

**Plant Species Differences and ‘Soil Test’ Measurable Plant
Nutrient Differences between “Bean Dips” and the
Periphery Soils in the North Carolina Sandhills Gamelands**

**Independent Study Project
Native Plant Studies Certificate Program**

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Abstract

The “Dry Longleaf Pineland” natural community comprises much of the North Carolina Sandhills Gamelands as inventoried by the North Carolina Natural Heritage Program. Within this natural community there are small areas that are anomalous due to their plant species composition. Some plant species, many of them of the Fabaceae (legumes), appear to only occur in these areas. As a result, these areas are called “bean dips” (or “pea swales”). It is hypothesized that these “bean dips” have more fertile soil.

It was the purpose of this Independent Study Project to evaluate these two contentions. Twelve “bean dip” sites were visited. Each “bean dip” and its associated periphery (surrounding) area were evaluated separately for both soil fertility and plant species composition.

Results showed that “bean dips” had decidedly more fertile soil than the periphery areas. Three quarters of all plant species observed within either “bean dips” or peripheries were from the Asteraceae, Fabaceae, and Poaceae. Fabaceae species especially, and also Poaceae species, were more likely to be found in “bean dips” than in peripheries. Asteraceae species were about evenly distributed between “bean dips” and peripheries and were prominent in peripheries. The plant species that occurred at more than three sites were mutually exclusive between “bean dips” and peripheries and, except for one species, were all from the Asteraceae, Fabaceae, or Poaceae. Plant species from several other plant families, in addition to some Fabaceae and Asteraceae species, were somewhat site-specific, occurring at only one to three sites.

Analysis of the data proved the two contentions to be true.

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Introduction

The North Carolina (NC) Botanical Garden requires an Independent Study Project for completion of its Native Plant Certificate Program. The project is to address a question of some importance to botanists. My Independent Study Project title, given above for mostly herbaceous plant species, reflects such a question. Sandhills is a physiographic region that is predominately of windblown sand from the geologic past.

I worked with Bruce Sorrie, Inventory Biologist with the NC Natural Heritage Program and Nicki Cagle, Duke University. Assistance was also provided by the NC Wildlife Resources Commission, which administers the NC Sandhills Gamelands, and the NC Department of Agriculture and Consumer Services Agronomic Division, which analyzed my soil samples.

Bruce Sorrie worked extensively in the Sandhills Gamelands as a botanist. He recently authored a field guide* of the herbaceous wildflowers and grasses of the physiographic Sandhills of North Carolina, South Carolina, and Georgia. In his field guide he identifies 9 natural communities. He refers to primary plant species which are those species expected to be in a particular natural community. They are not necessarily endemic (restricted) to that natural community or to the Sandhills region for that matter. In his book Bruce Sorrie lists only 9 plant species which are endemic to the Sandhills region. Of the 87 plant species observed in this project only one species, Sandhills Blazing-star (*Liatris cokeri*), was endemic.

According to the above field guide the “Dry Longleaf Pineland” natural community is the most prevalent and best represents the NC Sandhills Gamelands. (An alternative nomenclature is “Xeric Sandhill Scrub, Sandhills Variant” as found on p. 131 of the publication noted below with **). In “Dry Longleaf Pineland” are “bean dips” (BD), sometimes expressed as “pea swales”. BD are slight depressions in the landscape, without permanent or intermittent streams. Predominately the BD are elliptical in shape with the long axis being the major drainage pathway. BD vary in size from one quarter acre to more than 10 acres. They are not necessarily wetter than the surrounding soil. Past alluvial or colluvial soil activity appear, in varying degrees, to have occurred in BD. From previous observations two differences were assumed between BD and the periphery (surrounding) soils (P). They are: (1) the soil in BD is more fertile than in P because it is darker and (2) BD have many more legume (Fabaceae) species than occur in P. This Independent Study Project will test these two assumptions as well as the degree by which BD and P are mutually exclusive in terms of plant species composition and soil fertility properties.

**A Field Guide to Wildflowers of the Sandhills Region: North Carolina, South Carolina, Georgia*. Bruce A. Sorrie. 2011. 378 pp. The University of North Carolina Press. 116 S. Boundary Street, Chapel Hill, NC 27514-3808. ISBN: 978-0-8078-7186-7.

***Classification of the Natural Communities of North Carolina: Third Approximation*. Michael P. Schafale and Alan S. Weakley. 1990. 321 pp. North Carolina Natural Heritage Program, Department of Environment and Natural Resources, Raleigh, NC 27699-1601. MSC 1601.

Materials and Methods

Bruce Sorrie and I visited twelve (12) BD sites in the NCWC Sandhills Gamelands. They are located in both Richmond Co. and Scotland Co. (Appendix A). Bruce Sorrie randomly selected these sites based both upon his previous inventory work there and a desire to represent as much of the Sandhills Gamelands as possible. Our field work consisted of two days, October 3 and October 16, 2012. Katie Walsh, a botanist from Pinehurst, assisted on October 16.

Each site had two soil sampling locations. They were: (1) BD -- within a 5 meter by 10 meter plot (its center being the point location and the long axis being the same as the major drainage pathway) and (2) P -- at least 10 meters from the overall “bean dip” and encircling the “bean dip” as much as possible. A point location on the ground was chosen to best represent a given BD. For that point GPS coordinates were determined. Twelve sites were chosen to provide significant statistical “power” to make the results worthwhile as well as to fit within an allotted two field days. The Independent Study Project consisted of two parts, (I) Soils and (II) Plants. Soils are discussed first because they provide background information that would pertain to a discussion of the plants.

I. Soils

Composite soil samples, consisting of at least 8 subsamples, were taken randomly for both BD and P. Care was taken to avoid sampling in field crop or road areas for P. The sampling depth was the first 3 inches of soil. The subsamples were collected in a plastic bucket, afterwards thoroughly mixed, and then put into a pint-sized plastic bag that was identified for that composite soil sample. Later, in turn, 3 random subsamples were taken from each composite sample bag. Each subsample filled a standard soil sample box and served as a laboratory replication. A fourth subsample was saved for any additional, and presently undetermined, analysis. All sample boxes were then delivered to the NCDA&CS Agronomic Division Soil Testing Section for analysis. The Section used the Mehlich-3 Extraction procedure for the various analyses. The mean of the 3 replications hopefully accounted for laboratory variation and could make possible future, more sophisticated, statistical analysis more “robust”. Soil texture (mineral soil exclusive of organic matter content and determined by the “feel” method) for all BD and P subsamples, occurred randomly as either sand or loamy sand and was not further evaluated.

The statistical design for the soil analyses was a paired t-test which compared the means of the 3 BD subsamples and the three P subsamples for each of the 12 sites. Consequently, the design used 72 soil samples. The formula for a paired t-test is the following:

$$t = \frac{\sum d}{\sqrt{\frac{n(\sum d^2) - (\sum d)^2}{n-1}}}$$

$\sum d$ – sum of the differences

$\sum d^2$ – sum of the differences squared

n – number of samples

t – t statistic

The soil analyses provided data for 15 soil properties (independent variables). These properties were: HM% (% humic matter), W/V (weight per volume), CEC (cation exchange capacity), BS% (% CEC occupied by basic cations), Ac (exchangeable acidity), pH (current soil pH), P-I (phosphorus index),

K-I (potassium index), Ca% (% CEC occupied by calcium), Mg% (% CEC occupied by magnesium), S-I (sulfur index), Mn-I (manganese index), Zn-I (zinc index), Cu-I (copper index), and Na (sodium).

II. Plants

The native herbaceous (and tree) species were identified for both BD and P at each of the 12 sites. There was no counting of individuals for a species. *A Field Guide to Wildflowers of the Sandhills Region: North Carolina, South Carolina, Georgia*, as well as Bruce Sorrie’s tutelage, were most valuable in my plant species identification.

Results and Discussion

I. Soil Test Results

It is beyond the scope and purpose of this paper to explain the units of the soil property measurements. However, these measurements can be used as tools of comparison. The following results are from Table 1 with the abbreviations defined in the table.

BD are more fertile than P. At the 1 percent significance level BD have greater CEC, BS%, Ca%, Mg%, and K-I, as represented by higher pH. Also at the 1% significance level there is a greater Mn-I and Zn-I. Cu-I is higher at the 5 percent significance level. At the 10% significance level there is a greater P-I and S-I. Any difference in Na between BD and P is not significant, perhaps due to low amounts. At the 1 percent significance level BD also have greater HM% which probably enhances soil fertility and increases water-holding capacity and less W/V which makes for a more friable soil. The difference between BD and P for Ac is not significant.

It appears that the processes of colluvial and alluvial deposition in BD soils resulted in more fertile, more friable, and greater water-holding capacity conditions than for P soils.

Table 1

Colored Coded According to the Following:

Red – Any entries for Bean Dips (BD)

Green – Any entries for Peripheries (P)

Soil Property	Description	BD Mean	P Mean	t Statistic	Sig. Level
K-I	Potassium Index	16.58	10.67	5.85	**
pH	Current Soil pH	5.19	4.58	5.578	**
Mn-I	Manganese Index	719	149	5.452	**
BS%	% CEC Occupied by Basic Cations	45.75	24.5	5.284	**
Ca%	% CEC Occupied by Calcium	36.9	18.4	5.127	**

Soil Property	Description	BD Mean	P Mean	t Statistic	Sig. Level
CEC	Cation Exchange Capacity	5.8	4.13	4.409	**
HM%	% Humic Matter	1.71	1.09	4.083	**
Zn-I	Zinc Index	50.8	27.9	3.877	**
Mg%	% CEC Occupied by Magnesium	7.42	4.83	3.522	**
W/V	Weight per Volume	1.07	1.25	3.445	**
Cu-I	Copper Index	49.9	26.6	2.441	*
S-I	Sulfur Index	31.75	27.33	1.78	#
P-I	Phosphorus Index	8.25	6	1.562	#
Na	Sodium	0.11	0.1	0.957	NS
Ac	Exchangeable Acidity	3.142	3.125	0.06	NS

** t (11,0.005) = 3.106
* t (11,0.025) = 2.201
t (11,0.10) = 1.363
NS Not Significant

II. All Observed Plant Species as reflecting the “Dry Longleaf Pineland” Natural Community and whether found only in BD, only in P, or in both

Prior identification of primary plant species for the “Dry Longleaf Pineland” natural community was quite inclusive as confirmed by this project. From Table 2 can be seen that 69% of the plant species found at the 12 sites are primary for the “Dry Longleaf Pineland” natural community. (As used in *A Field Guide to Wildflowers of the Sandhills Region: North Carolina, South Carolina, Georgia*, “primary” means that a plant species was considered most likely to be found in a designated natural community). Of these primary plant species roughly one-half (29/60) were found exclusively in BD (colored-coded red), one-quarter (15/60) in P (color-coded green), and one-quarter (16/60) in both BD and P (color-coded blue). This same approximate relationship carried over for all (100%) of the plant species observed for this project. However, for the 31% of the plant species that are not-primary, the relationship changes somewhat. These plant species have a *greater* chance of being found in BD. Roughly three-fifths (16/27) of these species were found exclusively in BD, one-fifth in P (6/27), and one fifth (5/27) in both BD and P. Perhaps BD provide habitats that are more similar to other natural communities than P. Plant species, more suited to the soil conditions of other natural communities, may find that these conditions are met better in BD than in P.

Table 2

Bold Type – Listed as a Primary “Dry Longleaf Pineland” Natural Community Component

Italicized Type – Not Listed as a Primary “Dry Longleaf Pineland” Natural Community Component

Colored Coded According to the Following:

Red – Occurred in 1 to 12 Bean Dip Sites and 0 Periphery Sites

Blue -- Occurred in at least one Bean Dip Site and in at least one Periphery Site

Green -- Occurred in 1 to 12 Periphery Sites and 0 Bean Dip Sites

Primary Plant Species for Dry Longleaf Pineland Natural Community	No. of Plant Species	% of Total Plant Species
Found in Bean Dip Only	29	34
Found in Both Bean Dip and Periphery	16	18
Found in Periphery Only	15	17
Total	60	69
<i>Not Primary Plant Species for Dry Longleaf Pineland Natural Community</i>	<i>No. of Plant Species</i>	<i>% of Total Plant Species</i>
<i>Found in Bean Dip Only</i>	<i>16</i>	<i>18</i>
<i>Found in Both Bean Dip and Periphery</i>	<i>5</i>	<i>6</i>
<i>Found in Periphery Only</i>	<i>6</i>	<i>7</i>
<i>Total</i>	<i>27</i>	<i>31</i>
Total	87	100

Slightly more than 75 percent of all of the plant species observed in this project can be found in BD (add all red and blue percentages and divide by 87) and slightly less than 50 percent are observed in P (add all green and blue percentages and divide by 87). As a result, BD have greater plant species diversity than P.

III. High and Medium Occurrence Plant Species in Bean Dips

A High Occurrence of a plant species for the evaluated BD was when that species occurred in more than one-half (7 to 12) of the 12 sites. If the assumption is made that these 12 BD are representative of all BD in the NC Sandhills Gamelands, then it is likewise assumed that there is at least a 50 percent probability that those species could be found in any other BD site. In like manner, a Medium Occurrence of a plant species for the evaluated BD was when that species occurred in one-quarter to one-half (4 to 6) of the 12 sites. Again, if the assumption is made that these 12 BD are representative of all BD in the NC Sandhills Gamelands, then it is likewise assumed that there is a 25 to 50 percent probability that those species could be found in any other BD site. In order to simplify the discussion for this project, those

species that occurred in less than one-quarter (1 to 3) (Low Occurrence) of the BD for the 12 sites will not be discussed in this section. However, they can be referenced in Appendix B (Alphabetical Listing of All Observed Plant Species).

Eleven High Occurrence plant species occurred in the evaluated 12 BD (Table 3). The top contender was Eastern Silvery-aster (*Aster [Symphiotrichum] concolor*) which was present at 11 sites. From Table 3 it can be seen by the blue color-coding that this species, as well as 3 others, can also occur in P. The remaining 7 other species are color-coded red to indicate that they were only found in BD. The bold type used for Eastern Silvery-aster indicates that it is listed as a primary “Dry Longleaf Pineland” plant species. Eight of the other species are indicated likewise. By being italicized the remaining 2 species are noted as not-primary.

There are 10 Medium Occurrence plant species. Three species occurred also in P (blue color-coding), but 7 were found exclusively in BD (red color-coding). Six of the 10 species are primary for “Longleaf Pineland”, the remaining 4 species are not-primary

Five of the 11 High Occurrence plant species are in the Poaceae, 4 are in the Asteraceae, one is in the Anacardiaceae, but only one species, Sensitive Partridge-pea/Wild Sensitive-plant (*Chamaecrista (Cassia) nictitans*), is found in the Fabaceae. For the Medium Occurrence plant species, 7 of the 10 species are in the Fabaceae (including 5 *Desmodium* species), 2 in the Poaceae, and one in the Asteraceae. There was no individual plant species that was either High or Medium Occurrence in BD that was also High or Medium Occurrence in P.

A particular Fabaceae species, when perhaps abundant in any given BD (undetermined by this project), may not be consistently present across many BD. This may be due to its seeds not being wind-dispersed. However, more total Fabaceae species (greater species diversity) will be observed among all BD than either total Asteraceae or total Poaceae species. The Asteraceae and Poaceae species are widespread across the NC Sandhills Gamelands, perhaps because their seeds are wind-dispersed. The Poaceae species in addition greatly benefit from the fertile soil of the BD. A particular Asteraceae or Poaceae species has more chance (High Occurrence) of being observed across the range of all BD in the NC Sandhills Gamelands than a particular Fabaceae species (Medium Occurrence).

Table 3

Bold Type – Listed as a Primary “Dry Longleaf Pineland” Natural Community Component

Italicized Type – Not Listed as a Primary “Dry Longleaf Pineland” Natural Community Component

Colored Coded According to the Following:

Red – Occurred in 1 to 12 Bean Dip Sites and 0 Periphery Sites

Blue -- Occurred in at least one Bean Dip Site and in at least one Periphery Site

High Occurrence (7 to 12 Sites -- 1st and 2nd Quartiles)

Scientific Name	Plant Family	Common Name	No. Sites
<u>Aster (Symphiotrichum) concolor</u>	Asteraceae	Eastern Silvery-aster	11
<u>Aster (Symphiotrichum) walteri</u>	Asteraceae	Walter's Aster	9
<u>Ageratina (Eupatorium) aromatica</u>	Asteraceae	Small-leaved White Snakeroot	9
<i>Sporobolus clandestinus</i>	Poaceae	Rough Dropseed	9
<u>Andropogon gerardii</u>	Poaceae	Big Bluestem/Turkeyfoot	8
<u>Sorghastrum nutans</u>	Poaceae	Prairie Indiangrass/Yellow Indiangrass	8
<i>Aristida lanosa</i>	Poaceae	Woolly Three-awn	7
<u>Brickellia eupatorioides</u>	Asteraceae	Eastern False-boneset/E. False-eup.	7
<u>Chamaecrista (Cassia) nictitans</u>	Fabaceae	Sensitive Partridge-pea/Wild Sen.-plant	7
<u>Muhlenbergia capillaris</u>	Poaceae	Upland Muhly	7
<u>Rhus michauxii</u>	Anacardiaceae	Michaux's Sumac	7

Medium Occurrence (4 to 6 Sites – 3rd Quartile)

Scientific Name	Plant Family	Common Name	No. Sites
<u>Desmodium nuttallii</u>	Fabaceae	Nuttall's Tick-trefoil	6
<u>Eupatorium album</u>	Asteraceae	White Eupatorium	6
<u>Lespedeza hirta</u>	Fabaceae	Roundleaf Bush-clover	6
<i>Paspalum bifidum</i>	Poaceae	Pitchfork Crowngrass	6
<u>Rhynchosia reniformis</u>	Fabaceae	Dollarweed/Roundleaf Snoutbean	6
<u>Sorghastrum elliottii</u>	Poaceae	Nodding Indiangrass	6
<u>Desmodium ciliare</u>	Fabaceae	Littleleaf Tick-trefoil	5
<i>Desmodium ciliatum</i>	Fabaceae	Unidentified	5
<i>Desmodium paniculatum</i>	Fabaceae	Panicked Tick-trefoil	5
<i>Desmodium glabellum</i>	Fabaceae	Dillenius' Tick-trefoil	4

IV. High and Medium Occurrence Plant Species in Periphery Areas

A High Occurrence of a plant species for the evaluated P was when that species occurred in more than one-half (7 to 12) of the 12 sites. If the assumption is made that these 12 P are representative of all P in the NC Sandhills Gamelands, then it is likewise assumed that there is at least a 50 percent probability that those species could be found in any other P. In like manner, a Medium Occurrence of a plant species for the evaluated P was when that species occurred in one-quarter to one-half (4 to 6) of the 12 sites. Again, if the assumption is made that these 12 P are representative of all P in the NC Sandhills Gamelands, then it is likewise assumed that there is a 25 to 50 percent probability that those species could be found in any other P. In order to simplify the discussion for this project, those species that occurred in less than one-quarter (1 to 3) (Low Occurrence) of the P for the 12 sites will not be discussed in this section. However, they can be referenced in Appendix B (Alphabetical Listing of All Observed Plant Species).

Eight High Occurrence plant species occurred in the evaluated 12 P sites (Table 4). The top contender was Sticky Golden-aster (*Pityopsis aspera*), which was present in 11 sites and again in the Asteraceae. From Table 4 it can be seen by the blue color-coding that this species, as well as 4 others, can also occur in BD. Only 3 of the remaining species are color-coded green to indicate that they were only found in P. The bold type used for Sticky Golden-aster indicates that it is listed as a primary “Dry Longleaf Pineland” plant species. Six of the other species are indicated likewise. By being italicized the one remaining species is noted as not-primary.

There are 5 Medium Occurrence plant species. Only one species occurred also in BD (blue color-coding), and 4 were found exclusively in P (green color-coding). Four of the 5 species are primary for “Longleaf Pineland”, the remaining one species is not-primary

Four of the 8 High Occurrence plant species are in the Asteraceae, 2 are in the Fagaceae, one is in the Ericaceae, but only one species, Common Goat’s-rue (*Tephrosia virginiana*), is found in the Fabaceae. For the five Medium Occurrence plant species, two are in the Fabaceae, two in the Poaceae, and one in the Asteraceae. There was no individual plant species that was either High or Medium Occurrence in P that was also High or Medium Occurrence in BD.

Fabaceae or Poaceae species (almost all Medium Occurrence) were not as widespread the range of all P in the NC Sandhills Gamelands as were Asteraceae species (High Occurrence). Perhaps low soil fertility explains this observation. It appears that Asteraceae species can withstand lower soil fertility than either Fabaceae or Poaceae species (although in both Asteraceae and Poaceae wind seed dispersal is of great importance).

Table 4

Bold Type – Listed as a Primary “Dry Longleaf Pineland” Natural Community Component

Italicized Type – Not Listed as a Primary “Dry Longleaf Pineland” Natural Community Component

Colored Coded According to the Following:

Blue -- Occurred in at least one Bean Dip Site and in at least one Periphery Site

Green -- Occurred in 1 to 12 Periphery Sites and O Bean Dip Sites

High Occurrence (7 to 12 Sites -- 1st and 2nd Quartiles)

Scientific Name	Plant Family	Common Name	No. Sites
<u>Pityopsis aspera</u>	Asteraceae	Sticky Golden-aster	11
<u>Liatris cokeri</u>	Asteraceae	Sandhills Blazing-star	10
<u>Tephrosia virginiana</u>	Fabaceae	Common Goat's-rue	8
<u>Carphephorus bellidifolius</u>	Asteraceae	Sandhill Chaffhead	7
<u>Cirsium repandum</u>	Asteraceae	Sandhill Thistle	7
<u>Gaylussacia dumosa</u>	Ericaceae	Dwarf Huckleberry	7
<u>Quercus incana</u>	Fagaceae	Bluejack Oak	7
<u>Quercus laevis</u>	Fagaceae	(American) Turkey Oak	7

Medium Occurrence (4 to 6 Sites – 3rd Quartile)

Scientific Name	Plant Family	Common Name	No. Sites
<u>Vernonia angustifolia</u>	Asteraceae	Slender Ironweed	5
<u>Aristida stricta</u>	Poaceae	Carolina Wiregrass	4
<u>Baptisia cinerea</u>	Fabaceae	Carolina Wild-indigo	4
<u>Galactia regularis</u>	Fabaceae	Smooth Milkpea/Common Milkpea	4
<u>Sporobolus junceus</u>	Poaceae	Pineywoods Dropseed	4

V. Plant Family Percentages of All Observed Plant Species as a Diversity Measure in Bean Dips and Periphery Areas

There were 86 plant species observed for this project representing 19 plant families. (*Conyz pusilla* is not considered in this section because I could not identify its family). Three plant families, Asteraceae, Fabaceae, and Poaceae accounted for about three-quarters of the total plant species observed, whether in BD or in P or considered as combined data (Table 5).

The percentages of Fabaceae and Poaceae species were separately greater in BD than P. The percentage of Asteraceae species was greater in P than BD. Perhaps wind seed dispersal gave Asteraceae species an advantage in the less fertile P soils versus the advantage that Fabaceae species got in the more fertile BD soils.

In BD the percentage ranking was Fabaceae first, Asteraceae second, and Poaceae third. In P the percentage ranking was Asteraceae first, Fabaceae second, and Poaceae third. For combined BD and P the ranking was Asteraceae species slightly higher than Fabaceae species followed by Poaceae species.

Of the 16 remaining plant families accounted for by this project, 8 were exclusive for BD, 3 were exclusive for P, and 5 occurred in both BD and P. All of these families were Low Frequency. Possibly the Anacardiaceae, Boraginaceae, Cornaceae, Gentianaceae, Juglandaceae, Lamiaceae, Verbenaceae, and Vitaceae, each represented by one species, survive best in the more fertile soil of BD. Conversely, the one species per Apocynaceae, Caryophyllaceae, and Cyperaceae find the less fertile soil of P adequate if

not preferable. The up-to-3 species per Ericaceae, Fagaceae, Lauraceae, Orobanchaceae, and Pinaceae in either BD or P indicate that these plant families tolerate varied soils.

Table 5

Colored Coded According to the Following:

Red – Any entries for Bean Dips (BD)

Green – Any entries for Peripheries (P)

Plant Family	No. of BD Species	% of Total BD Species	No. of P Species	% of Total P Species	No. of Combined Species	% of Total Combined Species
Asteraceae	18	27.27	16	39.02	26	30.23
Fabaceae	20	30.30	9	21.95	24	27.91
Poaceae	11	16.67	5	12.20	13	15.12
[Subtotal]		[74.24]		[73.17]	[63]	73.26
Anacardiaceae	1	1.52			1	1.16
Apocynaceae			1	2.44	1	1.16
Boraginaceae	1	1.52			1	1.16
Caryophyllaceae			1	2.44	1	1.16
Cornaceae	1	1.52			1	1.16
Cyperaceae			1	2.44	1	1.16
Ericaceae	3	4.52	1	2.44	3	3.50
Fagaceae	2	3.02	2	4.88	3	3.50
Gentianaceae	1	1.52			1	1.16
Juglandaceae	1	1.52			1	1.16
Lamiaceae	1	1.52			1	1.16
Lauraceae	1	1.52	1	2.44	1	1.16
Orobanchaceae	2	3.02	3	7.31	3	3.50
Pinaceae	1	1.52	1	2.44	2	2.32
Verbenaceae	1	1.52			1	1.16
Vitaceae	1	1.52			1	1.16
Total	66	100	41	100	86	100.00

VI. Some Final Thoughts of Asteraceae, Fabaceae, and Poaceae

Table 6 provides additional details pertaining to the Asteraceae, Fabaceae, and Poaceae. Information for these plant families is taken direct from Appendix C (All Observed Plant Species by Plant Families).

A greater percentage of either the total Fabaceae or total Asteraceae species were of Low Occurrence as compared to the total Poaceae species, thus showing, for whatever reason, a greater tendency for site specificity.

Of the total 26 Asteraceae species observed in this project, 38.5% (10/26) occurred only in BD, 30.75% (8/26) occurred in both BD and P, and 30.75% (8/26) occurred only in P. There is almost an even distribution of Asteraceae species among these 3 categories, with a slight predominance given to only in BD.

Of the total 24 Fabaceae species observed in this project, 62.5% (15/24) occurred only in BD, 20.8% (5/24) occurred in both BD and P, and 16.7% (4/24) occurred only in P. Carolina Wild-indigo (Baptisia cinerea) and Smooth Milkpea/Common Milkpea (Galactia regularis) are note-worthy because they occur only in P with medium occurrence. Desmodium spp. occur only in BD and account for 7 of the 15 Fabaceae species exclusive for BD. Five of these Desmodium spp. are Medium Occurrence and 2 are Low Occurrence.

Of the total 13 Poaceae species observed in this project, 61.5% (8/13) occurred only in BD, 23.0% (3/13) occurred in both BD and P, and 15.5% (2/13) occurred only in P. Carolina Wiregrass (Aristida stricta) and Pineywoods Dropseed (Sporobolus junceus) are note-worthy because they occur only in P with Medium Occurrence.

There is close similarity in the distribution of Fabaceae and Poaceae species, both with a great preference for BD. BD could perhaps be called “grass dips” as well as “bean dips”. Asteraceae species appear to be more adaptable to varied conditions (such as soil fertility) across the “Dry Longleaf Pineland” landscape than the Fabaceae and Poaceae species.

Table 6

Bold Type – Listed as a Primary “Dry Longleaf Pineland” Natural Community Component

Italicized – Not Listed as a Primary “Dry Longleaf Pineland” Natural Community Component

Colored Coded According to the Following:

Red – Occurred in 1 to 12 Bean Dip Sites and 0 Periphery Sites

Blue -- Occurred in at least one Bean Dip Site and in at least one Periphery Site

Green -- Occurred in 1 to 12 Periphery Sites and 0 Bean Dip Sites

Occurrence Frequency:

High Occurrence (7 to 12 Sites -- 1st and 2nd Quartiles) – Notated by **

Medium Occurrence (4 to 6 Sites – 3rd Quartiles) – Notated by *

Low Occurrence (1 to 3 Sites – 4th Quartile) – No Notation

Asteraceae

Plant Family	Scientific Name	Common Name
<i>Asteraceae</i>	<u><i>Ambrosia artemisiifolia</i></u>	<i>Common Ragweed</i>
<i>Asteraceae</i>	<u><i>Ambrosia psilostachya</i></u>	<i>Cuman Ragweed</i>
Asteraceae	<u><i>Eupatorium hyssopifolium</i></u>	Hyssopleaf Eupatorium
<i>Asteraceae</i>	<u><i>Helianthus atrovirens</i></u>	<i>Unidentified</i>
Asteraceae	<u><i>Helianthus divaricatus</i></u>	Woodland Sunflower
Asteraceae	<u><i>Liatris squarrulosa</i></u>	Earle's Blazing-star
<i>Asteraceae</i>	<u><i>Prenanthes serpentina</i></u>	<i>Cankerweed</i>
Asteraceae	<u><i>Solidago arguta var. caroliniana</i></u>	Vasey's Goldenrod
Asteraceae	** <u><i>Aster (Symphiotrichum) walteri</i></u>	Walter's Aster
Asteraceae	** <u><i>Brickellia eupatorioides</i></u>	Eastern False-boneset/E. False-eupatorium
Asteraceae	** <u><i>Ageratina (Eupatorium) aromatica</i></u>	Small-leaved White Snakeroot
Asteraceae	** <u><i>Aster (Symphiotrichum) concolor</i></u>	Eastern Silvery-aster
Asteraceae	* <u><i>Eupatorium album</i></u>	White Eupatorium
<i>Asteraceae</i>	<u><i>Chrysopsis (Heterotheca) gossypina</i></u>	<i>Gossamer Golden-aster/Cottonleaf G-aster</i>
<i>Asteraceae</i>	<u><i>Eupatorium glaucescens</i></u>	<i>Waxy Thoroughwort</i>
Asteraceae	* <u><i>Vernonia angustifolia</i></u>	Slender Ironweed
Asteraceae	** <u><i>Liatris cokeri</i></u>	Sandhills Blazing-star
Asteraceae	** <u><i>Pityopsis aspera</i></u>	Sticky Golden-aster
Asteraceae	** <u><i>Carphephorus bellidifolius</i></u>	Sandhill Chaffhead
Asteraceae	** <u><i>Cirsium repandum</i></u>	Sandhill Thistle
<i>Asteraceae</i>	<u><i>Aster (Symphiotrichum) tortifolius</i></u>	<i>Twistleaf/Dixie White-topped Aster</i>
Asteraceae	<u><i>Coreopsis major var. rigida</i></u>	Whorled Tickseed/Whorled Coreopsis
Asteraceae	<u><i>Eupatorium linearifolium</i></u>	Narrowleaf Eupatorium
Asteraceae	<u><i>Liatris secunda</i></u>	One-sided Blazing-star
Asteraceae	<u><i>Silphium compositum</i></u>	Rosinweed
Asteraceae	<u><i>Solidago odora</i></u>	Fragrant Goldenrod

Fabaceae

Plant Family	Scientific Name	Common Name
Fabaceae	<u><i>Crotalaria rotundifolia</i></u>	Rabbitbells/Low Rattlebox
Fabaceae	<u><i>Desmodium laevigatum</i></u>	Smooth Tick-trefoil
<i>Fabaceae</i>	<u><i>Desmodium lineatum</i></u>	<i>Sand Tick-trefoil</i>
Fabaceae	<u><i>Galactia mollis</i></u>	Soft Milkpea
Fabaceae	<u><i>Lespedeza stuevei</i></u>	Stueve's Bush-clover
Fabaceae	<u><i>Lespedeza virginica</i></u>	Slender Bush-clover/Virginia Bush-clover
Fabaceae	<u><i>Phaseolus sinuatus</i></u>	Trailing Wild Bean/Sandhill Bean
Fabaceae	<u><i>Tephrosia spicata</i></u>	Tawny Goat's-rue
Fabaceae	** <u><i>Chamaecrista (Cassia) nictitans</i></u>	Sensitive Partridge-pea/Wild Sensitive-plant

Plant Family	Scientific Name	Common Name
Fabaceae	* <u>Desmodium ciliare</u>	Littleleaf Tick-trefoil
Fabaceae	* <u>Desmodium ciliatum</u>	<i>Unidentified</i>
Fabaceae	* <u>Desmodium glabellum</u>	<i>Dillenius' Tick-trefoil</i>
Fabaceae	* <u>Desmodium nuttallii</u>	Nuttall's Tick-trefoil
Fabaceae	* <u>Desmodium paniculatum</u>	<i>Panicled Tick-trefoil</i>
Fabaceae	* <u>Lespedeza hirta</u>	Roundleaf Bush-clover
Fabaceae	* <u>Rhynchosia reniformis</u>	Dollarweed/Roundleaf Snoutbean
Fabaceae	<u>Orbexilum lupinellum</u>	Sandhill Scrufpea/Lupine Scrufpea
Fabaceae	<u>Rhynchosia tomentosa</u>	Erect Snoutbean
Fabaceae	<u>Robinia nana</u>	Dwarf Locust
Fabaceae	** <u>Tephrosia virginiana</u>	Common Goat's-rue
Fabaceae	* <u>Baptisia cinerea</u>	Carolina Wild-indigo
Fabaceae	* <u>Galactia regularis</u>	Smooth Milkpea/Common Milkpea
Fabaceae	<u>Desmodium strictum</u>	Upland Slender Tick-trefoil/Pineland T-trefoil
Fabaceae	<u>Lupinus diffusus</u>	Sandhill Lupine

Poaceae

Plant Family	Scientific Name	Common Name
Poaceae	<u>Eragrostis spectabilis</u>	Purple Lovegrass
Poaceae	<u>Tridens carolinianus</u>	<i>Carolina Fluffgrass</i>
Poaceae	<u>Saccharum alopecuroides</u>	Foxtail Plumegrass
Poaceae	** <u>Andropogon gerardii</u>	Big Bluestem/Turkeyfoot
Poaceae	** <u>Sorghastrum nutans</u>	Prairie Indiangrass/Yellow Indiangrass
Poaceae	** <u>Sporobolus clandestinus</u>	<i>Rough Dropseed</i>
Poaceae	* <u>Paspalum bifidum</u>	<i>Pitchfork Crowngrass</i>
Poaceae	* <u>Sorghastrum elliottii</u>	Nodding Indiangrass
Poaceae	** <u>Aristida lanosa</u>	<i>Woolly Three-awn</i>
Poaceae	** <u>Muhlenbergia capillaris</u>	Upland Muhly
Poaceae	<u>Aristida purpurascens</u>	<i>Arrowfeather Three-awn</i>
Poaceae	* <u>Aristida stricta</u>	Carolina Wiregrass
Poaceae	* <u>Sporobolus junceus</u>	<i>Pineywoods Dropseed</i>

Summary

The statements below are for the BD and P for the 12 evaluated sites. These statements may be assumed to represent all BD and P in the NC Sandhills Gamelands.

Soils

- BD soils had more fertile, more friable, and greater water-holding capacity properties than P soils.
- Fabaceae and Poaceae species were especially well suited to the soils of BD.
- Asteaceae species were about evenly distributed in preference for either BD or P soils or both.
- Anacardiaceae, Boraginaceae, Cornaceae, Gentianaceae, Juglandaceae, Lamiaceae, Verbenaceae, and Vitaceae species were only present in BD soils and were not very frequent.
- Apocynaceae, Caryophyllaceae, and Cyperaceae species were only present in P soils and were not very frequent.
- Little preference difference between BD and P soils was noted for Ericaceae, Fagaceae, Lauraceae, Orobanchaceae, or Pinaceae species.

Plants

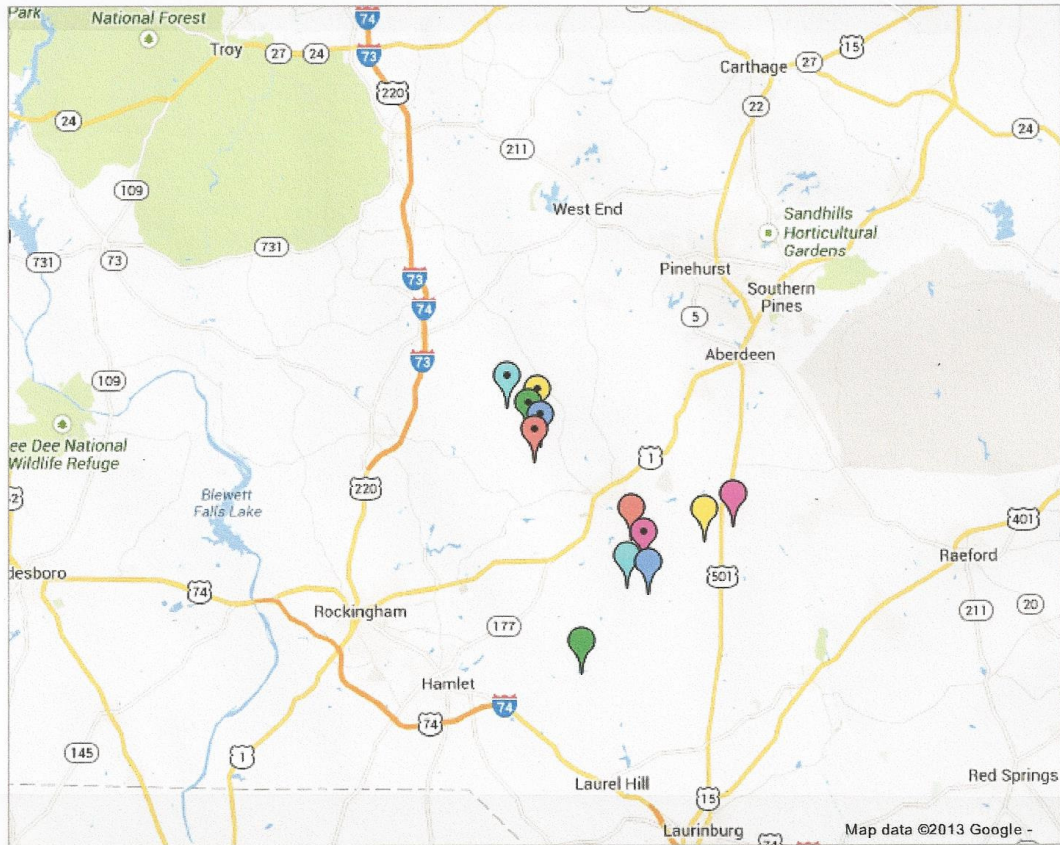
- Greater plant species diversity and plant family diversity occurred in BD than occurred in P.
- About 7 out of 10 plant species observed in this project are “primary” for the “Dry Longleaf Pineland” natural community.
- BD had a slightly lower percentage of plant species that were “primary” than did P.
- BD and P were mutually exclusive between their combined High and Medium Occurrence plant species.
- Poaceae or Asteraceae species (predominate as High Occurrence) occur among more BD than do Fabaceae species (predominate as Medium Occurrence).
- Asteraceae species (predominate as High Occurrence) occur among more P than do Fabaceae or Poaceae species (predominate as Medium Occurrence).
- The plant family ranking by the total number of plant species among all BD is Fabaceae first, Asteraceae second, and Poaceae third.
- The plant family ranking by the total number of plant species among all P is Asteraceae first, Fabaceae second, and Poaceae third.

Conclusions


- “Bean Dips” can also be thought of as “Grass Dips” because of the very high exclusivity of Poaceae as well as Fabaceae species in BD.
- Soil and plant species data from this project strongly support that “Bean Dips” are a variant of “Dry Longleaf Pineland” (or can possibly be an additional variant of “Xeric Sandhill Scrub”).
- There are management considerations concerning “Bean Dips”. For example, wildlife food plots should not be established in BD just because of naturally fertile soil; plant species diversity would be sacrificed in the process.

Appendix A

Twelve "Bean Dip" Sites NCWC Sandhills Gamelands



Legend

-  35.061389, -79.611528
+35° 3' 41.00", -79° 36' 41.50"
Site # 1
-  35.050000, -79.617222
+35° 3' 0.00", -79° 37' 2.00"
Site # 2
-  35.070556, -79.622361
+35° 4' 14.00", -79° 37' 20.50"
Site # 3
-  35.090556, -79.641528
+35° 5' 26.00", -79° 38' 29.50"
Site # 4
-  35.080278, -79.613333
+35° 4' 49.00", -79° 36' 48.00"
Site # 5
-  34.973333, -79.518056
+34° 58' 24.00", -79° 31' 5.00"
Site # 6
-  34.951111, -79.513889
+34° 57' 4.00", -79° 30' 50.00"
Site # 7
-  34.991389, -79.528611
+34° 59' 29.00", -79° 31' 43.00"
Site # 8
-  34.891389, -79.573611
+34° 53' 29.00", -79° 34' 25.00"
Site # 9
-  34.955556, -79.532222
+34° 57' 20.00", -79° 31' 56.00"
Site # 10
-  34.990972, -79.463333
+34° 59' 27.50", -79° 27' 48.00"
Site # 11
-  35.001667, -79.436944
+35° 0' 6.00", -79° 26' 13.00"
Site # 12

Appendix B

Alphabetical Listing of All Observed Plant Species

Scientific Name	Plant Family	Common Name	BD	P
<u>Agalinis setacea</u>	Orobanchaceae	Threadleaf Gerardia	1	2
<u>Ageratina (Eupatorium) aromatica</u>	Asteraceae	Small-leaved White Snakeroot	9	1
<u>Ambrosia artemisiifolia</u>	Asteraceae	Common Ragweed	1	0
<u>Ambrosia psilostachya</u>	Asteraceae	<i>Cuman Ragweed</i>	3	0
<u>Andropogon gerardii</u>	Poaceae	Big Bluestem/Turkeyfoot	8	0
<u>Aristida lanosa</u>	Poaceae	Woolly Three-awn	7	1
<u>Aristida purpurascens</u>	Poaceae	<i>Arrowfeather Three-awn</i>	1	3
<u>Aristida stricta</u>	Poaceae	Carolina Wiregrass	0	4
<u>Asclepias humistrata</u>	Apocynaceae	Fleshy Milkweed	0	1
<u>Aster (Symphiotrichum) concolor</u>	Asteraceae	Eastern Silvery-aster	11	1
<u>Aster (Symphiotrichum) tortifolius</u>	Asteraceae	Twistleaf/Dixie White-topped Aster	0	1
<u>Aster (Symphiotrichum) walteri</u>	Asteraceae	Walter's Aster	9	0
<u>Aureolaria pectinata</u>	Orobanchaceae	Sticky False-foxglove/Southern Oakleach	0	2
<u>Baptisia cinerea</u>	Fabaceae	Carolina Wild-indigo	0	4
<u>Brickellia eupatorioides</u>	Asteraceae	Eastern False-boneset/E. False-eupatorium	7	0
<u>Carphephorus bellidifolius</u>	Asteraceae	Sandhill Chaffhead	0	7
<u>Carya tomentosa</u>	Juglandaceae	Mockernut Hickory	1	0
<u>Chamaecrista (Cassia) nictitans</u>	Fabaceae	Sensitive Partridge-pea/Wild Sensitive-plant	7	0
<u>Chimaphila maculata</u>	Ericaceae	Spotted Wintergreen/Striped Pipsissewa	1	0
<u>Chrysopsis (Heterotheca) gossypina</u>	Asteraceae	Gossamer Golden-aster/Cottonleaf G-aster	1	2
<u>Cirsium repandum</u>	Asteraceae	Sandhill Thistle	0	7
<u>Conyz pusilla</u>	<i>Unidentified</i>	<i>Unidentified</i>	0	1
<u>Coreopsis major</u>	Asteraceae	Whorled Tickseed/Whorled Coreopsis	0	1
<u>Cornus florida</u>	Cornaceae	Flowering Dogwood	1	0
<u>Crotalaria rotundifolia</u>	Fabaceae	Rabbitbells/Low Rattlebox	1	0
<u>Desmodium ciliare</u>	Fabaceae	Littleleaf Tick-trefoil	5	0
<u>Desmodium ciliatum</u>	Fabaceae	<i>Unidentified</i>	5	0
<u>Desmodium laevigatum</u>	Fabaceae	Smooth Tick-trefoil	3	0
<u>Desmodium glabellum</u>	Fabaceae	<i>Dillenius' Tick-trefoil</i>	4	0
<u>Desmodium lineatum</u>	Fabaceae	<i>Sand Tick-trefoil</i>	2	0
<u>Desmodium nuttallii</u>	Fabaceae	Nuttall's Tick-trefoil	6	0
<u>Desmodium paniculatum</u>	Fabaceae	Panicked Tick-trefoil	5	0
<u>Desmodium strictum</u>	Fabaceae	Upland Slender Tick-trefoil/Pineland T-trefoil	0	1
<u>Eragrostis spectabilis</u>	Poaceae	Purple Lovegrass	1	0
<u>Eupatorium album</u>	Asteraceae	White Eupatorium	6	1
<u>Eupatorium glaucescens</u>	Asteraceae	<i>Waxy Thoroughwort</i>	1	1
<u>Eupatorium hyssopifolium</u>	Asteraceae	Hyssopleaf Eupatorium	1	0
<u>Eupatorium linearifolium</u>	Asteraceae	Narrowleaf Eupatorium	0	1

Scientific Name	Plant Family	Common Name	BD	P
<u>Galactia mollis</u>	Fabaceae	Soft Milkpea	1	0
<u>Galactia regularis</u>	Fabaceae	Smooth Milkpea/Common Milkpea	0	4
<u>Gaylussacia dumosa</u>	Ericaceae	Dwarf Huckleberry	2	7
<u>Gentiana villosa</u>	Gentianaceae	Striped Gentian	1	0
<u>Helianthus atrovirens</u>	Asteraceae	<i>Unidentified</i>	1	0
<u>Helianthus divaricatus</u>	Asteraceae	Woodland Sunflower	3	0
<u>Lespedeza hirta</u>	Fabaceae	Roundleaf Bush-clover	6	0
<u>Lespedeza stuevei</u>	Fabaceae	Stueve's Bush-clover	3	0
<u>Lespedeza virginica</u>	Fabaceae	Slender Bush-clover/Virginia Bush-clover	1	0
<u>Liatis cokeri</u>	Asteraceae	Sandhills Blazing-star	1	10
<u>Liatis secunda</u>	Asteraceae	One-sided Blazing-star	0	1
<u>Liatis squarrosa</u>	Asteraceae	Earle's Blazing-star	1	0
<u>Lupinus diffusus</u>	Fabaceae	Sandhill Lupine	0	1
<u>Minuartia caroliniana</u>	Caryophyllaceae	Carolina Sandwort	0	1
<u>Monarda punctata</u>	Lamiaceae	Spotted Beebalm	1	0
<u>Muhlenbergia capillaris</u>	Poaceae	Upland Muhly	7	1
<u>Onosmodium virginianum</u>	Boraginaceae	Virginia Marbleseed	1	0
<u>Orbexilum lupinellum</u>	Fabaceae	Sandhill Scrufpea/Lupine Scrufpea	1	1
<u>Pinus echinata</u>	Pinaceae	Shortleaf Pine	1	0
<u>Paspalum bifidum</u>	Poaceae	Pitchfork Crowngrass	6	0
<u>Phaseolus sinuatus</u>	Fabaceae	Trailing Wild Bean/Sandhill Bean	2	0
<u>Pinus palustris</u>	Pinaceae	Longleaf Pine	0	3
<u>Pityopsis aspera</u>	Asteraceae	Sticky Golden-aster	1	11
<u>Prenanthes serpentaria</u>	Asteraceae	<i>Cankerweed</i>	1	0
<u>Quercus laevis</u>	Fagaceae	(American) Turkey Oak	0	7
<u>Quercus incana</u>	Fagaceae	Bluejack Oak	1	7
<u>Quercus velutina</u>	Fagaceae	(Eastern) Black Oak	1	0
<u>Rhus michauxii</u>	Anacardiaceae	Michaux's Sumac	7	0
<u>Rhynchosia reniformis</u>	Fabaceae	Dollarweed/Roundleaf Snoutbean	6	2
<u>Rhynchosia tomentosa</u>	Fabaceae	Erect Snoutbean	1	1
<u>Rhynchospora grayi</u>	Cyperaceae	<i>Gray's Beaksedge</i>	0	3
<u>Robinia nana</u>	Fabaceae	Dwarf Locust	1	1
<u>Saccharum alopecuroides</u>	Poaceae	Foxtail Plumegrass	1	0
<u>Sassafras albidum</u>	Lauraceae	Sassafras	1	2
<u>Seymeria cassioides</u>	Orobanchaceae	Senna Seymeria	2	1
<u>Silphium compositum</u>	Asteraceae	Rosinweed	0	1
<u>Solidago arguta var. caroliniana</u>	Asteraceae	Vasey's Goldenrod	1	0
<u>Solidago odora</u>	Asteraceae	Fragrant Goldenrod	0	3
<u>Sorghastrum elliottii</u>	Poaceae	Nodding Indiangrass	6	0
<u>Sorghastrum nutans</u>	Poaceae	Prairie Indiangrass/Yellow Indiangrass	8	0
<u>Sporobolus clandestinus</u>	Poaceae	<i>Rough Dropseed</i>	9	0
<u>Sporobolus junceus</u>	Poaceae	<i>Pineywoods Dropseed</i>	0	4

Scientific Name	Plant Family	Common Name	BD	P
<u>Stylodon carneus</u>	Verbenaceae	Carolina Vervain	1	0
<u>Tephrosia spicata</u>	Fabaceae	Tawny Goat's-rue	2	0
<u>Tephrosia virginiana</u>	Fabaceae	Common Goat's-rue	1	8
<u>Tridens carolinianus</u>	Poaceae	<i>Carolina Fluffgrass</i>	3	0
<u>Vaccinium tenellum</u>	Ericaceae	Narrowleaf Blueberry	1	0
<u>Vernonia angustifolia</u>	Asteraceae	Slender Ironweed	1	5
<u>Vitis rotundifolia</u>	Vitaceae	Muscadine Grape	1	0

Appendix C

All Observed Plant Species by Plant Families

Legend

Bold Type – Listed as a Primary “Dry Longleaf Pineland” Natural Community Component

Italicized – Not Listed as a Primary “Dry Longleaf Pineland” Natural Community Component

Colored Coded According to the Following:

Red – Occurred in 1 to 12 Bean Dip Sites and 0 Periphery Sites

Blue -- Occurred in at least one Bean Dip Site and in at least one Periphery Site

Green -- Occurred in 1 to 12 Periphery Sites and 0 Bean Dip Sites

Occurrence Frequency:

High Occurrence (7 to 12 Sites -- 1st and 2nd Quartiles) – Notated by **

Medium Occurrence (4 to 6 Sites – 3rd Quartile) – Notated by *

Low Occurrence (1 to 3 Sites – 4th Quartile) – No Notation

Plant Family	Scientific Name	Common Name
Anacardiaceae	** <u>Rhus michauxii</u>	Michaux's Sumac
Apocynaceae	<u>Asclepias humistrata</u>	Fleshy Milkweed
<i>Asteraceae</i>	<i><u>Ambrosia artemisiifolia</u></i>	<i>Common Ragweed</i>
<i>Asteraceae</i>	<i><u>Ambrosia psilostachya</u></i>	<i>Cuman Ragweed</i>
Asteraceae	<u>Eupatorium hyssopifolium</u>	Hyssopleaf Eupatorium
<i>Asteraceae</i>	<i><u>Helianthus atrovirens</u></i>	<i>Unidentified</i>
Asteraceae	<u>Helianthus divaricatus</u>	Woodland Sunflower
Asteraceae	<u>Liatris squarrulosa</u>	Earle's Blazing-star
<i>Asteraceae</i>	<i><u>Prenanthes serpentaria</u></i>	<i>Cankerweed</i>
Asteraceae	<u>Solidago arguta var. caroliniana</u>	Vasey's Goldenrod
Asteraceae	** <u>Aster (Symphiotrichum) walteri</u>	Walter's Aster
Asteraceae	** <u>Brickellia eupatorioides</u>	Eastern False-boneset/E. False-eupatorium
Asteraceae	** <u>Ageratina (Eupatorium) aromatica</u>	Small-leaved White Snakeroot
Asteraceae	** <u>Aster (Symphiotrichum) concolor</u>	Eastern Silvery-aster
Asteraceae	* <u>Eupatorium album</u>	White Eupatorium
<i>Asteraceae</i>	<i><u>Chrysopsis (Heterotheca) gossypina</u></i>	<i>Gossamer Golden-aster/Cottonleaf G-aster</i>
<i>Asteraceae</i>	<i><u>Eupatorium glaucescens</u></i>	<i>Waxy Thoroughwort</i>
Asteraceae	* <u>Vernonia angustifolia</u>	Slender Ironweed
Asteraceae	** <u>Liatris cokeri</u>	Sandhills Blazing-star
Asteraceae	** <u>Pityopsis aspera</u>	Sticky Golden-aster
Asteraceae	** <u>Carphephorus bellidifolius</u>	Sandhill Chaffhead
Asteraceae	** <u>Cirsium repandum</u>	Sandhill Thistle

Plant Family	Scientific Name	Common Name
<i>Asteraceae</i>	<u><i>Aster (Symphiotrichum) tortifolius</i></u>	<i>Twistleaf/Dixie White-topped Aster</i>
Asteraceae	<u>Coreopsis major var. rigida</u>	Whorled Tickseed/Whorled Coreopsis
Asteraceae	<u>Eupatorium linearifolium</u>	Narrowleaf Eupatorium
Asteraceae	<u>Liatris secunda</u>	One-sided Blazing-star
Asteraceae	<u>Silphium compositum</u>	Rosinweed
Asteraceae	<u>Solidago odora</u>	Fragrant Goldenrod
Boraginaceae	<u>Onosmodium virginianum</u>	Virginia Marbleseed
Caryophyllaceae	<u>Minuartia caroliniana</u>	Carolina Sandwort
<i>Cornaceae</i>	<u><i>Cornus florida</i></u>	<i>Flowering Dogwood</i>
<i>Cyperaceae</i>	<u><i>Rhynchospora grayi</i></u>	<i>Gray's Beaksedge</i>
<i>Ericaceae</i>	<u><i>Chimaphila maculata</i></u>	<i>Spotted Wintergreen/Striped Pipsissewa</i>
Ericaceae	<u>Vaccinium tenellum</u>	Narrowleaf Blueberry
Ericaceae	<u>** Gaylussacia dumosa</u>	Dwarf Huckleberry
Fabaceae	<u>Crotalaria rotundifolia</u>	Rabbitbells/Low Rattlebox
Fabaceae	<u>Desmodium laevigatum</u>	Smooth Tick-trefoil
Fabaceae	<u>Desmodium lineatum</u>	<i>Sand Tick-trefoil</i>
Fabaceae	<u>Galactia mollis</u>	Soft Milkpea
Fabaceae	<u>Lespedeza stuevei</u>	Stueve's Bush-clover
Fabaceae	<u>Lespedeza virginica</u>	Slender Bush-clover/Virginia Bush-clover
Fabaceae	<u>Phaseolus sinuatus</u>	Trailing Wild Bean/Sandhill Bean
Fabaceae	<u>Tephrosia spicata</u>	Tawny Goat's-rue
Fabaceae	<u>** Chamaecrista (Cassia) nictitans</u>	Sensitive Partridge-pea/Wild Sensitive-plant
Fabaceae	<u>* Desmodium ciliare</u>	Littleleaf Tick-trefoil
Fabaceae	<u>* Desmodium ciliatum</u>	<i>Unidentified</i>
<i>Fabaceae</i>	<u><i>* Desmodium glabellum</i></u>	<i>Dillenius' Tick-trefoil</i>
Fabaceae	<u>* Desmodium nuttallii</u>	Nuttall's Tick-trefoil
<i>Fabaceae</i>	<u><i>* Desmodium paniculatum</i></u>	<i>Panicled Tick-trefoil</i>
Fabaceae	<u>* Lespedeza hirta</u>	Roundleaf Bush-clover
Fabaceae	<u>* Rhynchosia reniformis</u>	Dollarweed/Roundleaf Snoutbean
Fabaceae	<u>Orbexilum lupinellum</u>	Sandhill Scrufpea/Lupine Scrufpea
Fabaceae	<u>Rhynchosia tomentosa</u>	Erect Snoutbean
Fabaceae	<u>Robinia nana</u>	Dwarf Locust
Fabaceae	<u>** Tephrosia virginiana</u>	Common Goat's-rue
Fabaceae	<u>* Baptisia cinerea</u>	Carolina Wild-indigo
Fabaceae	<u>* Galactia regularis</u>	Smooth Milkpea/Common Milkpea
Fabaceae	<u>Desmodium strictum</u>	Upland Slender Tick-trefoil/Pineland T-trefoil
Fabaceae	<u>Lupinus diffusus</u>	Sandhill Lupine

Plant Family	Scientific Name	Common Name
<i>Fagaceae</i>	<u><i>Quercus velutina</i></u>	(Eastern) Black Oak
Fagaceae	** <u><i>Quercus incana</i></u>	Bluejack Oak
<i>Fagaceae</i>	** <u><i>Quercus laevis</i></u>	(American) Turkey Oak
Gentianaceae	<u><i>Gentiana villosa</i></u>	Striped Gentian
<i>Juglandaceae</i>	<u><i>Carya tomentosa</i></u>	Mockernut Hickory
Lamiaceae	<u><i>Monarda punctata</i></u>	Spotted Beebalm
<i>Lauraceae</i>	<u><i>Sassafras albidum</i></u>	Sassafras
Orobanchaceae	<u><i>Agalinis setacea</i></u>	Threadleaf Gerardia
Orobanchaceae	<u><i>Seymeria cassioides</i></u>	Senna Seymeria
Orobanchaceae	<u><i>Aureolaria pectinata</i></u>	Sticky False-foxtail/Southern Oakleach
<i>Pinaceae</i>	<u><i>Pinus echinata</i></u>	Shortleaf Pine
<i>Pinaceae</i>	<u><i>Pinus palustris</i></u>	Longleaf Pine
Poaceae	<u><i>Eragrostis spectabilis</i></u>	Purple Lovegrass
<i>Poaceae</i>	<u><i>Tridens carolinianus</i></u>	Carolina Fluffgrass
Poaceae	<u><i>Saccharum alopecuroides</i></u>	Foxtail Plumegrass
Poaceae	** <u><i>Andropogon gerardii</i></u>	Big Bluestem/Turkeyfoot
Poaceae	** <u><i>Sorghastrum nutans</i></u>	Prairie Indiangrass/Yellow Indiangrass
<i>Poaceae</i>	** <u><i>Sporobolus clandestinus</i></u>	<i>Rough Dropseed</i>
<i>Poaceae</i>	* <u><i>Paspalum bifidum</i></u>	<i>Pitchfork Crowngrass</i>
Poaceae	* <u><i>Sorghastrum elliottii</i></u>	Nodding Indiangrass
<i>Poaceae</i>	** <u><i>Aristida lanosa</i></u>	<i>Woolly Three-awn</i>
Poaceae	** <u><i>Muhlenbergia capillaris</i></u>	Upland Muhly
<i>Poaceae</i>	<u><i>Aristida purpurascens</i></u>	<i>Arrowfeather Three-awn</i>
Poaceae	* <u><i>Aristida stricta</i></u>	Carolina Wiregrass
<i>Poaceae</i>	* <u><i>Sporobolus junceus</i></u>	<i>Pineywoods Dropseed</i>
<i>Unidentified</i>	<u><i>Conyz pusilla</i></u>	<i>Unidentified</i>
Verbenaceae	<u><i>Stylodon carneus</i></u>	Carolina Vervain
Vitaceae	<u><i>Vitis rotundifolia</i></u>	Muscadine Grape