the data via the NatureServe guidelines.

Please feel free to check my math! It's a lot of rows on the spreadsheet to flesh out.

Rebekah Reid

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cell: 828-782-0090

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**From:** [Marshall, Michael E](#)  
**To:** [Reid, Rebekah N](#)  
**Cc:** [Endries, Mark](#); [Stephanie DeMay](#); [Becker, Drew N](#)  
**Subject:** Re: Updated Spreadsheets  
**Date:** Wednesday, January 31, 2018 4:12:15 PM  
**Importance:** High

---

Thanks a bunch Rebekah! Now it's time to sort and query all of this....should keep me nice and busy!

Mike

On Wed, Jan 31, 2018 at 3:32 PM, Reid, Rebekah <[rebekah\\_reid@fws.gov](mailto:rebekah_reid@fws.gov)> wrote:

Hi,

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Mike Marshall  
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Alternate email: [mmarshall@ag.tamu.edu](mailto:mmarshall@ag.tamu.edu)

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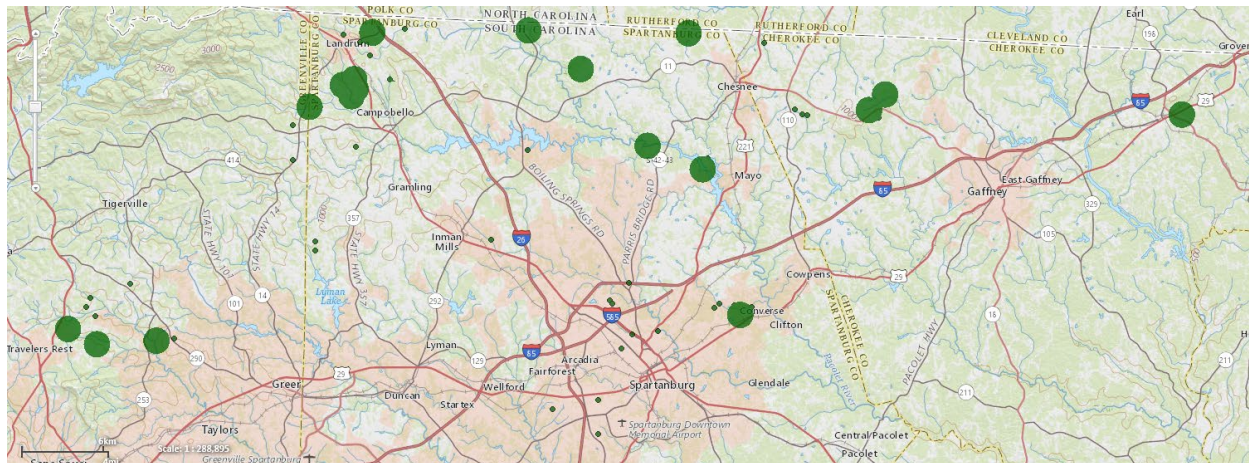
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From: [Kathy Boyle](#)  
To: [Rebekah N](#)  
Subject: SC Heritage - map of *Hexastylis naniflora* occurrences  
Date: Wednesday, January 31, 2018 5:32:14 PM  
Attachments: [image001.png](#)  
Importance: High

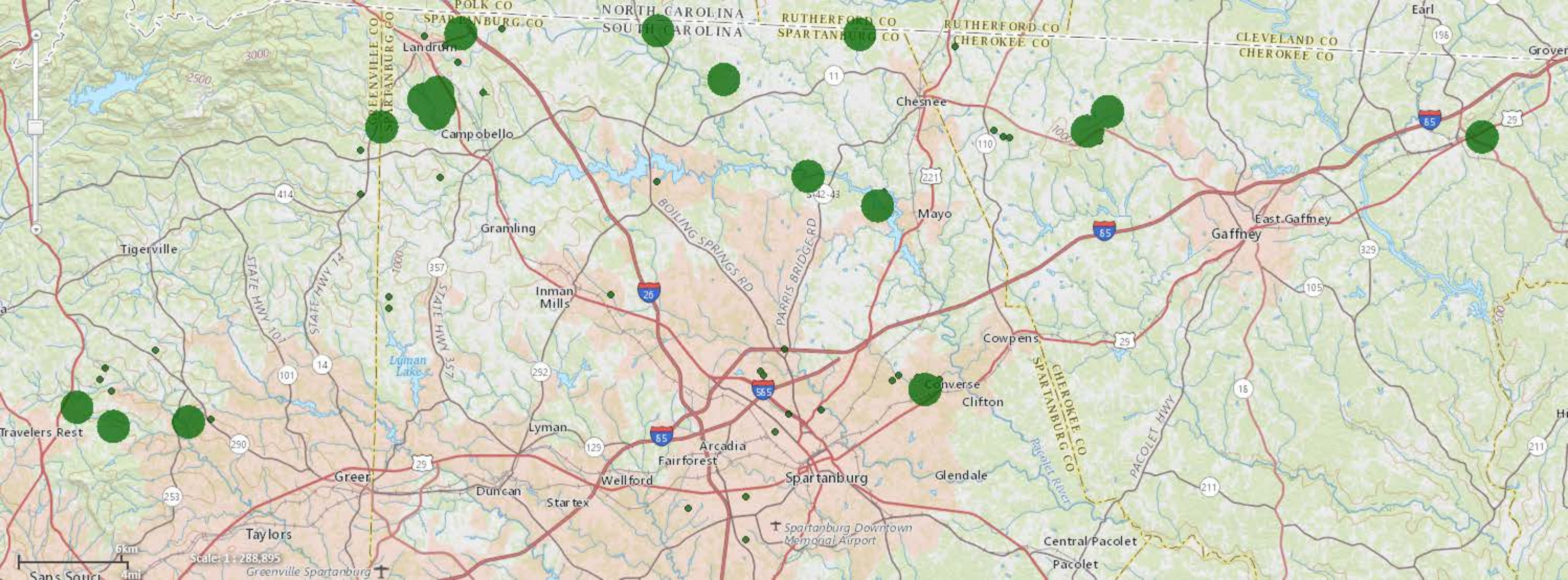
Hi Rebekah. The map below shows how *Hexastylis naniflora* is distributed in South Carolina. Beyond maintaining a minimum separation distance of thirty meters, I don't think there's been an attempt to aggregate any of the points in Biotics. ArcMap, though, has some tools that seem to be designed for this -- <http://desktop.arcgis.com/en/arcmap/10.3/tools/cartography-toolbox/aggregate-points.htm>

With only two office days remaining at SCDNR, I'm trying to wrap things up here but I'll call you again tomorrow. The Biotics database is being handed over to my SCDNR colleague Anna Smith [SmithAH@dnr.sc.gov](mailto:SmithAH@dnr.sc.gov); she'll be your data contact in the future.

Thanks,  
Kathy









From: [Rebekah N](#)  
To: [Kathy Boyle](#)  
Subject: Re: SC Heritage - map of Hexastylis naniflora occurrences  
Date: Thursday, February 1, 2018 7:37:34 AM  
Attachments: [jmsape001.png](#)  
Importance: High

Thanks, Kathy.

I would like to talk before you leave if possible. I am in the office today but will be in meetings from about 10-1:30 or so. The buffered points on the map are buffered by 100 meters for the small ones and 1000 meters for the large ones so I'm not understanding where the 30 meters comes in. Hopefully, we can catch up today.

Rebekah Reid

US Fish and Wildlife Service  
Asheville Ecological Services Field Office  
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On Wed, Jan 31, 2018 at 5:32 PM, Kathy Boyle <[BoyleK@dnr.sc.gov](mailto:BoyleK@dnr.sc.gov)> wrote:

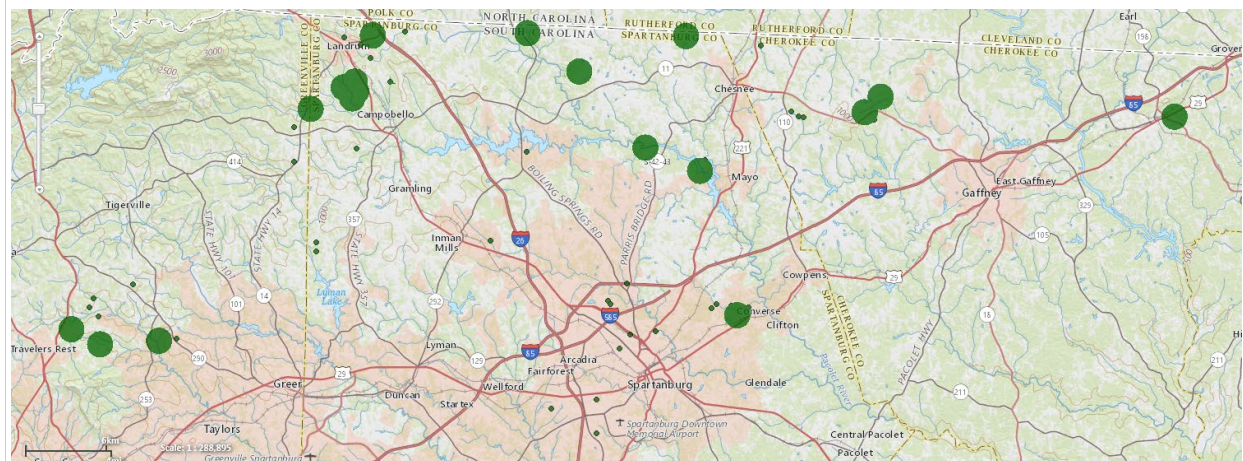
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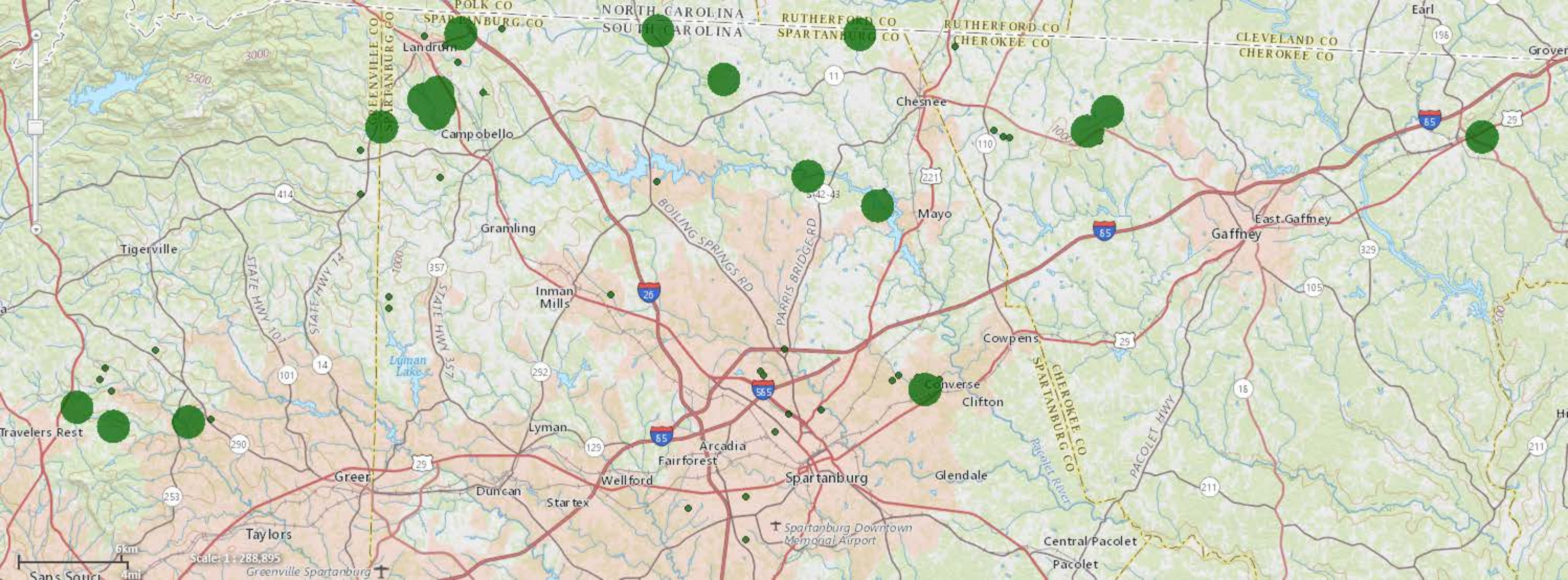
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Thanks,

Kathy









**From:** [Reid, Rebekah N](#)  
**To:** [Endries, Mark](#)  
**Subject:** HENA County Population Totals  
**Date:** Thursday, February 1, 2018 9:49:12 AM  
**Importance:** High

---

Here you go...let me know if we need to talk about the pops that cross county lines.

NC

County	Total Pops
Clev	25
Burk	14
Ruth	14
Cata	13
Linc	10
Cald	6
Polk	6
Alex	3
Ired	3
Burk/Cald/Cata	1
Burk/Clev	1
Clev/Ruth	1
Gast	1
	98

SC

County	Total Pops
Spar	10
Cher	3
Gree	2
Gree/Spar	1
	16

Rebekah Reid

US Fish and Wildlife Service  
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**From:** [Endries, Mark](#)  
**To:** [Reid, Rebekah N](#)  
**Subject:** Re: HENA County Population Totals  
**Date:** Thursday, February 1, 2018 9:59:53 AM  
**Importance:** High

---

Should I just count them in each county?

Mark

**Mark Endries**

USFWS  
160 Zillicoa St  
Asheville, NC 28801  
Office: 828.258.3939 ext. 231  
Mobile: 828.215.1740

On Thu, Feb 1, 2018 at 9:49 AM, Reid, Rebekah <[rebekah\\_reid@fws.gov](mailto:rebekah_reid@fws.gov)> wrote:  
Here you go...let me know if we need to talk about the pops that cross county lines.

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County	Total Pops
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Ruth	14
Cata	13
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Cald	6
Polk	6
Alex	3
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Burk/Cald/Cata	1
Burk/Clev	1
Clev/Ruth	1
Gast	1
	98

SC

County	Total Pops
Spar	10
Cher	3
Gree	2
Gree/Spar	1
	16

Rebekah Reid

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**From:** [Endries, Mark](#)  
**To:** [Reid, Rebekah N](#)  
**Subject:** Re: HENA County Population Totals  
**Date:** Thursday, February 1, 2018 10:22:05 AM  
**Importance:** High

---

Gaston County has a pop, but in Figure 1 it's only labeled as a H. minor county. Should I switch that?

**Mark Endries**

USFWS  
160 Zillicoa St  
Asheville, NC 28801  
Office: 828.258.3939 ext. 231  
Mobile: 828.215.1740

On Thu, Feb 1, 2018 at 9:59 AM, Endries, Mark <[mark\\_endries@fws.gov](mailto:mark_endries@fws.gov)> wrote:  
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**Mark Endries**

USFWS  
160 Zillicoa St  
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NC		SC	
County	Total Pops	County	Total Pops
Clev	25	Spar	10
Burk	14	Cher	3
Ruth	14	Gree	2
Cata	13	Gree/Spar	1
Linc	10		16
Cald	6		
Polk	6		
Alex	3		
Ired	3		
Burk/Cald/Cata	1		
Burk/Clev	1		
Clev/Ruth	1		
Gast	1		
	98		

Rebekah Reid

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**From:** [Reid, Rebekah N](#)  
**To:** [Endries, Mark](#)  
**Subject:** Re: HENA County Population Totals  
**Date:** Thursday, February 1, 2018 3:38:39 PM

---

Yes, I didn't catch that. Thanks.

Rebekah Reid

US Fish and Wildlife Service  
Asheville Ecological Services Field Office  
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phone: 828-258-3939 x238  
cell: 828-782-0090

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On Thu, Feb 1, 2018 at 10:22 AM, Endries, Mark <[mark\\_endries@fws.gov](mailto:mark_endries@fws.gov)> wrote:  
Gaston County has a pop, but in Figure 1 it's only labeled as a H. minor county. Should I switch that?

**Mark Endries**

USFWS  
[160 Zillicoa St](#)  
[Asheville, NC 28801](#)  
[Office: 828.258.3939](#) ext. 231  
Mobile: 828.215.1740

On Thu, Feb 1, 2018 at 9:59 AM, Endries, Mark <[mark\\_endries@fws.gov](mailto:mark_endries@fws.gov)> wrote:  
Should I just count them in each county?

Mark

**Mark Endries**

USFWS  
[160 Zillicoa St](#)  
[Asheville, NC 28801](#)  
[Office: 828.258.3939](#) ext. 231  
Mobile: 828.215.1740

On Thu, Feb 1, 2018 at 9:49 AM, Reid, Rebekah <[rebekah\\_reid@fws.gov](mailto:rebekah_reid@fws.gov)> wrote:  
Here you go...let me know if we need to talk about the pops that cross county lines.

NC	
County	Total Pops
Clev	25
Burk	14
Ruth	14
Cata	13
Linc	10

SC	
County	Total Pops
Spar	10
Cher	3
Gree	2
Gree/Spar	1
	16

Cald	6
Polk	6
Alex	3
Ired	3
Burk/Cald/Cata	1
Burk/Clev	1
Clev/Ruth	1
Gast	1
	98

Rebekah Reid

US Fish and Wildlife Service  
 Asheville Ecological Services Field Office  
[160 Zillico St.](#)  
[Asheville, NC 28801](#)  
 phone: 828-258-3939 x238  
 cell: 828-782-0090

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**From:** Kathy Boyle  
**To:** Reid, Rebekah  
**Subject:** RE: SC Heritage - map of Hexastylis naniflora occurrences  
**Date:** Thursday, February 1, 2018 4:24:38 PM  
**Attachments:** images001.png  
**Importance:** High

Hi Rebekah. I wasn't able to reach you by phone this afternoon so I'll try to explain here. The 100-or-1000 meter buffers are there to represent how exact (or inexact) we think a location might be, whereas the "30 meters" I mentioned yesterday is a minimum separation distance -- i.e., in terms of distance, what should separate one occurrence record (of the same species) from the next? This is up to the biologist, but for plant observations we usually use a minimum distance of 30 meters.

The confidence buffer and the separation distance are related in that, say, it wouldn't make sense to talk about a less-than-30-meter separation if you weren't confident that your GPS readings were accurate within 15 meters. But other separation considerations include -- how stationary is the organism? at what scale is the biologist assessing population?

I'm not sure how well any of this corresponds with NatureServe practices -- with no data manager on staff, we've been improvising! I'll try again tomorrow to get in touch by phone.

Kathy

**From:** Reid, Rebekah [mailto:rebekah\_reid@fws.gov]  
**Sent:** Thursday, February 01, 2018 7:38 AM  
**To:** Kathy Boyle <BoyleK@dnr.sc.gov>  
**Subject:** Re: SC Heritage - map of Hexastylis naniflora occurrences

Thanks, Kathy.

I would like to talk before you leave if possible. I am in the office today but will be in meetings from about 10-1:30 or so. The buffered points on the map are buffered by 100 meters for the small ones and 1000 meters for the large ones so I'm not understanding where the 30 meters comes in. Hopefully, we can catch up today.

Rebekah Reid

US Fish and Wildlife Service  
Asheville Ecological Services Field Office  
160 Zillicoa St.  
Asheville, NC 28801  
phone: 828-258-3939 x238  
cell: 828-782-0090

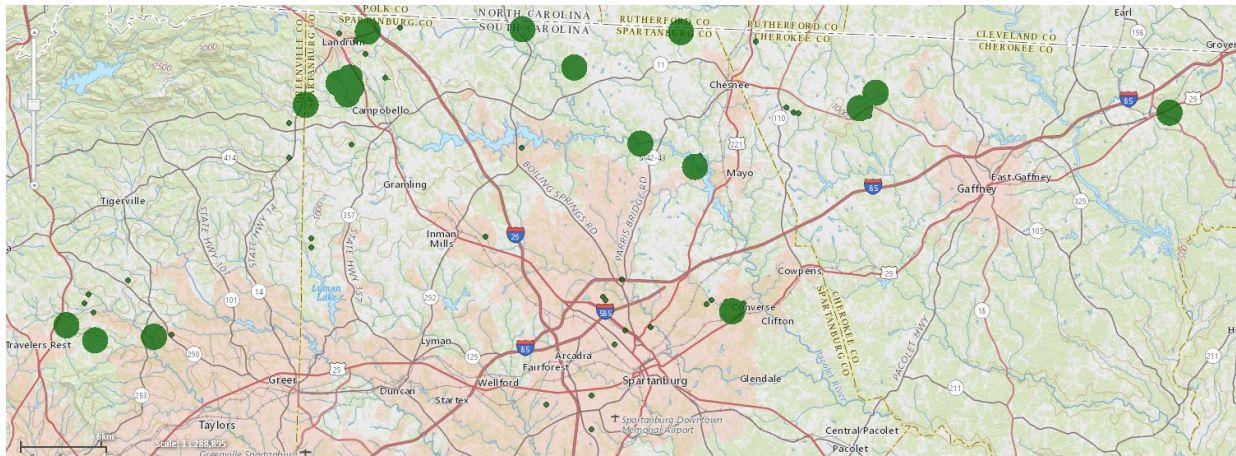
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On Wed, Jan 31, 2018 at 5:32 PM, Kathy Boyle <BoyleK@dnr.sc.gov> wrote:

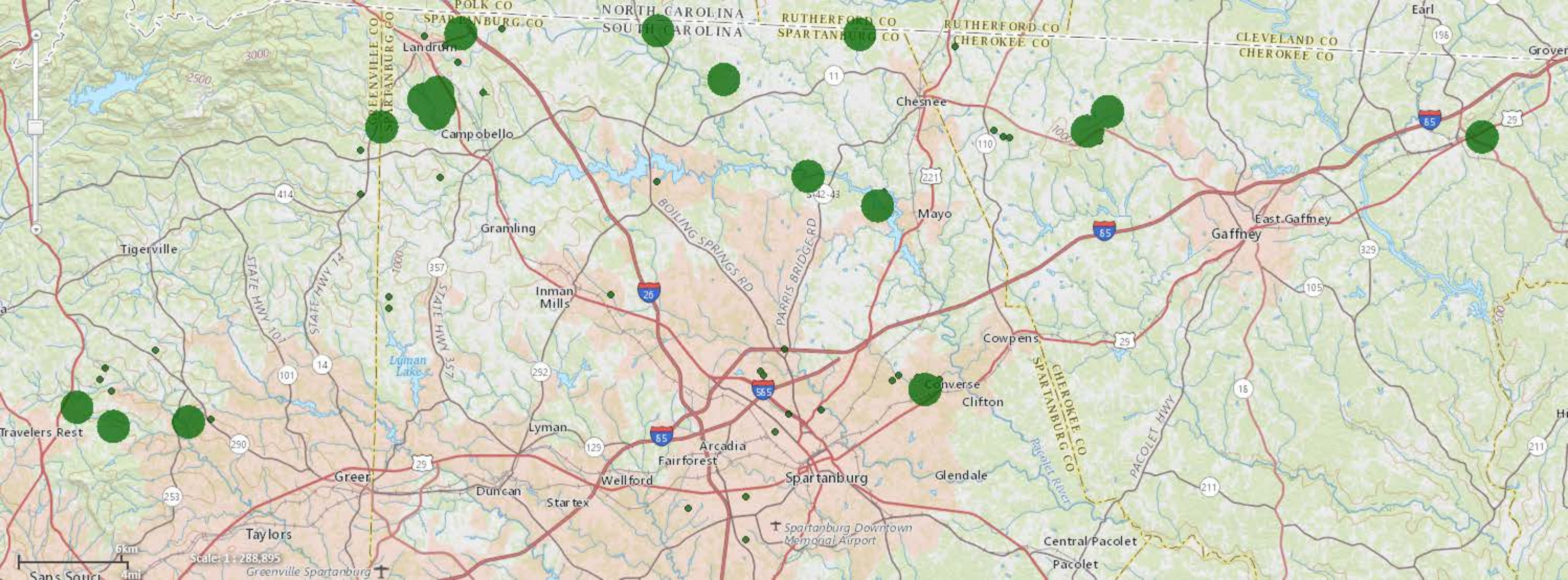
Hi Rebekah. The map below shows how *Hexastylis naniflora* is distributed in South Carolina. Beyond maintaining a minimum separation distance of thirty meters, I don't think there's been an attempt to aggregate any of the points in Biotics. ArcMap, though, has some tools that seem to be designed for this -- <http://desktop.arcgis.com/en/arcmap/10.3/tools/cartography-toolbox/aggregate-points.htm>

With only two office days remaining at SCDNR, I'm trying to wrap things up here but I'll call you again tomorrow. The Biotics database is being handed over to my SCDNR colleague Anna Smith [SmithAH@dnr.sc.gov](mailto:SmithAH@dnr.sc.gov); she'll be your data contact in the future.

Thanks,  
Kathy









**From:** [Marshall, Michael E](#)  
**To:** [Reid, Rebekah N](#); [Endries, Mark](#); [Stephanie DeMay](#); [Becker, Drew N](#)  
**Subject:** SSA plans  
**Date:** Friday, February 16, 2018 12:26:26 PM  
**Importance:** High

---

Hey guys,

Thanks for a productive call....a few items that came out of our discussion:

- 1) We have decided to move the date for sending our next section out to technical team for review. Instead of Monday Feb 19th, we will send out COB Thursday Feb 21st. This will allow us to incorporate more details on the model, resulting in a more informative review.
- 2) We have decided that rather than having 2 additional review periods (1 for future conditions and 1 for the entire SSA), we would just send out the entire draft for a final review by the technical team....this would then lead to our peer review period once all technical and core team comments are addressed.
- 3) Mark will be out of pocket and busy for a few weeks starting the last week of Feb....this makes next week pretty important to making sure we have all the data we need to include in Current Conditions draft, and Sleuth model results if possible so we can begin to draft the future conditions...along these lines, Rebekah and Mike will look at the model outputs and start to figure out how we might tabularize or graphically represent any relationships between Maxent scores and population resilience based on population size. We will also be brainstorming exactly how we want to use climate and development projections to assess resilience in the future....some ideas that we threw around had to do with change in development based on Sleuth models....scenarios based on uncertainty of the impact of development.....scenarios, or descriptive narrative on how temp and precip might change in the future, and how that might bring some of our populations out of the range the model predicts are needed.

Have a good weekend, and we'll talk soon!

Thanks,

Mike

--

Mike Marshall  
SSA Program Specialist  
U.S. Fish and Wildlife Service Region 4  
Cell: 512-461-6217  
Alternate email: [mmarshall@ag.tamu.edu](mailto:mmarshall@ag.tamu.edu)

**Work Schedule 1st Week**

Monday-Thursday --> In Office 7:30-4:30 CST

**Work Schedule 2nd Week**

Monday-Thursday --> In Office 7:30-4:30 CST

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**From:** [Reid, Rebekah N](#)  
**To:** [Jame Amoroso](#); [Mason, Suzanne](#); [Laura Robinson](#)  
**Cc:** [Marshall, Michael E](#)  
**Subject:** HENA Current Populations  
**Date:** Monday, March 26, 2018 12:29:05 PM  
**Importance:** High

---

Hi Jame, Suzanne, and Laura,

We were looking back at some of the comments for the current conditions section of the SSA. You all had questions about how/why we determined current populations the way we did. A number of factors came in to play but we ultimately decided on physical observation in the last 10 years. We are not assuming that older observations didn't exist or don't exist just that there is not a current observation to verify presence and condition. As a follow-up question to NHP, what EOs would you all include on our current-list that we didn't include? And, what level of certainty is there that they are persisting in the same condition as they were during the last observation?

Additionally, we are working on future conditions and several scenarios for the future. One is a "conservation scenario" or what we would consider a scenario better than the status quo. Are there sites or properties that are on NHP radar that are targeted for RHAs or preservation? In a best-case, conservation scenario, these sites would be preserved.

Thanks for all your input and participation!

Rebekah Reid

US Fish and Wildlife Service  
Asheville Ecological Services Field Office  
160 Zillicoa St.  
Asheville, NC 28801  
phone: 828-258-3939 x238  
cell: 828-782-0090

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**From:** [Amoroso, Jame](#)  
**To:** [Reid, Rebekah N](#); [Mason, Suzanne](#); [Robinson, Laura](#)  
**Cc:** [Marshall, Michael E](#)  
**Subject:** RE: [External] HENA Current Populations  
**Date:** Thursday, March 29, 2018 8:28:17 AM  
**Attachments:** [image001.png](#)  
**Importance:** High

---

Hi Rebekah,

We would include older EOs in the model that are not ranked as H or X. HENA is a long-lived perennial, and we have several EORs that were revisited after more than 10 years and HENA was present, such as EOR 157 first observed in 1957 and next observed in 2001. As long as suitable habitat is still present it is reasonable to assume that HENA is still there. Also, the inclusion of only ones with a last observed date after 2007, means that nearly half the data that could be used to develop a model is excluded. Using land cover to exclude occurrences that are classed as fields or developed would remove locations that are no longer suitable. We review aerial photos to determine the land cover for a particular conservation site or occurrence record on an ad hoc basis.

In your conservation scenario, we are not aware of any HENA locations that are targeted for future Registry or preservation. Registered Heritage Areas are only appropriate for consideration in the best-case conservation scenario, because they are non-binding agreements with the land owner. If the land changes ownership, or the owner decides not to continue with the agreement, then the Registry is no longer valid.

Thank you for the opportunity to provide feedback for the species status review.

Jame Amoroso

**Jame Amoroso**  
Conservation Information Specialist

121 W Jones St MSC 1651 Raleigh, NC 27699-1651  
919 707 8621 *office*  
[Jame.Amoroso@ncdcr.gov](mailto:Jame.Amoroso@ncdcr.gov)

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---

**From:** Reid, Rebekah [mailto:[rebekah\\_reid@fws.gov](mailto:rebekah_reid@fws.gov)]  
**Sent:** Monday, March 26, 2018 12:29 PM  
**To:** Amoroso, Jame <[jame.amoroso@ncdcr.gov](mailto:jame.amoroso@ncdcr.gov)>; Mason, Suzanne <[suzanne.mason@ncdcr.gov](mailto:suzanne.mason@ncdcr.gov)>; Robinson, Laura <[Laura.Robinson@ncdcr.gov](mailto:Laura.Robinson@ncdcr.gov)>

**Cc:** Marshall, Michael <michael\_marshall@fws.gov>

**Subject:** [External] HENA Current Populations

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Hi Jame, Suzanne, and Laura,

We were looking back at some of the comments for the current conditions section of the SSA. You all had questions about how/why we determined current populations the way we did. A number of factors came in to play but we ultimately decided on physical observation in the last 10 years. We are not assuming that older observations didn't exist or don't exist just that there is not a current observation to verify presence and condition. As a follow-up question to NHP, what EOs would you all include on our current-list that we didn't include? And, what level of certainty is there that they are persisting in the same condition as they were during the last observation?

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Thanks for all your input and participation!

Rebekah Reid

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Asheville Ecological Services Field Office  
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phone: 828-258-3939 x238  
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NORTH CAROLINA

# Natural Heritage Program

SCIENCE GUIDING CONSERVATION



NC DEPARTMENT  
OF NATURAL AND  
CULTURAL RESOURCES

**From:** [Marshall, Michael E](#)  
**To:** [Amoroso, Jame](#)  
**Cc:** [Reid, Rebekah N](#); [Mason, Suzanne](#); [Robinson, Laura](#)  
**Subject:** Re: [External] HENA Current Populations  
**Date:** Thursday, March 29, 2018 9:20:03 AM  
**Attachments:** [image001.png](#)  
**Importance:** High

---

Good morning all,

First, Jame, thank you so much for that feedback, it is extremely useful! This is why outside expert involvement is so critical in these SSAs. My initial inclination was to include most, if not all, most EOs, but there are several reasons for the 10 year cutoff.....as an example, I have worked on several SSAs in the past that used EOs as a basis for determining populations, and it has consistently been an issue with folks on the decision end to include older occurrences. If a species is reclassified, the subsequent rule and SSA will be held under a microscope, and 10 years has tended to be a threshold folks are relatively comfortable with.

I do want to capture your thoughts on this though, so my proposal: I would like to add a narrative in the SSA that takes from your description provided. I'd like to point out that it is likely that many, if not most EOs that are not included are likely to persist if the habitat is there. Further, I'd like to state in the SSA, that for future scenarios, it is likely that many of these populations are likely to be found to persist, and will be added to the viability analysis under a Conservation scenario, and to a certain degree under a Status Quo scenario. We can use the habitat model to help us determine to what extent habitat is predicted to be in these places. When the Future Conditions section is included in the next draft for review, I'd like to see your reactions to the approach.

Thanks a bunch, and I'll be in touch very soon!

Mike

On Thu, Mar 29, 2018 at 8:28 AM, Amoroso, Jame <[jame.amoroso@ncdcr.gov](mailto:jame.amoroso@ncdcr.gov)> wrote:

Hi Rebekah,

We would include older EOs in the model that are not ranked as H or X. HENA is a long-lived perennial, and we have several EORs that were revisited after more than 10 years and HENA was present, such as EOR 157 first observed in 1957 and next observed in 2001. As long as suitable habitat is still present it is reasonable to assume that HENA is still there. Also, the inclusion of only ones with a last observed date after 2007, means that nearly half the data that could be used to develop a model is excluded. Using land cover to exclude occurrences that are classed as fields or developed would remove locations that are no longer suitable. We review aerial photos to determine the land cover for a particular conservation site or occurrence record on an ad hoc basis.

In your conservation scenario, we are not aware of any HENA locations that are targeted for future Registry or preservation. Registered Heritage Areas are only appropriate for



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Jame Amoroso

Jame Amoroso

Conservation Information Specialist

[121 W Jones St](#) MSC 1651 Raleigh, NC 27699-1651

919 707 8621 *office*

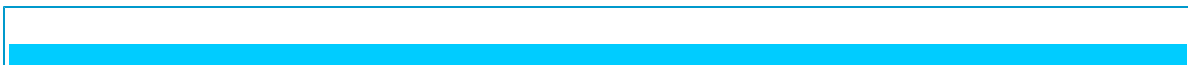
[Jame.Amoroso@ncdcr.gov](mailto:Jame.Amoroso@ncdcr.gov)

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---

**From:** Reid, Rebekah [mailto:[rebekah\\_reid@fws.gov](mailto:rebekah_reid@fws.gov)]  
**Sent:** Monday, March 26, 2018 12:29 PM  
**To:** Amoroso, Jame <[jame.amoroso@ncdcr.gov](mailto:jame.amoroso@ncdcr.gov)>; Mason, Suzanne <[suzanne.mason@ncdcr.gov](mailto:suzanne.mason@ncdcr.gov)>; Robinson, Laura <[Laura.Robinson@ncdcr.gov](mailto:Laura.Robinson@ncdcr.gov)>  
**Cc:** Marshall, Michael <[michael\\_marshall@fws.gov](mailto:michael_marshall@fws.gov)>  
**Subject:** [External] HENA Current Populations



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Hi Jame, Suzanne, and Laura,

We were looking back at some of the comments for the current conditions section of the SSA. You all had questions about how/why we determined current populations the way we did. A number of factors came in to play but we ultimately decided on physical observation in the last 10 years. We are not assuming that older observations didn't exist or don't exist just that there is not a current observation to verify presence and condition. As a follow-up question to NHP, what EOs would you all include on our current-list that we didn't include? And, what level of certainty is there that they are persisting in the same condition as they were during the last observation?

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Rebekah Reid

US Fish and Wildlife Service

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phone: 828-258-3939 x238

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--

Mike Marshall  
SSA Program Specialist  
U.S. Fish and Wildlife Service Region 4  
Cell: 512-461-6217  
Alternate email: [mmarshall@ag.tamu.edu](mailto:mmarshall@ag.tamu.edu)

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NORTH CAROLINA

# Natural Heritage Program

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OF NATURAL AND  
CULTURAL RESOURCES

**From:** [Marshall, Michael E](#)  
**To:** [Reid, Rebekah N](#); [Endries, Mark](#)  
**Subject:** Fwd: [External] HENA Current Populations  
**Date:** Thursday, March 29, 2018 9:41:28 AM  
**Attachments:** [image001.png](#)  
**Importance:** High

---

Hey guys,

I wanted to discuss a path forward given the response from the emails below.....

It would help me with the write-up if we could identify all the EOs that we did not include in the current conditions (last observed prior to 2007), but for which the model predicts there to be potential habitat available in 2040.....this might be easiest to do by going to the original EO record spreadsheet, and deleting the historical and extirpated records, but keeping all other EOs, and ranking them based on our population size rules.....then, we would do the same SLEUTH model approach as before, but include these older records as well as our reduced list based on the >10 years old rule....here is my thought on the approach:

Status Quo--only consider those older EOs where they overlap the highest Maxent ranked habitat category (>.80 I think).....will add some/all of these populations to the mix of pops across the landscape.....urbanization thresholds will apply as resilience subtractions to all populations as discussed before (>25% increase in urban development as predicted by the SLEUTH model)

Targeted Conservation--consider the older EOs where they overlap any potential habitat within all Maxent ranks (>.40 I think)....will add many/all of these populations to the mix of pops across the landscape.....urbanization thresholds will apply as resilience subtractions to all populations as discussed before (>25% increase in urban development as predicted by the SLEUTH model)

High Development--will not consider old EOs....higher impacts from development to existing populations.....this is our worst case scenario.

Perhaps we should discuss this over the phone.....just wanted to get the mental juices flowing....I know I rambled on above.

Thanks,

Mike

----- Forwarded message -----

From: **Marshall, Michael** <[michael\\_marshall@fws.gov](mailto:michael_marshall@fws.gov)>  
Date: Thu, Mar 29, 2018 at 9:20 AM  
Subject: Re: [External] HENA Current Populations  
To: "Amoroso, Jame" <[jame.amoroso@ncdcr.gov](mailto:jame.amoroso@ncdcr.gov)>  
Cc: "Reid, Rebekah" <[rebekah\\_reid@fws.gov](mailto:rebekah_reid@fws.gov)>, "Mason, Suzanne" <[suzanne.mason@ncdcr.gov](mailto:suzanne.mason@ncdcr.gov)>, "Robinson, Laura" <[Laura.Robinson@ncdcr.gov](mailto:Laura.Robinson@ncdcr.gov)>

Good morning all,

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Jame Amoroso

Jame Amoroso

Conservation Information Specialist

[121 W Jones St](#) MSC 1651 Raleigh, NC 27699-1651

919 707 8621 *office*

[Jame.Amoroso@ncdcr.gov](mailto:Jame.Amoroso@ncdcr.gov)

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**From:** Reid, Rebekah [mailto:[rebekah\\_reid@fws.gov](mailto:rebekah_reid@fws.gov)]  
**Sent:** Monday, March 26, 2018 12:29 PM  
**To:** Amoroso, Jame <[jame.amoroso@ncdcr.gov](mailto:jame.amoroso@ncdcr.gov)>; Mason, Suzanne <[suzanne.mason@ncdcr.gov](mailto:suzanne.mason@ncdcr.gov)>; Robinson, Laura <[Laura.Robinson@ncdcr.gov](mailto:Laura.Robinson@ncdcr.gov)>  
**Cc:** Marshall, Michael <[michael\\_marshall@fws.gov](mailto:michael_marshall@fws.gov)>  
**Subject:** [External] HENA Current Populations

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Hi Jame, Suzanne, and Laura,

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Thanks for all your input and participation!

Rebekah Reid

US Fish and Wildlife Service

Asheville Ecological Services Field Office

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Mike Marshall  
SSA Program Specialist  
U.S. Fish and Wildlife Service Region 4



Cell: 512-461-6217

Alternate email: [mmarshall@ag.tamu.edu](mailto:mmarshall@ag.tamu.edu)

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Mike Marshall

SSA Program Specialist

U.S. Fish and Wildlife Service Region 4

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NORTH CAROLINA

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**From:** [Reid, Rebekah N](#)  
**To:** [Marshall, Michael E](#)  
**Cc:** [Endries, Mark](#)  
**Subject:** Re: [External] HENA Current Populations  
**Date:** Friday, March 30, 2018 7:36:36 AM  
**Attachments:** [image001.png](#)  
**Importance:** High

---

Hi Mike,

Thanks for your response to Jame. I was in the field yesterday with zero cell service! I'll touch base with Mark about the updated approach and we can catch up the first part of next week if needed.

Rebekah Reid

US Fish and Wildlife Service  
Asheville Ecological Services Field Office  
160 Zillicoa St.  
Asheville, NC 28801  
phone: 828-258-3939 x238  
cell: 828-782-0090

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Date: Thu, Mar 29, 2018 at 9:20 AM

Subject: Re: [External] HENA Current Populations

To: "Amoroso, Jame" <[jame.amoroso@ncdcr.gov](mailto:jame.amoroso@ncdcr.gov)>

Cc: "Reid, Rebekah" <[rebekah\\_reid@fws.gov](mailto:rebekah_reid@fws.gov)>, "Mason, Suzanne"

<[suzanne.mason@ncdcr.gov](mailto:suzanne.mason@ncdcr.gov)>, "Robinson, Laura" <[Laura.Robinson@ncdcr.gov](mailto:Laura.Robinson@ncdcr.gov)>

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NORTH CAROLINA

# Natural Heritage Program

SCIENCE GUIDING CONSERVATION



NC DEPARTMENT  
OF NATURAL AND  
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**From:** [Reid, Rebekah N](#)  
**To:** [Marshall, Michael E](#)  
**Cc:** [Endries, Mark](#)  
**Subject:** Re: [External] HENA Current Populations  
**Date:** Friday, March 30, 2018 10:25:33 AM  
**Attachments:** [image001.png](#)  
**Importance:** High

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**Subject:** Re: [External] HENA Current Populations  
**Date:** Friday, March 30, 2018 1:20:55 PM  
**Attachments:** [image001.png](#)  
**Importance:** High

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Hey guys,

Understood....one obstacle is that the draft is supposed to be completed by the 9th....I'll write up what I can for now, and take it from there. If there is anytime during next week you could discuss, let me know....if not, we'll try to adjust and get the draft out by the end of the week after.

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NORTH CAROLINA

# Natural Heritage Program

SCIENCE GUIDING CONSERVATION



NC DEPARTMENT  
OF NATURAL AND  
CULTURAL RESOURCES

**From:** [Reid, Rebekah N](#)  
**To:** [Marshall, Michael E](#)  
**Cc:** [Endries, Mark](#)  
**Subject:** Re: [External] HENA Current Populations  
**Date:** Monday, April 2, 2018 7:33:57 AM  
**Attachments:** [image001.png](#)  
**Importance:** High

---

Mike,

Mark and I have opposite schedules this week so having us both on the phone at the same time this week will be difficult. If you wanted to catch us individually, I'm in the first part of the week and I think Mark is in the end of the week. Our office is a ghost-town since it's Spring Break in NC.

Thanks.

Rebekah Reid

US Fish and Wildlife Service  
Asheville Ecological Services Field Office  
160 Zillicoa St.  
Asheville, NC 28801  
phone: 828-258-3939 x238  
cell: 828-782-0090

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On Fri, Mar 30, 2018 at 1:20 PM, Marshall, Michael <[michael\\_marshall@fws.gov](mailto:michael_marshall@fws.gov)> wrote:

Hey guys,

Understood....one obstacle is that the draft is supposed to be completed by the 9th....I'll write up what I can for now, and take it from there. If there is anytime during next week you could discuss, let me know....if not, we'll try to adjust and get the draft out by the end of the week after.

Thanks!

Mike

On Fri, Mar 30, 2018 at 10:25 AM, Reid, Rebekah <[rebekah\\_reid@fws.gov](mailto:rebekah_reid@fws.gov)> wrote:

Hi Mike,

Mark and I talked about this. We think a conference call would be good to make sure we are moving ahead in the right direction. Spring Break is next week so if we could schedule something for the week of the 9th, that would be great. We are both available the 10-13th.

Thanks.



Rebekah Reid

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On Fri, Mar 30, 2018 at 7:36 AM, Reid, Rebekah <[rebekah\\_reid@fws.gov](mailto:rebekah_reid@fws.gov)> wrote:

Hi Mike,

Thanks for your response to Jame. I was in the field yesterday with zero cell service! I'll touch base with Mark about the updated approach and we can catch up the first part of next week if needed.

Rebekah Reid

US Fish and Wildlife Service  
Asheville Ecological Services Field Office  
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On Thu, Mar 29, 2018 at 9:41 AM, Marshall, Michael <[michael\\_marshall@fws.gov](mailto:michael_marshall@fws.gov)> wrote:

Hey guys,

I wanted to discuss a path forward given the response from the emails below.....

It would help me with the write-up if we could identify all the EOs that we did not include in the current conditions (last observed prior to 2007), but for which the model predicts there to be potential habitat available in 2040.....this might be easiest to do by going to the original EO record spreadsheet, and deleting the historical and extirpated records, but keeping all other EOs, and ranking them based on our population size rules.....then, we would do the same SLEUTH model approach as before, but include these older records as well as our reduced list based on the >10 years old rule....here is my thought on the approach:

Status Quo--only consider those older EOs where they overlap the highest Maxent ranked habitat category (>.80 I think).....will add some/all of these populations to the mix of pops across the landscape.....urbanization thresholds will apply as resilience subtractions to all populations as discussed before (>25% increase in urban development as predicted by the SLEUTH model)

Targeted Conservation--consider the older EOs where they overlap any potential habitat within all Maxent ranks (>.40 I think)....will add many/all of these populations to the mix of pops across the landscape.....urbanization thresholds will apply as resilience subtractions to all populations as discussed before (>25% increase in urban development as predicted by the SLEUTH model)

High Development--will not consider old EOs....higher impacts from development to existing populations.....this is our worst case scenario.

Perhaps we should discuss this over the phone.....just wanted to get the mental juices flowing....I know I rambled on above.

Thanks,

Mike

----- Forwarded message -----

From: **Marshall, Michael** <[michael\\_marshall@fws.gov](mailto:michael_marshall@fws.gov)>

Date: Thu, Mar 29, 2018 at 9:20 AM

Subject: Re: [External] HENA Current Populations

To: "Amoroso, Jame" <[jame.amoroso@ncdcr.gov](mailto:jame.amoroso@ncdcr.gov)>

Cc: "Reid, Rebekah" <[rebekah\\_reid@fws.gov](mailto:rebekah_reid@fws.gov)>, "Mason, Suzanne"

<[suzanne.mason@ncdcr.gov](mailto:suzanne.mason@ncdcr.gov)>, "Robinson, Laura" <[Laura.Robinson@ncdcr.gov](mailto:Laura.Robinson@ncdcr.gov)>

Good morning all,

First, Jame, thank you so much for that feedback, it is extremely useful! This is why outside expert involvement is so critical in these SSAs. My initial inclination was to include most, if not all, most EOs, but there are several reasons for the 10 year cutoff.....as an example, I have worked on several SSAs in the past that used EOs as a basis for determining populations, and it has consistently been an issue with folks on the decision end to include older occurrences. If a species is reclassified, the subsequent rule and SSA will be held under a microscope, and 10 years has tended to be a threshold folks are relatively comfortable with.

I do want to capture your thoughts on this though, so my proposal: I would like to add a narrative in the SSA that takes from your description provided. I'd like to point out that it is likely that many, if not most EOs that are not included are likely to persist if the habitat is there. Further, I'd like to state in the SSA, that for future scenarios, it is likely that many of these populations are likely to be found to persist, and will be added to the viability analysis under a Conservation scenario, and to a certain degree under a Status Quo scenario. We can use the habitat model to help us determine to what extent habitat is predicted to be in these places. When the Future Conditions section is included in the next draft for review, I'd like to see your reactions to the approach.

Thanks a bunch, and I'll be in touch very soon!

Mike

On Thu, Mar 29, 2018 at 8:28 AM, Amoroso, Jame <[jame.amoroso@ncdcr.gov](mailto:jame.amoroso@ncdcr.gov)> wrote:

Hi Rebekah,

We would include older EOs in the model that are not ranked as H or X. HENA is a long-lived perennial, and we have several EORs that were revisited after more than 10 years and HENA was present, such as EOR 157 first observed in 1957 and next observed in 2001. As long as suitable habitat is still present it is reasonable to assume that HENA is still there. Also, the inclusion of only ones with a last observed date after 2007, means that nearly half the data that could be used to develop a model is excluded. Using land cover to exclude occurrences that are classed as fields or developed would remove locations that are no longer suitable. We review aerial photos to determine the land cover for a particular conservation site or occurrence record on an ad hoc basis.

In your conservation scenario, we are not aware of any HENA locations that are targeted for future Registry or preservation. Registered Heritage Areas are only appropriate for consideration in the best-case conservation scenario, because they are non-binding agreements with the land owner. If the land changes ownership, or the owner decides not to continue with the agreement, then the Registry is no longer valid.

Thank you for the opportunity to provide feedback for the species status review.

Jame Amoroso

**Jame Amoroso**

**Conservation Information Specialist**

[121 W Jones St](#) MSC 1651 Raleigh, NC 27699-1651

919 707 8621 *office*

[Jame.Amoroso@ncdcr.gov](mailto:Jame.Amoroso@ncdcr.gov)

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---

**From:** Reid, Rebekah [mailto:[rebekah\\_reid@fws.gov](mailto:rebekah_reid@fws.gov)]  
**Sent:** Monday, March 26, 2018 12:29 PM  
**To:** Amoroso, Jame <[jame.amoroso@ncdcr.gov](mailto:jame.amoroso@ncdcr.gov)>; Mason, Suzanne <[suzanne.mason@ncdcr.gov](mailto:suzanne.mason@ncdcr.gov)>; Robinson, Laura <[Laura.Robinson@ncdcr.gov](mailto:Laura.Robinson@ncdcr.gov)>  
**Cc:** Marshall, Michael <[michael\\_marshall@fws.gov](mailto:michael_marshall@fws.gov)>  
**Subject:** [External] HENA Current Populations

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Hi Jame, Suzanne, and Laura,

We were looking back at some of the comments for the current conditions section of the SSA. You all had questions about how/why we determined current populations the way we did. A number of factors came in to play but we ultimately decided on physical observation in the last 10 years. We are not assuming that older observations didn't exist or don't exist just that there is not a current observation to verify presence and condition. As a follow-up question to NHP, what EOs would you all include on our current-list that we didn't include? And, what level of certainty is there that they are persisting in the same condition as they were during the last observation?

Additionally, we are working on future conditions and several scenarios for the future. One is a "conservation scenario" or what we would consider a scenario better than the status quo. Are there sites or properties that are on NHP radar that

are targeted for RHAs or preservation? In a best-case, conservation scenario, these sites would be preserved.

Thanks for all your input and participation!

Rebekah Reid

US Fish and Wildlife Service

Asheville Ecological Services Field Office

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NORTH CAROLINA

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**From:** [Amoroso, Jame](#)  
**To:** [Marshall, Michael E](#)  
**Cc:** [Reid, Rebekah N](#); [Mason, Suzanne](#); [Robinson, Laura](#)  
**Subject:** RE: [External] HENA Current Populations  
**Date:** Friday, April 6, 2018 1:04:05 PM  
**Attachments:** [image001.png](#)  
**Importance:** High

---

Hi Mike,

Yes, we think it will be important to include the information about the likely persistence of HENA where habitat has continued to be suitable. You can include the information we have already provided about this. We will look forward to seeing your next draft for review.

Jame

---

**From:** Marshall, Michael [mailto:michael\_marshall@fws.gov]  
**Sent:** Thursday, March 29, 2018 9:20 AM  
**To:** Amoroso, Jame <jame.amoroso@ncdcr.gov>  
**Cc:** Reid, Rebekah <rebekah\_reid@fws.gov>; Mason, Suzanne <suzanne.mason@ncdcr.gov>; Robinson, Laura <Laura.Robinson@ncdcr.gov>  
**Subject:** Re: [External] HENA Current Populations

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**Cc:** Marshall, Michael <[michael\\_marshall@fws.gov](mailto:michael_marshall@fws.gov)>

**Subject:** [External] HENA Current Populations

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**From:** [Endries, Mark](#)  
**To:** [Reid, Rebekah N](#); [Marshall, Michael E](#)  
**Subject:** Updated Maxent Methodology  
**Date:** Thursday, April 12, 2018 10:53:43 AM  
**Attachments:** [HENA Maxent Model Methods NewUpdate.docx](#)  
**Importance:** High

---

Hi Mike, Rebekah,

I've updated the Maxent methodology document. In short, not much has changed. Slight changes to area summaries and percentages but the results are essentially the same.

Please let me know if you have any questions.

I'll next work on the statistical test then work on the population summaries.

Thanks!

Mark

**Mark Endries**

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160 Zillicoa St  
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Office: 828.258.3939 ext. 231  
Mobile: 828.215.1740

## *Study Extent, Coordinate System, and Cell Size*

Fifty three 10-digit hydrologic units (HUC) comprise the analysis extent (Figure 1). In North Carolina it includes all 10-digit HUC that fall within the boundaries of 8-digit HUC with known occurrence of *Hexastylis*. In South Carolina we also included all 10-digit HUC that fell within the boundaries of 8-digit HUC with known occurrence of *Hexastylis*, but excluded the southern portions of the HUC-8 areas due to the boundaries being exceedingly large and far away from any known occurrences.

Figure 1. Analysis extent. Red line indicates Maxent analysis extent, blue lines are 8-digit HUC boundaries, black lines are 10-digit HUC boundaries. The orange line in the inset map indicates where the analysis extent is situated in North and South Carolina



Coordinate System: USA Contiguous Albers Equal Area Conic USGS version

Cell Size: 30 x 30 meters derived from the USGS National GAP Landcover

### *Source Element Occurrence Data*

Hexastylis naniflora element occurrence data was obtained from the North and South Carolina Natural Heritage Programs. These data were in polygon format and digitized at scale that accurately identified the boundaries of the individual population areas. Current populations of Hexastylis naniflora were identified by reviewing the last observed data in the database and excluding all populations that have not been observed in the last 10 years (2007). To represent these current population areas in Maxent, a raster cell center was retained for every 30 x 30 meter pixel that was situated within the current element occurrence data polygons.

### *Source Datasets Used:*

**USGS National GAP Landcover** - The GAP National Terrestrial Ecosystems – Ver 3.0 is a 2011 update of the National Gap Analysis Program Land Cover Data – Version 2.2 for the conterminous U.S. The GAP National Terrestrial Ecosystems – Version 3.0 represents a highly thematically detailed land cover map of the U.S at a 30 x 30 meter pixel resolution. The map legend includes types described by NatureServe's Ecological Systems Classification (Comer et al. 2002) as well as land use classes described in the National Land Cover Dataset 2011 (Homer et al. 2015). These data cover the entire continental U.S. and are a continuous data layer. The land cover map identifies 49 different land cover types within the range of Hexastylis Naniflora.

**LandFire** - Landscape Fire and Resource Management Planning Tools, is a shared program between the wildland fire management programs of the U.S. Department of Agriculture Forest Service and U.S. Department of the Interior, providing landscape scale geo-spatial products to support cross-boundary planning, management, and operations.

**SSURGO Soils** - The SSURGO database contains information about soil as collected by the National Cooperative Soil Survey over the course of a century. The information was gathered by walking over the land and observing the soil. Many soil samples were analyzed in laboratories. The maps outline areas called map units. The map units describe soils and other components that have unique properties, interpretations, and productivity. The information was collected at scales ranging from 1:12,000 to 1:63,360.

**National Elevation Dataset** - The NED is a seamless dataset with the best available raster elevation data of the conterminous United States, Alaska, Hawaii, and territorial islands. The NED is derived from diverse source data that are processed to a common coordinate system and unit of vertical measure. NED data are available nationally (except for Alaska) at resolutions of 1 arc-second (about 30 meters) and 1/3 arc-second (about 10 meters), and in limited areas at 1/9 arc-second (about 3 meters). The 1/3 arc-second database was used for HENA modelling purposes.

**PRISM Climate Data** - The PRISM Climate Group gathers climate observations from a wide range of monitoring networks, applies sophisticated quality control measures, and develops spatial climate datasets to reveal short- and long-term climate patterns. The resulting datasets incorporate a variety of modeling techniques and are available at multiple spatial/temporal resolutions, covering the period from 1895 to the present.

### *Model Variables Created:*

**Landcover** – Landcover represented by the default landcover classification (Table 1).

**Landcover Hexastylis Grouping** – Landcover represented by a grouping of landcover types. For the purposes of discussing Hexastylis naniflora habitat, many of the default landcover classifications are similar and could be grouped together. The definition of each landcover classification was reviewed and categorized using a much broader habitat definition (Table 1).

Table 1. Landcover classification

Default Landcover Classification	Hexastylis Grouping
Southern Piedmont Glade and Barrens	Barren
Southern Ridge and Valley / Cumberland Dry Calcareous Forest	Barren
Undifferentiated Barren Land	Barren
Cultivated Cropland	Disturbed
Deciduous Plantations	Disturbed
Developed, High Intensity	Disturbed
Developed, Low Intensity	Disturbed
Developed, Medium Intensity	Disturbed
Developed, Open Space	Disturbed
Disturbed/Successional - Grass/Forb Regeneration	Disturbed
Disturbed/Successional - Shrub Regeneration	Disturbed
Evergreen Plantation or Managed Pine	Disturbed
Harvested Forest - Grass/Forb Regeneration	Disturbed
Harvested Forest-Shrub Regeneration	Disturbed
Introduced Upland Vegetation - Annual Grassland	Disturbed
Introduced Upland Vegetation - Shrub	Disturbed
Introduced Upland Vegetation - Treed	Disturbed
Pasture/Hay	Disturbed
Quarries, Mines, Gravel Pits and Oil Wells	Disturbed
Ruderal forest	Disturbed
Southern Appalachian Low Mountain Pine Forest	Evergreen
Southern Appalachian Montane Pine Forest and Woodland	Evergreen
Southern and Central Appalachian Cove Forest	Hardwood
Southern and Central Appalachian Oak Forest	Hardwood
Southern and Central Appalachian Oak Forest - Xeric	Hardwood
Southern Piedmont Mesic Forest	Hardwood



Central and Southern Appalachian Montane Oak Forest	High Elevation
Central and Southern Appalachian Northern Hardwood Forest	High Elevation
Central and Southern Appalachian Spruce-Fir Forest	High Elevation
Southern Appalachian Grass and Shrub Bald	High Elevation
Southern Appalachian Grass and Shrub Bald - Shrub Modifier	High Elevation
Appalachian Hemlock-Hardwood Forest	Mixed
Southern Piedmont Dry Oak-(Pine) Forest - Hardwood Modifier	Mixed
Southern Piedmont Dry Oak-(Pine) Forest - Loblolly Pine Modifier	Mixed
Southern Piedmont Dry Oak-(Pine) Forest - Mixed Modifier	Mixed
Southern Ridge and Valley Dry Calcareous Forest	Mixed
Southern Ridge and Valley Dry Calcareous Forest - Pine modifier	Mixed
Open Water (Fresh)	Open Water/Wetland
Southern and Central Appalachian Bog and Fen	Open Water/Wetland
Southern Piedmont/Ridge and Valley Upland Depression Swamp	Open Water/Wetland
Southern Appalachian Granitic Dome	Outcrop
Southern Appalachian Montane Cliff	Outcrop
Southern Appalachian Rocky Summit	Outcrop
Southern Piedmont Cliff	Outcrop
Southern Piedmont Granite Flatrock	Outcrop
South-Central Interior Large Floodplain - Forest Modifier	Riparian
South-Central Interior Small Stream and Riparian	Riparian
Southern Piedmont Large Floodplain Forest - Forest Modifier	Riparian
Southern Piedmont Small Floodplain and Riparian Forest	Riparian

**Landcover Diversity** – Identifies the number of landcover classes (default classification) within a 10-cell radius (300 meters) of an individual pixel.

**Landcover Majority** – Identifies the dominant landcover class (default classification) within a 10-cell radius (300 meters) of an individual pixel.

**Landfire Canopy Height** – Represents the vertically projected percent cover of the live vegetation canopy.

**Landfire Canopy Cover** – Represents the average height of the dominant vegetation across the landscape.

**SSURGO mukey** – SSURGO soils dataset represented by the Map Unit Key (mukey)

**SSURGO Drainage Class** – SSURGO soils dataset represented by wettest drainage class. Drainage class refers to the frequency and duration of wet periods in conditions similar to those under which the soil formed.

**SSURGO Hydrologic Group** – SSURGO soils dataset represented by hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

**Elevation** – National elevation dataset elevation values. This 10-meter dataset was reclassified to 30-meters.

**Aspect 9-class** – Using the national elevation dataset, the aspect was derived and categorized into the following classes: Flat, North, Northeast, East, Southeast, South, Southwest, West, and Northwest.

**Aspect 5-class** – Using the national elevation dataset, the aspect was derived and categorized into the following classes: Flat, North, East, South, and West.

**Slope** – The national elevation dataset represented by degree of slope.

**Geomorphons** – A pattern recognition analysis that converts a digital elevation dataset into 10 common landform elements: flat, peak, ridge, shoulder, spur, slope, pit, valley, footslope, and hollow. The national elevation dataset was used as the source elevation for the analysis.

**Solar Radiation** – An analysis of the amount of solar radiation (radiant energy) reaching the earth's surface using the national elevation dataset as the elevation model. The output solar model is reported in watt hours per square meter (WH/m<sup>2</sup>)

**Average Annual Precipitation** – Climate dataset of average annual precipitation according to a model using point precipitation and elevation data for the 30-year period of 1971-2000.

**Maximum Average Annual Temperature** – Climate dataset of average annual maximum temperature according to a model using point temperature data for the 30-year period of 1981-2010.

**Minimum Average Annual Temperature** – Climate dataset of average annual minimum temperature according to a model using point temperature data for the 30-year period of 1981-2010.

### *Maxent Model Development*

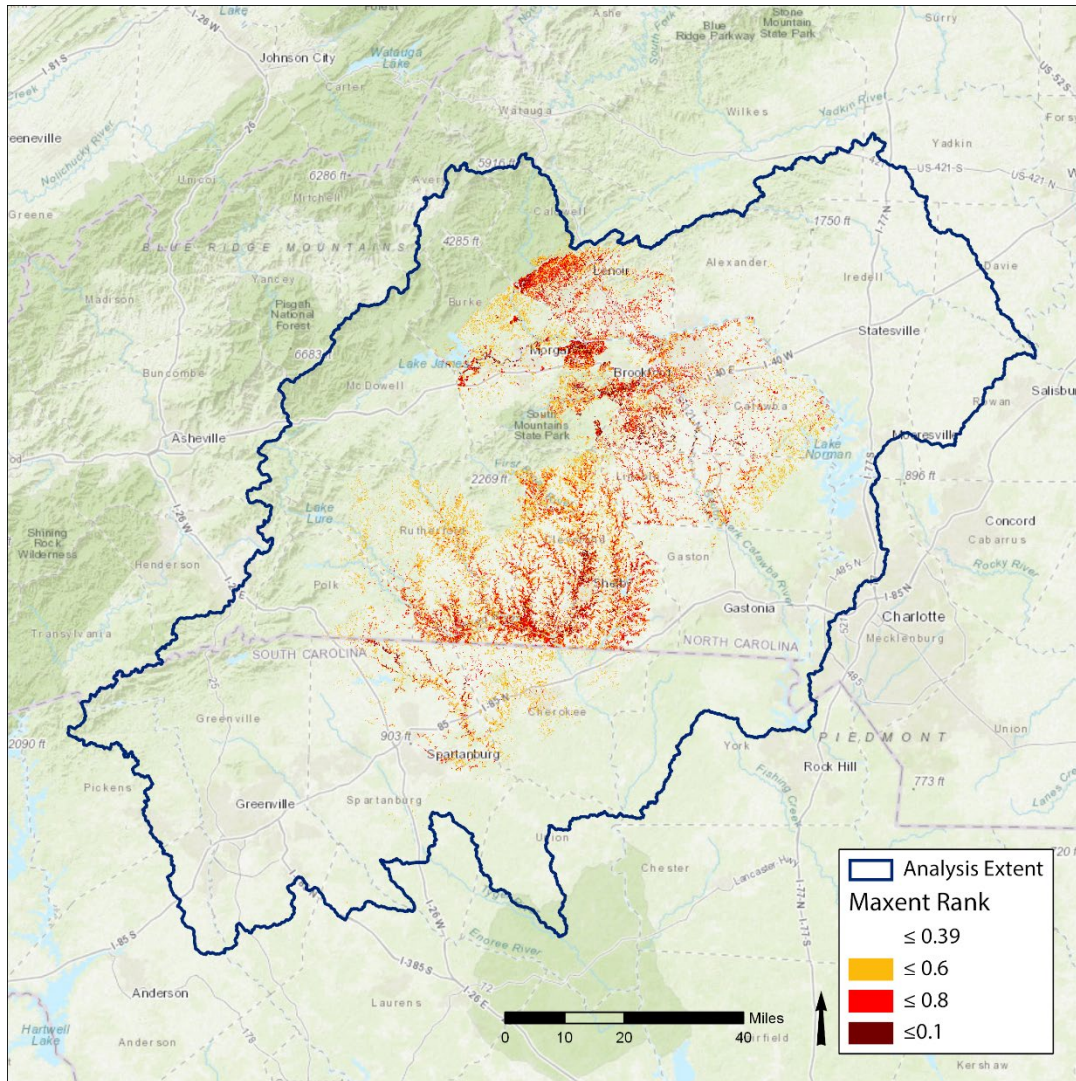
Maxent software for species habitat modeling (version 3.4.1) was used (Philips et al., 2018).

An initial single model Maxent run was done to determine which variables could be excluded due to limited percent contribution to the model. Any variable that contributed less than 1% to the single model run results was excluded in the final model. The following variables were excluded:

landcover diversity, canopy height, SSURGO drainage class, SSURGO hydrologic group, aspect 9-class, aspect 5-class, slope, solar radiation, and maximum annual temperature.

For the final model a 10-run replicate Maxent model was created using crossvalidation. For replicate models, the occurrence data is randomly split into a number of equal-sized groups called "folds", and separate models are created leaving out each fold in turn. The individual model runs are then averaged together to derive the final model. Cloglog output format was used. Cloglog output gives an estimate between 0 and 1 of probability of presence assuming an appropriate sampling design.

Figure 2. Maxent model output map.



## Results

Figure 2 shows the model output. The minimum cutoff value (to determine if an area is considered potential habitat for a species) of 0.39 was determined by using the average 10th percentile training presence. The 10th percentile training presence uses the suitability threshold associated with the presence record that occurs at the 10th percentile of presence records (Phillips 2018). This value excludes some of the outlier population areas in the Maxent predictions to focus on the typical habitat conditions for this species. The total area ranked greater than 0.39 in the Maxent model was just 6.0% of the total analysis area (Table 1).

Table 1. Area estimates of the Maxent model

Maxent Score	Acres	Square Miles	Percent of Total
0.406 and greater	302,834.13	473.18	6.02%
0.6 and greater	128,273.52	200.43	2.55%
0.8 and greater	22,115.97	34.56	0.44%

The average area-under-curve (AUC) score for the replicate Maxent model is 0.86. The AUC is calculated from the receiver operating characteristic (ROC) plot. This value has a range of 0 – 1 and may be interpreted as a single test statistic that assesses model performance, indicating the ability of the model to correctly classify the occurrence data used. AUC values close to 0.50 indicate a model fit no better than random, values less than 0.5 indicate a model fit worse than random, a value of 1.0 indicate a perfect fit (Baldwin 2009). A value of 0.86 is a good fitting model.

The Maxent output supplies estimates of the relative contributions of the environmental variables to the Maxent model (Table 2.)

Table 2. Percent contribution of the environmental variables

Environmental Variable	Percent Contribution
SSURGO mukey	23.5%
Minimum Annual Temperature	17.8%
Average Annual Precipitation	15.7%
Landcover	12.9%
Landcover Majority	12.0%
Landcover Hexastylis Grouping	5.4%
Geomorphons	4.9%
Elevation	4.6%
Canopy Cover	3.2%

SSURGO mukey is the top contributing variable. 135 different individual soil types are present within the polygon boundaries of the Hexastylis element occurrences. Many of these individual soil types are part of soil complexes and are separated by things such as percent slope, erosion, how stony/rocky, and amount of clay. The most common individual soil type was Meadowfield-Rhodhiss complex, 25 to 60 percent slopes, very stony (14.1% of total). However, collectively the Meadowfield soils only comprised 14.3% of all soils). The individual Pacolet soil types were very common and collectively comprise 32.2% of all soil types present. Woolwine, Rion, and Fairview

soils were also collectively common, comprising 10.4%, 9.7%, and 8.8% of all soils present respectively.

The minimum annual average temperature range in the analysis extent is 39 – 51 degrees Fahrenheit. The majority of the *Hexastylis* element occurrences (89%) are found at the 47 and 48 degrees. The Average annual precipitation range in the analysis extent is 42 – 81 inches per year. The majority of the *Hexastylis* element occurrences (82%) are found in the 47 – 49 inches per year range.

Piedmont forested landcover habitats dominate the land area of the element occurrences. Southern Piedmont Dry Oak-Pine Forest – Hardwood Modifier (53%), Southern Piedmont Mesic Forest (9%), Southern Piedmont Dry Oak-Pine Forest (5.2%), Southern Piedmont Small Floodplain and Riparian Forest (4.4%), and collectively comprise 71% of the element occurrences area. Unfortunately, non-native habitats are also present. Evergreen Plantation or Managed Pine (9%), Harvested Forest (7.2%), Developed, Open Space (5%), Pasture/Hay (2.1%) collectively comprise 22% of the total element occurrence area. The Remaining 6 percent of element occurrence area is comprised of a mix of 14 other natural and disturbed landcover classes, but each at small percentages.

The landcover majority classification scheme reduces the total number of landcover classes present in the analysis extent from 23 to 11. Southern Piedmont Dry Oak-Pine Forest – Hardwood Modifier is still the dominant landcover class (58%). However disturbed categories are increased in area (sum total of 35%). Evergreen plantation or managed pine (12%) and Pasture/Hay (12%) are the only other categories that have at least 10% or greater area. The increase in disturbed landcover area representation in the landcover majority layer suggests that many *Hexastylis* population areas are situated in areas impacted by disturbed landcover. This is likely due to urban encroachment and increasing fragmentation of habitats.

The landcover *Hexastylis* grouping reveals the amount of disturbance present in *Hexastylis* population areas. Landcover classes grouped as disturbed comprises 27% of the total area. Mixed forest (deciduous and evergreen) comprises 58%, pasture/hay 12%, and hardwood forest 2%,

Geomorphons revealed that the majority of *Hexastylis* element occurrence areas are situated in concave landforms. Geomorphon categories hollow (13%), valley (46%), and depression (10%) collectively comprise 69% of all *Hexastylis* population areas. Flat landforms comprise 15.5% of the area and convex landforms the remaining 15.5%.

Within the analysis extent, the range of elevation present is 335 – 5,265 feet. For *Hexastylis*, the prime elevation range is from 666 – 908 feet (53% of total element occurrence area). A lesser elevation range is present from 935 – 1,184 (37% of total element occurrence area).

Canopy cover for the *Hexastylis* populations are dominated by Tree Cover 70-80% (20.2%) and Tree Cover 80-90% (63.9%). The rest of the canopy cover categories are 2% or less.

## *Citations*

Baldwin, R.A. 2009. Use of maximum entropy modeling in wildlife research. *Entropy*. 11:854-866.

Phillips, S. J. 2018. A Brief Tutorial on Maxent. Available from url:

[http://biodiversityinformatics.amnh.org/open\\_source/maxent/](http://biodiversityinformatics.amnh.org/open_source/maxent/). Accessed on 2018-02/21.

Steven J. Phillips, Miroslav Dudík, Robert E. Schapire. [Internet] Maxent software for modeling species niches and distributions (Version 3.4.1). Available from url:

[http://biodiversityinformatics.amnh.org/open\\_source/maxent/](http://biodiversityinformatics.amnh.org/open_source/maxent/). Accessed on 2018-2-20.

**From:** [Marshall, Michael E](#)  
**To:** [Endries, Mark](#)  
**Cc:** [Reid, Rebekah N](#)  
**Subject:** Re: Updated Maxent Methodology  
**Date:** Thursday, April 12, 2018 11:07:35 AM  
**Importance:** High

---

Thanks Mark...off the cuff, I see on page 2, you mention using EO back to 2007....is this correct, or did you include EOs back to 2005?

Thanks,

Mike

On Thu, Apr 12, 2018 at 10:53 AM, Endries, Mark <[mark\\_endries@fws.gov](mailto:mark_endries@fws.gov)> wrote:

Hi Mike, Rebekah,

I've updated the Maxent methodology document. In short, not much has changed. Slight changes to area summaries and percentages but the results are essentially the same.

Please let me know if you have any questions.

I'll next work on the statistical test then work on the population summaries.

Thanks!

Mark

**Mark Endries**

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Office: 828.258.3939 ext. 231  
Mobile: 828.215.1740

--

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Alternate email: [mmarshall@ag.tamu.edu](mailto:mmarshall@ag.tamu.edu)

**Work Schedule 1st Week**

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**Work Schedule 2nd Week**

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**From:** [Endries, Mark](#)  
**To:** [Marshall, Michael E](#)  
**Cc:** [Reid, Rebekah N](#)  
**Subject:** Re: Updated Maxent Methodology  
**Date:** Thursday, April 12, 2018 11:39:15 AM  
**Importance:** High

---

Oops, 2005 is the cutoff date. I don't think I actually modified that from the original doc.

Mark

**Mark Endries**

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Asheville, NC 28801  
Office: 828.258.3939 ext. 231  
Mobile: 828.215.1740

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**From:** [Endries, Mark](#)  
**To:** [Marshall, Michael E](#)  
**Cc:** [Reid, Rebekah N](#)  
**Subject:** Re: Updated Maxent Methodology  
**Date:** Thursday, April 12, 2018 11:48:40 AM  
**Importance:** High

---

I also forgot to mention that in the Maxent write-up you'll notice a couple of added variables from the original Maxent model. I added **Solar Radiation**, **Canopy Cover**, and **Canopy Height** to the mix. Solar Radiation measures how much sun reaches each pixel over the year. Canopy Cover is the density of green vegetation, and Canopy Height is the height of the vegetation. Only Canopy Cover made it into the final model and was the least contributing variable present. So the further exploration of additional variables resulted in a minor change to the conclusions.

Thanks!

Mark

**Mark Endries**

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160 Zillicoa St  
Asheville, NC 28801  
Office: 828.258.3939 ext. 231  
Mobile: 828.215.1740

On Thu, Apr 12, 2018 at 11:39 AM, Endries, Mark <[mark\\_endries@fws.gov](mailto:mark_endries@fws.gov)> wrote:  
Oops, 2005 is the cutoff date. I don't think I actually modified that from the original doc.

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**Mark Endries**

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Thanks!

Mark

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**From:** [L L Gaddy](#)  
**To:** [Reid, Rebekah N](#)  
**Subject:** [EXTERNAL] Re: Peer Review for Species Status Assessment  
**Date:** Monday, April 23, 2018 10:33:35 AM  
**Importance:** High

---

Thanks for the heads up.

Chick Gaddy

On Mon, Apr 23, 2018, 10:05 AM Reid, Rebekah <[rebekah\\_reid@fws.gov](mailto:rebekah_reid@fws.gov)> wrote:

All,

You will likely be receiving an email from the US Fish and Wildlife Service asking for your participation in the Peer Review of the Species Status Assessment for *Hexastylis naniflora*. Please consider participating as your comments and input will be a valuable asset to the document.

Please do not hesitate to contact me with any questions. Thank you.

Rebekah Reid

US Fish and Wildlife Service  
Asheville Ecological Services Field Office  
160 Zillicoa St.  
Asheville, NC 28801  
phone: 828-258-3939 x238  
cell: 828-782-0090

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**From:** [Marshall, Michael E](#)  
**To:** [Reid, Rebekah N](#)  
**Subject:** HENA SSA--expert review  
**Date:** Monday, April 23, 2018 10:51:48 AM  
**Importance:** High

---

Hi Rebekah,

Are you comfortable with me sending out the draft SSA for expert team review? I've incorporated your suggestions for the future condition section and replaced a figure in Chapter 2 with a new one Mark made. If you're good with it, I'll send along asap.

Thanks!

Mike

--

Mike Marshall  
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**From:** [Reid, Rebekah N](#)  
**To:** [Marshall, Michael E](#)  
**Subject:** Re: HENA SSA--expert review  
**Date:** Monday, April 23, 2018 10:58:29 AM

---

Mike,

I saw you asked that and I didn't respond. Sorry, this morning has been crazy. Yes, I'm OK with you sending it along.

One thing Mark and I talked about was minimizing or taking out references to the old model that ASU did for DOT. We never received the model and we really don't know how it was created. That coupled with the fact that DOT is working on a new model for their purposes leads us to assume that DOT doesn't take much stock in the one ASU created. I don't think this needs to be addressed for the Tech Team review but maybe we consider removing it for the peer review and final draft. We can talk about it more later.

I plan to print the entire document and read through everything this week or early next.

Thanks.

Rebekah Reid

US Fish and Wildlife Service  
Asheville Ecological Services Field Office  
160 Zillicoa St.  
Asheville, NC 28801  
phone: 828-258-3939 x238  
cell: 828-782-0090

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On Mon, Apr 23, 2018 at 10:51 AM, Marshall, Michael <[michael\\_marshall@fws.gov](mailto:michael_marshall@fws.gov)> wrote:  
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Thanks!

Mike

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**From:** [Endries, Mark](#)  
**To:** [Marshall, Michael E](#)  
**Cc:** [Reid, Rebekah N](#)  
**Subject:** Change permissions to Final Drafts folder  
**Date:** Monday, April 23, 2018 1:24:52 PM  
**Importance:** High

---

Hi Mike,

Could I get edit permissions to the Final Drafts folder? I want to upload my commented draft but am not currently allowed.

Draft Looks good!

My initial comments all done through track changes and comments. Most are comments, but there is are a few very minor changes to the text.

Probably the biggest comment I have included is the use of the DOT model (Wagner 2015). Rebekah and I both could not find any supporting material on it and I couldn't make sense of the nuts and bolts of the model. Given that I'd suggest removing the bulk of it from the document and use our model in it's place. You'll see in the comments once I post the doc.

One additional overall comment is that the tables all need to be formatted to a single style. I kind of figured you already knew to do this.

I plan to spend some more time reading and commenting, but wanted to get my first run overview to you quickly.

Thanks!

Mark

**Mark Endries**

USEWS  
160 Zillicoa St  
Asheville, NC 28801  
Office: 828.258.3939 ext. 231  
Mobile: 828.215.1740

**From:** [Marshall, Michael E](#)  
**To:** [Endries, Mark](#)  
**Cc:** [Reid, Rebekah N](#)  
**Subject:** Re: Change permissions to Final Drafts folder  
**Date:** Monday, April 23, 2018 1:54:26 PM  
**Importance:** High

---

Hi Mark,

I went in and changed the permissions on the google drive folder....here's the link in case that changed. [https://drive.google.com/drive/folders/1JU16oapIvML\\_Foe\\_FrXi9WjnprXsihqG?usp=sharing](https://drive.google.com/drive/folders/1JU16oapIvML_Foe_FrXi9WjnprXsihqG?usp=sharing)

Rebekah mentioned the model and paring that down a bit....sounds good to me. I figured I'd let the Experts comment on that as well....so will send out with that included for now, but with the idea that we will likely take a lot of that out.

So...the path forward, if that's ok with you is: I'm going to send this out really soon. I'll take both of your comments, along with the experts comments and revise over the next couple of weeks.

Thanks!

Mike

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**From:** [Endries, Mark](#)  
**To:** [Marshall, Michael E](#)  
**Cc:** [Reid, Rebekah N](#)  
**Subject:** Re: Change permissions to Final Drafts folder  
**Date:** Tuesday, April 24, 2018 6:47:59 AM  
**Importance:** High

---

Hi Mike,

Sounds great to me. Draft is uploaded.

Thanks!

Mark

**Mark Endries**

USFWS  
160 Zillicoa St  
Asheville, NC 28801  
Office: 828.258.3939 ext. 231  
Mobile: 828.215.1740

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**From:** [Becker, Drew N](#)  
**To:** [Stephanie DeMay](#)  
**Cc:** [Reid, Rebekah N](#); [Marshall, Michael E](#)  
**Subject:** Re: [EXTERNAL] SMART analysis HENA thoughts  
**Date:** Tuesday, June 19, 2018 8:53:41 AM  
**Importance:** High

---

Hi All,

I think Stephanie's suggest path forward, i.e. changing the name makes sense. No need to hang onto the term SMART (i.e. simple additive weighting) if we can still hang onto our analysis and results.

Thanks for doing some research and providing us your opinion on the matter Stephanie, your smart (i.e. having or showing quick-witted intelligence).

Drew

**Drew Becker**  
Assistant Field Supervisory (Detail)  
Tennessee Ecological Services Field Office  
931-525-4982

Recovery Coordinator  
U.S. Fish and Wildlife Service  
Southeast Region  
1875 Century Boulevard  
Atlanta, GA 30345  
404-679-7226  
[drew\\_becker@fws.gov](mailto:drew_becker@fws.gov)

*Our Mission is to work with others to conserve, protect and enhance fish, wildlife and plants and their habitats for the continuing benefit of the American people.*

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On Mon, Jun 18, 2018 at 4:49 PM, Stephanie DeMay <[Stephanie.DeMay@ag.tamu.edu](mailto:Stephanie.DeMay@ag.tamu.edu)> wrote:

Hi all,

After talking with Drew today, I did some reading up on SMART analysis and the HENA SSA and did some thinking. Below are my official thoughts on the issue at hand, that you are welcome to use in future discussions about this. Let me know if you have any questions, or if I have gotten wrong how the HENA analysis was done.

Steph

Based on what I have been able to read up about SMART analysis, I agree with Angela that SMART (Simple Multi Attribute Rating Technique) isn't the most appropriate tool to use for the HENA SSA task of identifying EOs that potentially could still harbor extant populations. I do understand the argument that it could be, or could easily be morphed into, a decision context. However, I believe that the analysis that was conducted is valid and justifiable, and that present concerns could be alleviated by changing how the analysis is presented, specifically, by not calling it a SMART analysis.

A large component of SMART has to do with the decision context, such as identifying the decision maker, determining objectives of the resulting decision, coming up with alternatives, etc. This is more than is needed for the task at hand, the simpler task of ranking a pre-defined set of habitat patches on their likelihood of supporting extant HENA based on multiple factors. The ranking method used in the SSA was "simple additive weighting". This is also considered a decision analysis tool, but at its core, it is a just ranking tool that lacks the decision context baggage that comes with SMART. With simple additive weighting, different attributes of an object of comparison are measured, these values are normalized and weighted based on some kind of expert opinion or other justification, and a weighted sum is calculated for each option so that multiple attributes are combined into a single score. This is a basic and intuitive tool that is applicable to a myriad of situations, including the present situation, and is not bound to being used only in decision support settings. It could be used to rank the best burgers in town based on size, texture, toppings, and price. This information could be used in a decision context for a hungry and indecisive biologist (who would also have the alternative of eating pizza or something else not a burger), but a decision context is not necessary. The analysis and results are valuable and relevant even if the only objective is to create a ranked list of burgers. This is a similar objective to the HENA analysis; the objective was to create a ranked list to identify the top most suitable habitat patches from a pre-defined set, and the simple additive weighting analysis that was conducted accomplished that objective.

Smith, P.G. and Theberge, J.B., 1987. Evaluating natural areas using multiple criteria: theory and practice. *Environmental management*, 11(4), pp.447-460. <https://link.springer.com/content/pdf/10.1007/BF01867653.pdf>

Simple additive weighting specifically discussed on pages 454-455

Stephanie DeMay, PhD  
Assistant Research Scientist  
Natural Resources Institute, Texas A&M  
[stephanie.demay@ag.tamu.edu](mailto:stephanie.demay@ag.tamu.edu)

**From:** [Reid, Rebekah N](#)  
**To:** [Becker, Drew N](#)  
**Subject:** Follow-up on HENA  
**Date:** Friday, June 29, 2018 7:06:04 AM  
**Importance:** High

---

Hi Drew,

How did the meeting go on Monday? Do we need to change the language on the SMART analysis?

Thanks.

Rebekah Reid

US Fish and Wildlife Service  
Asheville Ecological Services Field Office  
160 Zillico St.  
Asheville, NC 28801  
phone: 828-258-3939 x238  
cell: 828-782-0090

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**From:** [Becker, Drew N](#)  
**To:** [Reid, Rebekah N](#)  
**Subject:** Re: Follow-up on HENA  
**Date:** Friday, June 29, 2018 12:26:15 PM  
**Importance:** High

---

Hey Rebekah,

Didn't happen. But yes I think we need to remove smart but keep the analysis part. Call with questions.

Drew

**Drew Becker**  
Recovery Coordinator  
U.S. Fish and Wildlife Service  
Southeast Region  
1875 Century Boulevard  
Atlanta, GA 30345  
404-679-7226  
[drew\\_becker@fws.gov](mailto:drew_becker@fws.gov)

*Our Mission is to work with others to conserve, protect and enhance fish, wildlife and plants and their habitats for the continuing benefit of the American people.*

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**From:** [Reid, Rebekah N](#)  
**To:** [Becker, Drew N](#)  
**Subject:** Re: Follow-up on HENA  
**Date:** Friday, June 29, 2018 12:40:33 PM

---

Thanks, Drew. I'll work on it.

Have a great 4th!

Rebekah Reid

US Fish and Wildlife Service  
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**From:** [Reid, Rebekah N](#)  
**To:** [Endries, Mark](#); [Marshall, Michael E](#)  
**Subject:** Question about SLEUTH Data  
**Date:** Tuesday, January 7, 2020 1:11:44 PM

---

Mark and Mike,

I need a little help. Byron Hamilton in the RO has asked for my help answering some questions/comments from HQ about HENA. Below is an excerpt from the doc they are reviewing. The part in yellow is subject to the comment.

- The SLEUTH model has been successfully applied worldwide over the last 15 years to simulate land use change, including urbanization (Clarke 1995, entire). The SLEUTH model predictions are broken down by probabilities of urbanization, ranging from 0 to 100 percent. We chose 80 percent probability as our cutoff, as this cutoff has been used by USGS and by us in other SSAs, and this threshold represents a highly likely outlook for urbanization of the landscape.

And, the comment:

- This is not the strongest rationale, is there a particular reason that we and USGS used this threshold? Note that our foreseeable future reg uses the term “likely” which means “more likely than not” which can be interpreted as 51%.

Can ya'll help me beef up the rational? Thanks.

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**From:** [Marshall, Michael E](#)  
**To:** [Reid, Rebekah N](#)  
**Cc:** [Endries, Mark](#)  
**Subject:** Re: Question about SLEUTH Data  
**Date:** Tuesday, January 7, 2020 2:10:48 PM  
**Importance:** High

---

Hi Rebekah!

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Sorry for the confusion. I'll get back to you asap.

Thanks,

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Mike Marshall  
SSA Program Specialist  
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Cell: 512-461-6217  
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**Date:** Tuesday, January 7, 2020 2:33:48 PM  
**Importance:** High

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Mark

**Mark Endries**

USFWS  
160 Zillicoa St  
Asheville, NC 28801  
Office: 828.258.3939 x42231  
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**From:** [Reid, Rebekah N](#)  
**To:** [Endries, Mark](#)  
**Cc:** [Marshall, Michael E](#)  
**Subject:** Re: Question about SLEUTH Data  
**Date:** Tuesday, January 7, 2020 2:47:00 PM

---

Thanks, guys. It has been forever...kick-off was this time in 2018!

Yes, we can wait until next week. I appreciate the help.

I think if we can cite those documents that back us up and quantify the difference between 50 and 80 (if possible) that would be great.

I also got a question about foreseeable future being based on data. If I remember correctly, our future timeframe was linked to our confidence in the data used for modeling. Mark - when you get back, I'll hit you up for info on that, too.

Rebekah Reid

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**From:** [Endries, Mark](#)  
**To:** [Reid, Rebekah N](#)  
**Subject:** SLEUTH  
**Date:** Tuesday, January 14, 2020 2:05:48 PM  
**Importance:** High

---

Perhaps Michael was referencing this with SLEUTH. It comes out of the LCC network and includes Gulf Ozarks and South Atlantic.

<https://www.sciencebase.gov/catalog/item/583c49e9e4b0d9329c80c266>

We can say we used the cut off based upon how it was used by Landscape Conservation Cooperatives in the Southeast and reference the data link.

Looking at the HENA population areas only, SLEUTH2040:

176.07 acres already developed or with an 80% or greater chance of development

22.55 acres with a 50-70% chance of development.

The percent difference  $(22.55/(176.07+22.55))$  is **11.35%**

The percentage change in total population area  $(22.55/595.8)$  is **3.78%**

Mark

**Mark Endries**

USEWS

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**From:** [Endries, Mark](#)  
**To:** [Reid, Rebekah N](#)  
**Subject:** Re: SLEUTH  
**Date:** Tuesday, January 14, 2020 2:17:26 PM  
**Attachments:** [image.png](#)  
**Importance:** High

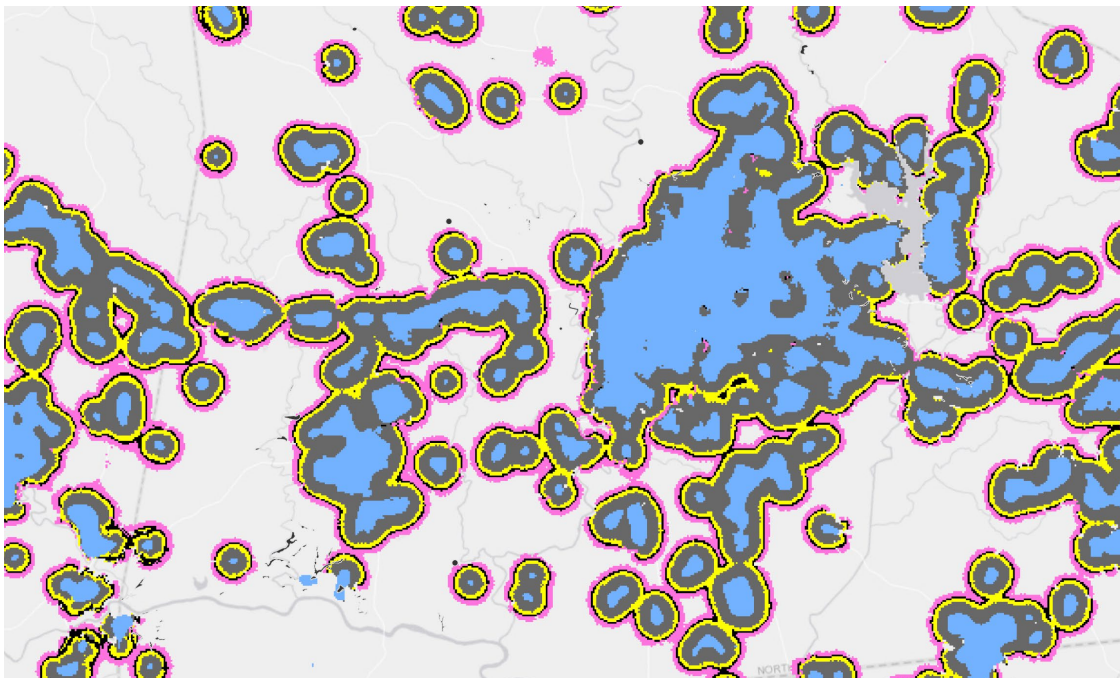
---

Hi Rebekah,

I forgot to link the spreadsheet where I got those numbers. It's here: S:\Staff\Rebekah and called Sleuth 2040 area estimates by HENA population.

Also, here's a picture to visualize SLEUTH.

Blue is already urban, grey is 100% chance of urban, yellow is 80-97.5% urban, Black is 50-70% urban, Pink is everything less than 50%.



**Mark Endries**

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160 Zillicoa St  
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Office: 828.258.3939 x42231  
Mobile: 828.215.1740

On Tue, Jan 14, 2020 at 2:05 PM Endries, Mark <[mark\\_endries@fws.gov](mailto:mark_endries@fws.gov)> wrote:

Perhaps Michael was referencing this with SLEUTH. It comes out of the LCC network and includes Gulf Ozarks and South Atlantic.

<https://www.sciencebase.gov/catalog/item/583c49e9e4b0d9329c80c266>

We can say we used the cut off based upon how it was used by Landscape Conservation Cooperatives in the Southeast and reference the data link.

Looking at the HENA population areas only, SLEUTH2040:

176.07 acres already developed or with an 80% or greater chance of development

22.55 acres with a 50-70% chance of development.

The percent difference  $(22.55/(176.07+22.55))$  is **11.35%**

The percentage change in total population area  $(22.55/595.8)$  is **3.78%**

Mark

**Mark Endries**

USFWS

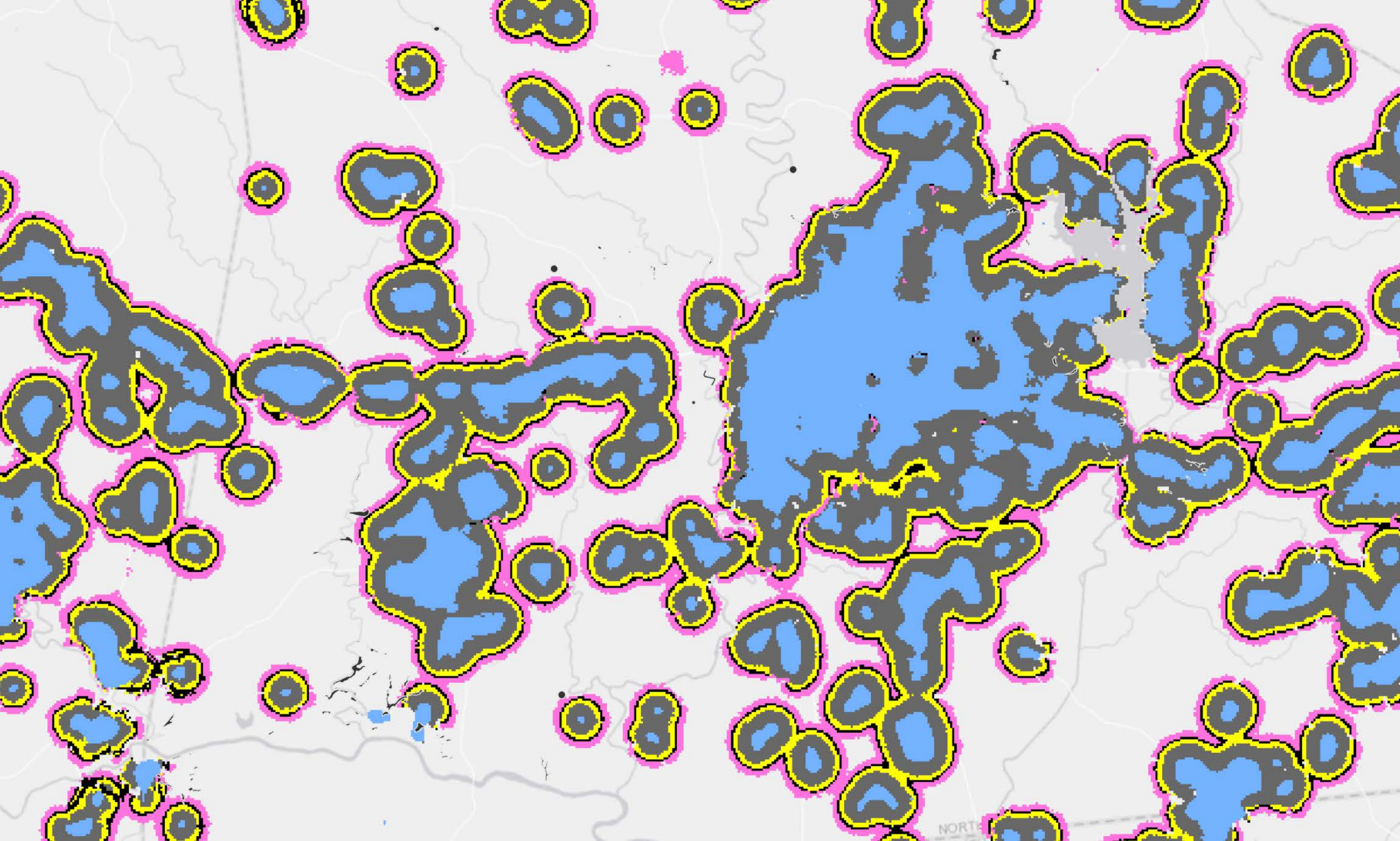
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**From:** [Endries, Mark](#)  
**To:** [Reid, Rebekah N](#)  
**Subject:** Re: SLEUTH  
**Date:** Tuesday, January 14, 2020 2:17:26 PM  
**Attachments:** [image.png](#)  
**Importance:** High

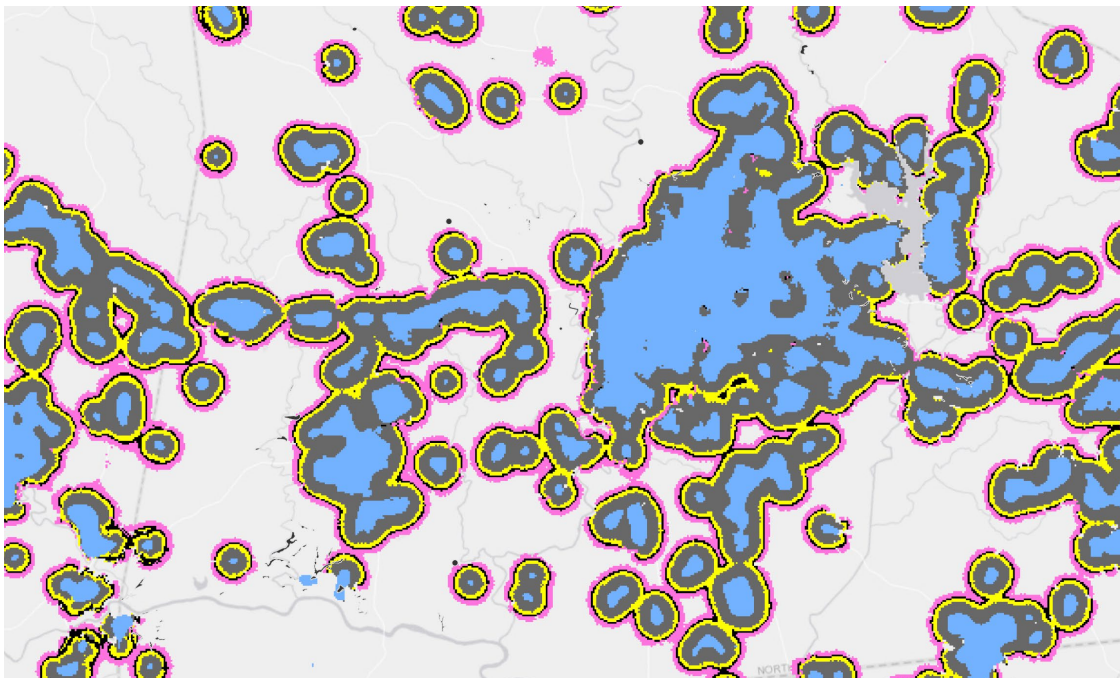
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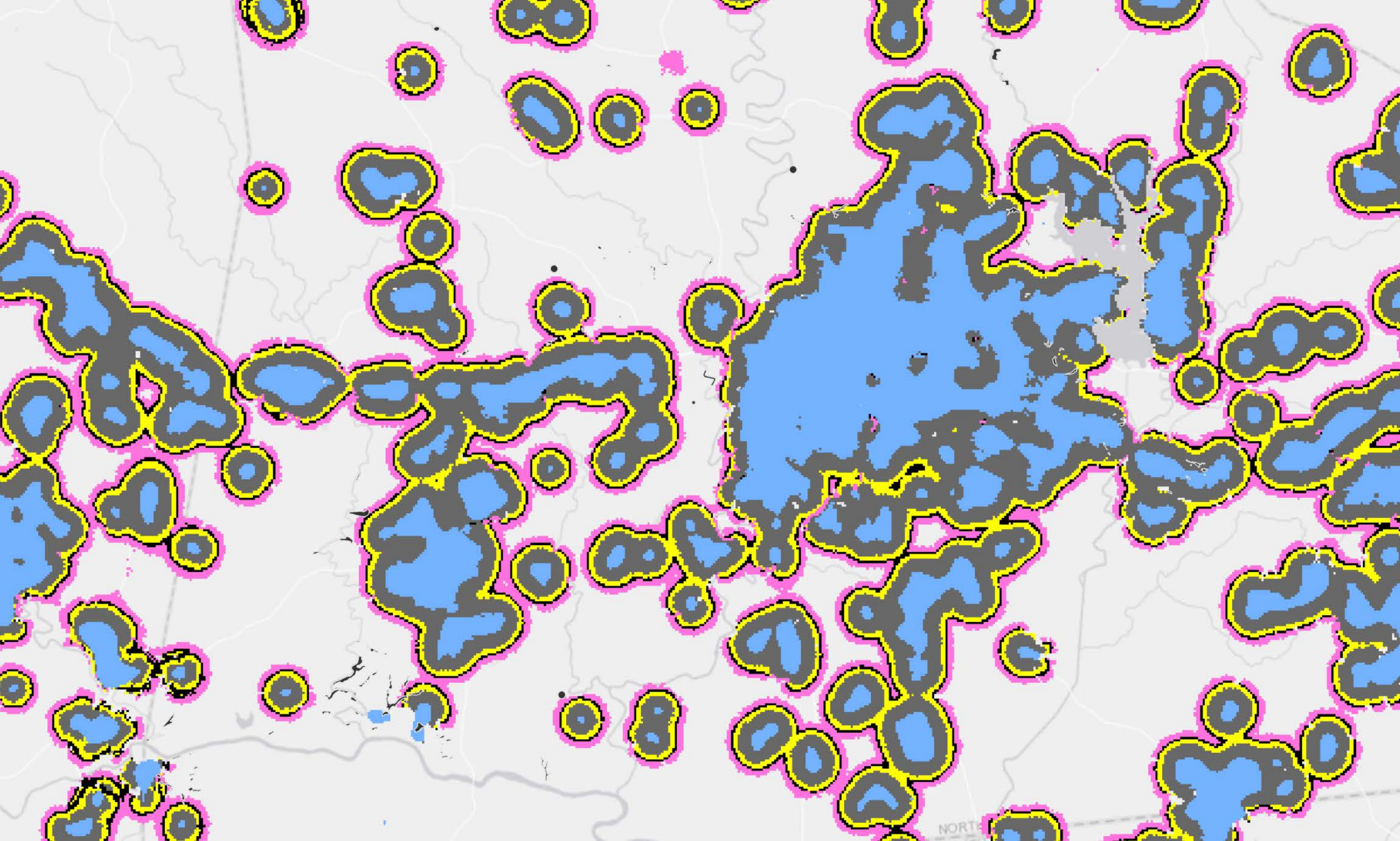
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**From:** [Endries, Mark](#)  
**To:** [Reid, Rebekah N](#)  
**Subject:** SLEUTH  
**Date:** Tuesday, January 21, 2020 2:23:09 PM  
**Importance:** High

---

This supports your question earlier today:

Early on in SLEUTH's history, attention was paid to temporal sensitivity. Candau (2002) proved that SLEUTH gives superior results when used with short histories and shorter forecast horizons than longer. A long history produces a less convincing short term forecast than a short one.

Candau, J.C., 2002. Temporal Calibration Sensitivity of the SLEUTH Urban Growth Model. M.A. Thesis. University of California, Santa Barbara.

Mark

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**From:** [Reid, Rebekah N](#)  
**To:** [Endries, Mark](#)  
**Subject:** Re: SLEUTH  
**Date:** Tuesday, January 21, 2020 2:30:48 PM

---

Thank you. Did you get a copy? I can only find citations or subscription-based access.

Rebekah Reid

US Fish and Wildlife Service  
Asheville Ecological Services Field Office  
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Asheville, NC 28801  
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cell: 828-782-0090

***NOTE: This email correspondence and any attachments to and from this sender is subject to the Freedom of Information Act (FOIA) and may be disclosed to third parties.***

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Mark

**Mark Endries**

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**From:** [Endries, Mark](#)  
**To:** [Reid, Rebekah N](#)  
**Subject:** Re: SLEUTH  
**Date:** Tuesday, January 21, 2020 3:00:24 PM  
**Importance:** High

---

No I didn't I read that bit from another article that cited it.

Mark

**Mark Endries**

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On Tue, Jan 21, 2020 at 2:31 PM Reid, Rebekah <[rebekah\\_reid@fws.gov](mailto:rebekah_reid@fws.gov)> wrote:  
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Rebekah Reid

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