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## I. INTRODUCTION

The Jacksonville Arboretum & Gardens (“Arboretum”) is comprised of 119 acres (more or less) located in the Arlington area of Jacksonville in the northeast quadrant of the intersection of 9A (I-295 East) and Monument Road.

The land comprising the Arboretum was acquired by the City of Jacksonville (City) in connection with the City’s development of a regional sewer plant in the early 1970s. The U.S. Environmental Protection Agency (EPA) provided a substantial Federal Grant to the City for construction of the proposed plant and to mitigate the effects of the sewer plant on the community, a condition was added to the EPA grant (Appendix A) which provided that the City must obtain for use as a passive recreation park an additional buffer zone “the 119 acre tract shown as exhibit two of chapter II of the Final Environmental Impact Statement”. That tract is the Arboretum site. The EPA awarded the grant to the City and the City built the Arlington East Sewage Treatment Plant. Although the City acquired most of the Arboretum lands in the 1970s, the land was not used or made available to the community for a passive recreation park. Except for digging a 1-acre pond and a borrow pit in the mid 1970s, and illegal dumping over the years, nothing happened on the property for more than thirty years.

In 1998, the City transferred all City lands “used for water and sewer purposes” to JEA by ordinance. In 2004, a group of interested citizens approached JEA and EPA concerning the use of the site for an arboretum and gardens, consistent with the EPA Grant condition (Appendix A). JEA completed acquisition of the last parcel in the agreed tract and, in 2006, JEA’s board disclaimed any interest in the site to the City. In July 2006, the City passed ordinance 2006-234-E, thereby entered into a 20 year lease of the site to the Jacksonville Arboretum & Gardens, Inc., (“JAG”) a 501(c)3 non-profit entity to develop an arboretum and gardens on the site (Appendix B). The Arboretum opened to the public in November 2008.

### A. General Mission and Goals

The mission of JAG is to educate northeast Florida and its regional communities about native and cultivated plants, improve its beauty and atmosphere, engage in and promote the conservation & preservation of our natural resources, and provide public service. To fulfill its Mission, in 2006, JAG adopted the following goals:

#### Conservation

To provide stewardship of the Arboretum lands by protecting, sustaining, and enhancing biological diversity by means of large tracts of open-space. JAG also provides leadership locally and beyond in conservation matters such as the eradication of invasive species, water conservation, and the responsible use of chemicals.

#### Teaching

To provide an outdoor laboratory for use by college faculty and students in Botany, Zoology, Horticulture, Biology, Environmental Studies, and other departments. The biodiversity of the site makes

the Arboretum a unique and valuable academic resource and support facility.

#### Research

To support and conduct research in a broad range of subjects including ecology, field biology, horticulture, conservation, and natural history. JAG has and continues to emphasize useful long-term studies.

#### Collection

To maintain, develop, and interpret well-documented plant collections for teaching, research, and public education and enjoyment.

#### Public Education

To provide programs and publications about conservation, horticulture, gardening, botany, and natural history which work to enhance public understanding of the natural world and foster an appreciation of JAG's mission.

#### Recreation

To provide a place where people from the community may enjoy passive recreation and where they may come to learn, reflect, and renew themselves through contact with the natural world. By all the elements of the JAG's mission, JAG enhances the quality of life both for northeast Florida and the residents of the community.

### B. Accomplishments

Through volunteer elbow grease, funding from the City of Jacksonville and Greenscape of Jacksonville, Inc., substantial donations of time and professional services, and gifts from supporters, the vision of JAG is becoming a reality. Major activities include:

#### Volunteer/In kind projects:

- Establishment of a Board of Directors.
- Approval of entity as a 501(c)3 non-profit by IRS.
- Approval of lease of the arboretum land by City Council together with an appropriation of \$250,000 for improvement of the trailhead and parking area.
- Obtained grant of \$15,000 from Greenscape for educational signage.
- Obtained grant of \$200,000 from the City of Jacksonville and JEA for utilities and other improvements.
- Completion of an intermediate level analysis of natural communities (Figure 1).

- Completion of a tree inventory in a limited area of the Arboretum.
- Development of a Conceptual Master Site Plan that includes: possible nature trails, elevated boardwalks, an amphitheater, learning facilities, restrooms, educational signage, demonstration gardens, and a parking area (Figure 2).
- Design and engineering for a parking area with additional phases.
- Establishment of monthly to weekly volunteer workdays that resulted in the removal of invasive plants, illegally dumped trash, appliances, derelict vehicles, and construction debris from the park.
- Design and completion of: four  $\frac{1}{3}$  –  $\frac{1}{2}$  mile trails and one 1-mile trail (Figure 3.)
- Construction and installation of park benches.
- Construction and installation of trail markers.
- Design and development of printed trail guides.
- Design and development of color brochures.
- Construction of a website for the park.
- Removal of hazardous tree limbs. Remedial work on live oaks and other trees.
- Construction of 5' wide permanent bridge for gully crossing on Ravine Trail.
- Construction of five temporary pedestrian bridges and boardwalks over Jones Creek.
- Removal of invasive plants.
- Urban Forestry Grant of \$20,000 and \$15,000 renewal from Florida Division of Forestry (DOF) for a temporary part-time consultant/independent contractor.
- Grant of \$13,314.78 from United Way for acquisition of utility vehicle, trailer, and power landscape tools.
- Approval for Tree Protection Fund appropriation of \$119,304 for tree planting on Lake Loop by Davey Tree Co.
- Construction and installation of five picnic tables.
- Continuation of Urban Forestry Grant of \$15,000 from DOF.
- Flail mowing of approximately 10 acres by DOF as part of their urban wildfire hazard mitigation project.
- Arranged for training of 11 “lakewatch” volunteers, completed first sampling and collected basic bathymetric data.

Capital improvements and equipment:

- Asphalt parking area (25 cars) with water management structure.
- Overflow parking area (30 cars).
- Acquisition of four aluminum gates.
- Aluminum shed and shipping container for storage.
- ADA accessible trailhead and initial 200' of Lake Loop.
- Educational signage.
- Potable water line, meter and water fountain.
- Electric lines and meter.
- Reuse water irrigation system in parking area.
- Landscaping in parking area.
- Landscaping around Lake Loop (to be installed Winter, 2010).
- Overflow pipe for Lake Ray.

C. Future Objectives and Performance Measures

**GOAL 1: *Conservation***– *To provide stewardship of the Arboretum lands by protecting, sustaining, and enhancing biological diversity by means of large tracts of open-space. JAG also provides leadership locally and beyond in conservation matters such as the eradication of invasive species, water conservation and the responsible use of chemicals.*

**OBJECTIVE 1: Evaluate, restore and maintain the physical aspects of the site.**

Performance Measure 1 – Evaluate and ameliorate natural erosion problems. Evaluate and restore sites where human impact has caused erosion (banks of ravine, shortcut trails).

Performance Measure 2 - Remove trash and debris in public areas.

Performance Measure 3 – Write general site best management practices (BMP's)

**OBJECTIVE 2: Identify and eradicate existing exotic invasives following recommended methods and evaluate site for new infestations. Educate neighbors to prevent new infestations.**

Performance Measure 1 – Develop early detection and rapid response (EDRR) protocol and follow BMP's for removal of exotic invasives. EDRR protocol to include mapping, monitoring and weed management plan. BMP's to include key prevention actions such as implementation of equipment decontamination protocols.

Performance Measure 2 – Establish and maintain boundaries so that plants off Arboretum property are not inadvertently sprayed. Establish weed free buffers between private residences and Arboretum

Performance Measure 3 – Spray Cogon Grass on JEA right of way and around parking lot, hack and squirt or saw and squirt various invasives on earth dam and bottomland forest east of Lake Ray, spray invasives along eastern boundary with residential neighborhoods, spray invasives on banks and seasonally flooded bottomlands surrounding Jones Creek.

Performance Measure 4 – Continue meeting with neighbors to familiarize them with invasive species and their threat to terrestrial ecosystems and to encourage the neighbors to us Florida-friendly “alterNative” species in their landscapes.

**OBJECTIVE 3: Protect species of special concern.**

Performance Measure 1 – Conduct survey of species of special concern.

Performance Measure 2 – Write management plans for all rare, threatened and endangered species.

Performance Measure 3 - Share data concerning threatened and endangered plant and animal species with appropriate Federal/State entities.

**OBJECTIVE 4: Protect health of Jones Creek.**

Performance Measure 1 – Notify St. Johns River Water Management District (SJRWMD) and City with results and recommendations.

Performance Measure 2 – Meet with neighbors to familiarize them with sources of nutrients and their threat to aquatic ecosystems.

Performance Measure 3 – Develop and follow BMP’s for jurisdictional wetlands surrounding Jones Creek.

Performance Measure 4 – Remove debris, snags, and earth clogging feeder creeks to Jones Creek including feeder creeks in man-made ravine.

**OBJECTIVE 5: Protect and restore areas of “High Conservation Value Native Landscape” - upland mixed forest, champion loblolly baygall, Jones Creek bottomland forest, rosemary scrub and surrounding xeric hammock and scrubby flatwoods.**

Performance Measure 1 – Determine “ideal” boundary between xeric hammock and rosemary scrub and maintain with very small (200 sq.ft.) patch burns or if that is not possible then investigate feasibility of mechanical/smoke methods.

Performance Measure 2 – Evaluate possibility of re-introducing fire to declining scrubby flatwoods. If that is not possible evaluate cost benefit of removing excess undergrowth by mechanical or chemical means. Finally evaluate desirability/feasibility of logging and replanting following adequate chemical site preparation.

Performance Measure 3 – Follow restoration goals detailed in section IV B for above “High Conservation Value Native Landscapes”.

**OBJECTIVE 6: Restore depression marsh to pre-mining conditions.**

Performance Measure 1 – Evaluate feasibility/desirability of removing red root and replacing it with species characteristic of a depression marsh.

**OBJECTIVE 7: Convert Lake Ray to a healthy upland Clastic Lake.**

Performance Measure 1 – Work with IFAS to enroll Lake Ray in Florida Lakewatch Program

Performance Measure 2 – Investigate, and if necessary, remediate the dissolved oxygen problem in Lake Ray, to the extent feasible.

Performance Measure 3 - List additional steps that should be taken to improve the health of Lake Ray. Select several to pursue based on cost-benefit study.

**OBJECTIVE 8: Decide what, if any, restoration or preservation needs to be done in freshwater tidal marsh, and estuarine and marine tidal marsh.**

Performance Measure 1 – Conduct habitat assessment of freshwater, tidal, estuarine areas.

Performance Measure 2 – Write restoration goals for freshwater, tidal marsh and estuarine and marine tidal marsh.



**OBJECTIVE 9: - Implement an adaptive monitoring program to identify and track status of High Conservation Value Native Landscape Areas and other areas proposed for restoration and to prioritize expenditure of resources and funding in these areas.**

Performance Measure 1 – Establish baseline ecological data and status.

Performance Measure 2 – Develop metrics to detect positive and negative trends.

Performance Measure 3 – Develop response actions and metrics that trigger them.

Performance Measure 4 – Develop management matrix to prioritize restoration projects.

Performance Measure 5 – Develop and implement program which integrates the above segments with restoration efforts.

**OBJECTIVE 10: Re-evaluate conceptual master site plan in 2011 and every five years thereafter.**

**GOAL 2: *Teaching and Research*** – *To provide an outdoor laboratory for use by college faculty and students in Botany, Zoology, Horticulture, Environmental Studies, and other departments.*

*To support and conduct research in a broad range of subjects including ecology, field biology, horticulture, conservation and natural history.*

**OBJECTIVE 1: Provide adequate data upon which to base preservation and conservation decisions.**

Performance Measure 1 – Prioritize list of desired research projects and find local or regional college and university students or faculty, Federal/State agencies, and citizen science groups associated with public agencies to conduct. Current projects are monitoring Lake Ray, Jones Creek and the new rosemary scrub trail. Reprioritize list based on results of Adaptive Monitoring Plan.

**OBJECTIVE 2: Provide adequate data for recreation, public education activities and collection installations.**

Performance Measure 1 – Produce list of desired research projects and find local or regional college and university students or faculty to conduct.

**OBJECTIVE 3: Protect arboretum from abuse and JAG from liability associated with research. Provide adequate oversight of projects.**

Performance Measure 1 – Produce application, contracts, and report procedures for researchers conducting projects.

**GOAL 3: *Collection*** – *To maintain, develop and interpret well-documented plant collections for teaching, research, and public education and enjoyment.*

**OBJECTIVE 1: Re-evaluate collections policy at least every five years.**

Performance Measure 1 – Policy revisions dated 2011 and 2016.

**OBJECTIVE 2: Augment “high conservation value nature landscapes” with carefully chosen and located collection specimens.**

Performance Measure 1 – Installation of plants considered native to that habitat in NE Florida.

**OBJECTIVE 3: Augment non-restorable areas with carefully chosen demonstration gardens.**

Performance Measure 1 – Gardens within directive of collection policy installed in mixed hardwood area (north of Lake Ray, between Lake Ray and Ravine, between Ravine and powerline), dam, and bottomland forest east of Lake Ray, parking lot and surrounding 30’ – 50’.

**OBJECTIVE 4: Generate map of plants in permanent collection and keep up to date.**

Performance Measure 1 – Choose initial plants and gardens, identify layers, and add plants to appropriate layer. Update at least annually.

**OBJECTIVE 5: Create and keep current a database to accompany map.**

Performance Measure 1 – Choose attributes for table to accompany map (include direction and distance from nearest trail).

**OBJECTIVE 6: Field identify plants in collection.**

Performance Measure 1 – Label each plant or garden with collection tag.

**GOAL 4: *Public Education*** – *To provide programs and publications about conservation, horticulture, gardening, botany, and natural history which work to enhance public understanding of the natural world and foster an appreciation of JAG’s mission.*

**OBJECTIVE 1: Provide public with identification of selected plants near trails.**

Performance Measure 1 – Annually check and correct, existing public plant ID signs and add new signs as necessary.

**OBJECTIVE 2: Use public education opportunities to promote conservation and preservation.**

Performance Measure 1 – All educational signage, tours, and outreach activities have preservation and/or conservation components.

**OBJECTIVE 3: Use public education opportunities to provide information about ecological processes.**

Performance Measure 2 – Adapt programs, tours, and temporary signage to include timely information about ecological processes.

**OBJECTIVE 4: Offer scheduled small educational activities (tours, seminars, workshops).**

Performance Measure 1 – Develop list of education activities that fit within missions and goals of arboretum.

Performance Measure 2 – Poll visitors to determine their interests.

Performance Measure 3 – Develop list of desired activities, identify number of volunteers to adequately “staff” activities, schedule activities, and recruit and maintain volunteer corps.

Performance Measure 4 – Annually evaluate past year’s offerings and revise list for upcoming year.

**OBJECTIVE 5: Educate public about past use of site and impact of humans on native habitats.**

Performance Measure 1 – Include information about railroads, logging, mining and construction of borrow pits in educational signage, tours, and outreach activities.

**OBJECTIVE 6: Provide informal education throughout site.**

Performance Measure 1 – Install permanent educational signage on all trails.

**OBJECTIVE 7 – Evaluate conceptual master site plan.**

**GOAL 5: Recreation** – *To provide a place where people from the community may enjoy passive recreation and where they may come to learn, reflect and renew themselves through contact with the natural world.*

**OBJECTIVE 1: Provide recreational opportunities.**

Performance Measure 1 – Consider changing the Future Land Use Map (FLUM) zoning of property to Recreation and Open Space (ROS).

Performance Measure 2 – Clear and open trails as determined in conceptual master site plan.

Performance Measure 3 – Provide access to scenic areas and areas of special interest.

Performance Measure 4 – Provide event areas and areas for gatherings and programs.

Performance Measure 5 – Install and maintain interpretive and educational signage in areas of special interest.

Performance Measure 6 – Partner with non-traditional entities to increase awareness of arboretum in new target groups (e.g. medical and fitness community to promote mental and physical health benefits of outdoor exercise).

**OBJECTIVE 2: Accessible, safe, and environmentally sensitive trails and facilities.**

Performance Measure 1 – Insure that trails are generally free of obstacles except where removal of an obstacle could cause harm to the natural features of the terrain or vegetation or where compliance would otherwise be impractical. Insure that pathways are as hazard-free as possible.

Performance Measure 2 – Clearly mark hazardous areas and install safety barriers where indicated.

Performance Measure 3 – Insure that Lake Loop Trail and adjoining event areas are as universally accessible as is practical.

Performance Measure 4 – Install benches along trails.

Performance Measure 5 – Build decks, bridges, observation platforms and/or towers on trails that encourage accessibility given the terrain and other environmental factors; replace existing structures as needed with new structures that promote accessibility.

Performance Measure 6 – Endeavor to clear poisonous or hazardous plants away from trails.

Performance Measure 7 – Around the Trailhead and Lake Loop area, to the extent feasible without causing an adverse environmental impact, prune underbrush to promote visitor comfort and safety.

Performance Measure 8 – Incorporate Adaptive Monitoring Plan into trail maintenance projects.

**OBJECTIVE 3: Provide visitors with adequate space and facilities for enhanced recreational experience.**

Performance Measure 1 – Construct story circle and campfire area with stepped access from trailhead.

Performance Measure 2 – Install picnic tables in non-sensitive areas where their use will not compromise the enjoyment of the park by other visitors.

Performance Measure 3 – Construct permanent “green” restroom facility.

Performance Measure 4 – Construct pavilion to provide shelter from the elements and space for special events and community activities.

Performance Measure 5 – Construct small amphitheater on southwest corner of Lake Ray to accommodate events and educational activities and programs.

Performance Measure 6 – Evaluate desirability of an events lawn to support special events and community use activities.

Performance Measure 7 – Design and obtain cost estimates for multi-function visitor’s center that will support interpretive and educational programs, special events, office and retail space.

**OBJECTIVE 4: Provide access to the Arboretum site and adequate paved parking for daily use and surfaces parking special events.**

Performance Measure 1 – Identify, design and install on-site parking to support increased daily traffic and special events (e.g. power line easement, permeable temporary parking adjacent to paved lot).

Performance Measure 2 – Partner with neighboring businesses for extra off-site parking during special events.

Performance Measure 3 – Work toward obtaining annual visitor goal for directional signage on State Road 9A (I-295).

Performance Measure 4 – Evaluate need and feasibility of separate access to northern portions of the park from a small parking lot off of Ft. Caroline Road.

Performance Measure 5 – Evaluate need, location and feasibility of connecting drive between the north and south entrances to the park.

Performance Measure 6 – Evaluate feasibility of green building and low impact design for all hardscape projects.

**OBJECTIVE 5 – Reevaluate conceptual master site plan in 2011 and every five years thereafter.**

**II. ADMINISTRATIVE SECTION**

**A. Descriptive Information**

1. Common Name of Property:

The common name of the property is the Jacksonville Arboretum & Gardens. Throughout the plan, this parcel of real property will be referred to as the “Arboretum” while the entity that operates it will be referred to as “JAG.”

2. Location, Boundaries, and Improvements:

The Arboretum is located in Duval County on approximately 119 acres of land. The entrance to the Arboretum is located on the opened part of Millcoe Road which is slightly to the east of the intersection of 9A and Monument Road. The Arboretum is bordered to the north by Merrill Road, to the east by Jones Creek, to the West by unopened Millcoe Road, the JEA Arlington East Regional Plant, and Millcoe road. The southerly boundary lies south of a JEA power line easement which crosses the Arboretum in an east west direction, as shown in Figure 4.

3. Legal Description of the Arboretum: See Figure 4

A part of tract C-C, Holly Oaks Forest: Section 4-A, according to the plat thereof as recorded in Plat Book 34, page 18 15-A and a part of: Lots 14, 15 and 16, block 3 Holly Oaks Forest Section 4, according to Plat Book 22 page 42, all of the current public records of Duval County, Florida and a portion of government lot 3, all lying in Section 6, Township 2 south. Range 28 east Duval County, Florida, together with a portion of government lots 4, 5, 7, and 14 lying in Section

7 Township 2 south range 28 east of said county and being more particularly described as follows:

Commence at the southwest corner of said Section 6, said point lying in the centerline of Millcoe Road, (a 66' right-of-way); then north 00'36'40" west, along the westerly line of said Section 6 to its intersection with the southerly right-of-way line or Merrill Road, (a 80' right-of-way, at this point), a distance of 81.20 feet; thence easterly and northeasterly along last said southerly right-of-way line the following seven, 7, courses and distances: Course No 1: north 78'20'10" east, 33.62 feet to easterly right-of-way line of said Millcoe Road, and the Point of Beginning. Course No 2: continue north 78'20'10" east, 362.29 feet to the point of curvature of a curve, being concave southerly and having a radius of 915.37 feet; Course No 3: along and around the arc of said curve, an arc distance of 136.20 feet, said curve being subtended by a chord bearing and distance of north 82'35'56" east 136.08 feet to the point of tangency of said curve; Course No 4: north 86'31'40" east 197.74 feet to the point of curvature of a curve, being concave northerly and having a radius of 995.37 feet; Course No 5: along and around the arc of said curve an arc distance of 392.91 feet, being subtended by a chord bearing and distance of north 75'33'10" east, 390.36 feet to the point of tangency of said curve; Course No 6: north 64'14'40" east, 139.76 feet, to a point of curvature of a curve being concave southerly and having a radius of 12992.08 feet; Course No 7: along the arc of said curve an arc distance of 106.34 feet, said arc being subtended by a chord bearing and distance of north 80'19'25" east, 106.34 feet to an intersection with the westerly right-of-way line of Holly Oaks River Drive ( a 60' right-of-way); thence south 05'34'20" east, along said westerly right-of-way line 144.60 feet to an intersection with the southerly line of said right-of-way, said point also lying on a curve being concave southerly, having a radius of 3114.79 feet; thence along and around the arc of a curve an arc distance of 30.01 feet, said curve being subtended by a chord bearing and distance of north 84'09'06" east, 30.01 feet, to the point of tangency of said curve; thence north 84'25'40" east, continuing along said southerly right-of-way line, a distance of 30.00 feet to an intersection with the easterly right-of-way line of said Holly Oaks River Drive and also being the southwest corner of lot 14 of said Holly Oaks Forest Section 4; thence north 05'34'20" west along said easterly right-of-way line, and the westerly line of said lot 14, a distance of 149.20 feet to its intersection with the southerly right-of-way of Fort Caroline Road ( a variable width right-of-way) said point also lying in a curve concave southerly and having a radius of 12992.08 feet; thence in an easterly direction along last said southerly right-of-way line run the following three 3 courses and distances: Course No 1: along and around the arc of said curve an arc distance of 260.31 feet, said arc being subtended by a chord bearing and distance of north 81'24'57" east, 260.31 feet to the point of tangency of said curve; Course No 2: south 84'34'58" east, 67.12 feet; Course No 3: north 82'36'40" east, 150.91 feet to a point from hereon after referred to as Reference Point "A": thence return to the Point of Beginning; thence south 00'32'00" east, along aforementioned easterly right-of-way line of Millcoe Road, 716.94 feet; thence north 85'49'29" east 1061.93 feet to the line

common to the east line of said Government lot 5 and the west line of said Government lot 4; thence south 00°47'15" east, along last said west line and the west line of said Government lot 7 a distance of 1914.05 feet to an intersection with the northerly line of said Government lot 14; thence south 00°21'00" east, along the westerly line of said lot 14 a distance of 772.78 feet; thence north 86°15'14" east, 1320.00 feet to the easterly line of said Government lot 14, and the westerly boundary of Holly Oaks Manor replat as recorded in plat book 39, page 56, of said current public records; thence north 00°21'00" west, along last said westerly boundary 772.78 feet to an intersection with the southerly line of said Government lot 7 and the southerly boundary of Holly Oaks Forest Section 3, Unit 2, as shown on plat book 24, page 84, said current records; thence north 00°47'15" west, along the easterly line of said Government lot 7 and the westerly line of Holly Oaks Forest Section 3, Unit 2, a distance of 1477 feet more or less to the westerly bank of Jones Creek; thence in a northwesterly and northeasterly direction following the meanderings, thereof said westerly bank a distance of 2503 feet more or less to a point on aforementioned southerly right-of-way line of Fort Caroline Road, said point lying south 88°27'38" west, a distance of 385+ or – feet, more or less from Reference Point "A". Thence north 88°27'38" east, along last said southerly right-of-way line 385 feet more or less to Reference Point "A" and to close.

Less and except

The east 20 feet of the following official records:

Volume 4288 page 735

Book 11422, page 176

Volume 4357, Page 867

Volume 4359M Page 873

Also the west 20 feet of the following official records:

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All of the current public records of Duval County Florida, this 20 feet to be used for a road.

The above described parcel contains 119 acres more or less

See Figure 4

#### 4. Title Interest

Fee simple title to the Arboretum is held by the City. JAG obtained a 20-year lease of the Arboretum for operation and management of the Arboretum as a passive recreation area, arboretum and gardens. The Arboretum is subject to a JEA power easement, as well as easement for other utility services.

5. Proximity to Other Public Resources

The Arboretum is proximate to the St. Johns River, Timucuan Ecological and Historic Preserve (including Fort Caroline National Memorial and Kingsley Plantation), Buck Park, Sunny Acres Park, Jacksonville University, University of North Florida and to the Ed Austin Regional Park.

6. Aquatic Preserve/Area of Critical State Concern

The Arboretum is not within an aquatic preserve or an area of critical state concern, nor is it in an area under study for such designation.

B. Acquisition Information

1. Land Acquisition Program/Purpose of the Acquisition

Most of the lands comprising the Arboretum were acquired by the City from various individual owners in 1974. The land was acquired by the City to satisfy a condition in an EPA grant. The grant required that the City acquire a 119 acre parcel as shown on a site plan attached to the grant for additional “passive recreation area and buffer” in connection with the construction of the Arlington East Sewage Treatment Plant. A final parcel was obtained by JEA in or about 2003-2004. This parcel was transferred by JEA to the City in exchange for title to JEA’s electric sub-station on Millcoe Road.

2. Legislative Constraints

The land is subject to the conditions of the EPA grant. In addition, JAG’s use of the Arboretum is subject to the terms and conditions of its lease with the City.

3. Designated Multiple Use Management

The Arboretum is designated for multiple-use management with the Board of Directors acting as the lead “agency” as stated in the lease with the city. Sustainable multiple use management will provide the maximum public benefit and is the overall goal for the Arboretum. Multiple-use management includes, but is not limited to, the following activities: creation of demonstration gardens, recreation, wildlife management, archaeological and cultural resource management, ecosystem restoration, environmental education, and watershed management.

4. Additional Land Needs

Although no additional land is required for operation of an arboretum, there are additional contiguous parcels, one abutting Monument Road that could provide greater visibility and another parcel along the western boundary, belonging to JEA, that would allow additional recreational space. JAG has



neither funds to make any land acquisitions nor current plans to raise funds for land acquisition

## 5. Adjacent Conflicting Land Uses

There are no known conflicting land uses at this time. Aerostar Environmental Services, Inc., made a Phase I Site Assessment. They investigated surrounding land use and stated that “None of the current uses of the adjoining properties appear likely to indicate the presence of recognized environmental conditions, based upon site observation”. North of the Arboretum a sewage lift station and across Ft. Caroline Rd. are residences, and a Discount Auto Parts. East of the Arboretum are residences of the Holly Oaks subdivision. South of the Arboretum is a veterinary clinic and vacant wooded land. West of the Arboretum are the JEA Arlington East Water Reclamation Facility, an electrical substation and small commercial uses located along the entrance road. Residences occur west of 9A. Odor from JEA reclamation facility occasionally interferes with enjoyable use of the arboretum. JEA indicates that the odor from this facility will be rectified when they complete their conversion from chlorine treatment to UV treatment.

Residential landscapes also pose threats to the natural habitats at the Arboretum. Exotic invasives from Holly Oaks subdivision back yards colonize the upland hardwood and bottomland forests. Non-point source runoff from Holly Oaks backyards and point source drainage from the five storm water outflow drains have the potential to pollute Jones Creek. (Figure 5)

## C. Agency and Public Involvement

### 1. Responsibilities of the City

The City is responsible under the terms of the EPA grant to ensure that the property is used for passive recreation uses. The City is also responsible under the terms of the Lease for our remediation of any hazardous or toxic substances which were discharged or placed on the Arboretum prior to the date of the Lease. By completing a Phase I Environmental Site Assessment (Aerostar Environmental Services, Inc., August 2006), JAG is an “innocent” operator and is not responsible under CERCLA for any pre-existing contamination on the property. In addition, in ordinance 2006-234-E, the City agreed to provide \$250,000 of funding which was used for construction of a parking area, with retention area, and 300’ feet of paved path.

### 2. Public and Local Government Involvement

Due to confusion over the ownership of the Arboretum, neither the City nor JEA was actively involved in the Arboretum prior to the date that the JEA quit claimed its interest, if any, in the Arboretum to the City and the City leased the Arboretum to JAG. After the lease, the City funded construction of the

parking area and has participated with JAG in several events on the Arboretum. JEA also is providing \$200,000 in funding to JAG to mitigate its use of a portion of the buffer on JEA property for expansion of its sewer plan. Though the Arboretum is not an official City Park, city offices continue to be extremely active and helpful in forwarding Jag's mission. Whenever possible JAG desires to partner with public agencies that share conservation and recreation missions in an effort to leverage resources.

### 3. Compliance with the Comprehensive Plan

The Arboretum is in compliance with the City's Comprehensive Land Use Plan. The FLUM designation is PBF (Public Buildings and Facilities). The zoning for the Arboretum is primarily PBF-1, except for a small parcel (being the same parcel acquired by JEA in 2003-2004) which is PBF-2. It may be more appropriate to change land use to ROS (recreation and open space).

## D. Volunteer and Staff Involvement

### 1. Volunteer Leadership (Board of Directors)

The Board of Directors is comprised of community leaders who volunteer their time and expertise because they believe in the mission of the organization and its value to the community-at-large.

The primary roll of the Board of Directors is to provide leadership in determining organizational policy, insuring financial stability, and supervising staff and resources.

Currently, the board is also the staff of the Arboretum and participates in all aspects of the park including: site planning, site development, events, programs, fundraising and management.

As money becomes available to hire staff, the board will transition to a more traditional role and will launch its first facilities capital campaign.

### 2. Community Service Volunteers

Community Service Volunteers are members of the community who support the goals and mission of the organization and volunteer their time and expertise to help in their achievement. Community Service Volunteers can generally be divided into two categories:

#### a. Service Volunteers

Service Volunteers are people who volunteer to help on an "as-needed" basis such as; work days, events, administrative and program support. The need and duties of Service Volunteers don't change over time and are, therefore, essential throughout all timeframes of organizational development.

b. Specialty Volunteers

Specialty Volunteers are people who volunteer their time and expertise to perform a specific function for the organization, i.e.; technology, bookkeeping, mechanical, etc. The needs and duties of Specialty Volunteers change over time and are greatly influenced by the organization's current needs and ability to hire staff to perform those. The most immediate need is for a volunteer coordinator to help manage, recruit and train the service volunteer corps.

3. Staff

Staff are paid employees whose primary responsibility is management of the day-to-day operations of the organization. All staff report to the Board of Directors.

Staff positions are not static and change over time as the organization grows and its needs and ability to support paid employees changes. JAG has no staff. Currently there is a part-time consultant/independent contractor who works on special projects. Very soon, the organization needs to obtain funding for part-time Volunteer/Events Coordinator, Development Director and Maintenance positions. Long term needs will include making the above positions full-time and hiring part-time Operations Manager, Program Director and Office Manager.

### **III. NATURAL RESOURCE SECTION**

A. Past Uses

The site has an interesting history. In or about 1888, part of the Jacksonville, Mayport & Pablo Railroad & Navigation Co. (JM&P) traversed the land near what is now Merrill Road carrying freight and passengers from urban areas to what is now Kathryn Abbey Hannah Park and to Mayport (including Burnside Beach and Hotel and Savigon Hotel). Trains carried passengers and freight from 1888-1895, mail until 1900, and then (JM&P) went bankrupt. Portions of the track were pulled up and used elsewhere. Even after the trains disappeared, the railroad bed continued to provide a wagon road connecting Ft. Caroline to Arlington. Today the only remains on the site are the old railroad bed along the northern boundary.

In 1944, parts of the Arboretum were excavated by the Humphries Gold Mining Co. in conjunction with their mining activities in the Regency area. Rutile, ilmenite, zircon, and monazite (titanium) were mined from the site and evidence of these activities is still visible on the site. Excavated areas include the tailings deposits on the north end of the Arboretum and the area that is now the Millcoe Road parking lot. Mining ceased by 1961. The City of Jacksonville acquired the parcel from various private landowners as a buffer in the 1970's. A dammed pond, now called Lake Ray, and a borrow pit were

built sometime between 1974 and 1975. Aerial photographs dated 1943, 1952, 1960, 1969, 1972, 1975 and 1977 show the progression of impacts of mining activity and the borrow pits constructed during or prior to city ownership (Appendix C).

## B. Natural Resources

### 1. Soil Types

The current Natural Resources Conservation Service (NRCS) soil map is included in Figure 5. The Arboretum is located on the eastern ridge of Florida which is characterized by acidic soils formed under forests (spodosols = Evergreen-Wesconnett, Leon, Mandarin, Boulogne), interspersed with very weakly developed soils (entisols = Kershaw, Kureb, Ortega) on slopes and young weakly developed soils (inceptisols = Rutlege) in low lying areas.

In April 2009 District Conservationist NRCS (NRCS-DC), Allen Moore, spent several hours verifying soil types on the map. He said that in undisturbed portions of the southern third of the Arboretum, the classic Kershaw (dark horizon 6 ft plus), Ortega (dark horizon 3.5-6 ft), Rutlege (dark horizon within 6 in) gradient was a good fit (see Figure 7). There may also be a small band of Ridgewood soil (dark horizontal 2.5-3.5 ft).

The NRCS-DC checked several disturbed areas. The parking lot area and invasive area adjacent to Lake Ray dam he said could not be classified as anything other than Arents (a catch-all for altered urban land) because they were so disturbed. The soil color and smell indicated salt contamination in the parking lot and he encouraged JAG to get the soil tested before installing plant material. The ravine area he said could not be classified as Rutlege or Kershaw, as shown on the map, because so much of the top horizons had been stripped away. He suggested that we call this gleyed (blue-green because constantly wet) soil “excavated Kershaw”.

North of Lake Ray, the NRCS-DC did not find any Leon soil as indicated on the map and suggested that it had been misidentified. He verified that the xeric hammock and area north of the Live Oak Trail near the champion loblolly baygall were both Kureb soil, that the champion loblolly baygall was Rutlege, and that the areas south of the Live Oak Trail and at the intersection of the Live Oak Trail and old mining road were Kershaw soil. He hypothesized that the boundary between the two soil types (Kershaw and Kureb) roughly follows the palmetto, an indicator species for Kureb soils and suggested JAG verify this with additional soil cores.

The NRCS-DC did not check the Boulogne soil in the extreme southwestern corner of the site. He did not check the soils on the north end, but felt that the classification of Rutlege, Tisonia, and Kureb fit the topography and habitat types that existed. The Mandarin, Leon, and Evergreen-Wesconnett soils need to be confirmed.

Soil tests in the parking lot area corroborated the NRCS-DC's suspicion that the soil had moderately high electrical conductivity (1.59) and also indicated isolated spots with extremely high pH (11.18). The high pH was attributed to spreading leftover EZBase (also pH 11.18) during the construction of the parking lot. The City of Jacksonville's Department of Rights of Way replaced the soil in the affected area with soil (pH 7) donated by Alltel Stadium.

The dominant soil orders at the arboretum are quarternary spodosols (Boulogne, Evergreen-Westconnett, Leon, Mandarin) and entisols (Ortega, Kershaw, Kureb) formed by deposition of marine sediments on dunes and on flats, terraces, or depressions respectively. Also locally important are inceptisols (Rutlege) formed in upland flats and histosols (Tisonia) formed in salt marshes. Very detailed series descriptions are available on the NRCA website.

Entisols (formed on marine dunes):

Kershaw soil is a very deep, excessively drained, rapidly or very rapidly permeable grayish to yellowish brown sand. It is moderately to strongly acid. Slopes range from 2-15%. The depth to the seasonal high water table exceeds 6 feet. The parking lot and surrounding scrub in an arc to the uplands surrounding Lake Ray are all of this soil type.

Kureb soil is a very deep, excessively drained, very rapidly permeable gray sand. It is neutral to slightly acid. Slopes range from 0-20%. The depth of the seasonal high water table exceeds 6 feet. The oak hammock, rosemary scrub, and scrubby flatwoods habits flourish on this soil.

Ortega soil is very deep, moderately well drained, rapidly permeable gray-brown fine sand to sand. It is slightly to extremely acid. Slopes range from 0-12%. The depth of the seasonal high water table is 48 to 80 inches. During periods of drought it is below 80 inches. The upland hardwood forest grows in this soil.

Spodosols (formed on marine depressions, flats, terraces):

Boulogne soil is very deep, poorly drained fine sand that can be variably permeable depending on whether it is cemented or non-cemented. These soils tend to be moderately to extremely acidic. The mean high water table is 6 to 18 inches. Slopes are 0-2%. This soil is located in the extreme southwestern corner of the arboretum.

Evergreen-Wesconnett soil is a very deep, very poorly drained fine sand (Wesconnett) mixed with fine sand

overlain by muck (Evergreen). The permeability is generally through the topsoil but slow through the subsoil layer. The mean high water table is at or above the surface. Slopes are 0-2%. This soil type is under the upstream portions of the Jones Creek tributaries.

Leon soil is very deep, very poorly to poorly drained black and white sand that is rapidly to moderately rapidly permeable. The soil is extremely acid. The mean high water table is 18-36 inches. During times of drought, the water table is below 60 inches. Slopes are 0-5%. This soil is just uphill of the Evergreen-Westconnett in the Jones Creek tributaries. The pine flatwoods and seasonal depression habits are on this soil type.

Mandarin soil is a very deep somewhat poorly drained fine sand. The first layer of sand is dark gray but within 4 inches depth, the sand is light brownish gray. The soil is moderately permeable and moderately to extremely acid. The mean high water table is 18to 42 inches. The mixed forests of the arboretum north of the oak hammock are the dominant habitat growing on this soil.

Inceptisols (formed in floodplains or flats):

Rutlege soil is very deep, poorly drained but rapidly permeable loamy sand overlying sand. The soil is strongly to extremely acid. The mean high water table is 0-6 inches. Slopes are 0-2%. This soil underlies the Jones Creek bottomland forest and the downstream portion of the tributaries.

Histosols (high organic matter, usually formed in water):

Tisonia soil is very poorly drained, very slowly permeable mucky peat. It is slightly acid to neutral. The soil floods twice daily during normal high tides. Slopes are less than 1%. This soil is the substrate for the extensive tidal marshes at the north end of the arboretum along the western shore of Jones Creek.

## 2. Archaeological and Historical Resources

We have found very little evidence of prehistoric settlement. Lad Hawkins found a conch shell that had been punctured in the side and possibly used with a stick handle for digging or as a weapon. The puncture is for the leather ties that would have been used to attach the stick to the shell. The point

was well worn while the broken puncture was sharp indicating that the shell had not just been worn evenly by waves. It would be worth doing an intensive survey of the arboretum since the high sand with creek access to the river could have been a settlement site.

As previously discussed, in section (II A), a railroad ran along the northern boundary of the Arboretum in the late 19<sup>th</sup> century and parts of the Arboretum were excavated for sand minerals during the mid 20<sup>th</sup> century. AES Aerostar Environmental's Level I impact has captured some information about this stage of history. JAG needs to collect additional information from local citizens and museums.

### 3. Water Resources

Jones Creek bisects the southern third of the Arboretum and then runs northward along the eastern boundary. There are several feeder creeks one in the ravine area, a second just south of the southern upland mined area, a third between the two upland mined areas and a fourth creek running through the ravine. Finding the water sources for the feeder creeks is of utmost importance and a high priority research project. There is also a small man-made pond that was built some time between 1972 and 1975. It has properties similar to a clastic upland lake.

### 4. Fish and Wildlife

Management of the Arboretum natural areas will focus on maintaining and enhancing diversity. These goals will be accomplished through proven land management techniques such as removal of invasive species and replanting with native species, restoring appropriate undercover, and, where possible, prescribed burning. It is assumed that by augmenting the plant community, the animal community will prosper as well. In an effort to better understand the health and function of the ecosystems JAG will try to partner with universities to conduct ecosystem food chain process, ecological succession, and biogeochemistry studies similar to the 2006 TNC/UNF/City Betz Tiger food chain study. During this ten-year planning period, we will compile a list of observed species, including fish in both Jones Creek and Lake Ray. There are no current plans to release additional animal species.

### 5. Species of Concern

At this time, the only endangered or threatened species known to occur on site is gopher tortoise (*Gopherus polyphemus*). The gopher tortoise is on the state of Florida's threatened species list and as such no person can take, pursue, hunt, harass, capture or possess gopher tortoises or their burrows, nests, or eggs except by permission of the Florida Fish & Wildlife Service. Gopher tortoise

populations in Alabama, Mississippi and Louisiana are federally protected as “threatened” by the United States Fish & Wildlife Service. The populations in Florida, Georgia, and South Carolina are not currently protected by the federal government, however, their status is under review.

Tortoises inhabiting the area where the parking lot was built were either moved to the sandy mine tailings at the north end or excluded from returning to burrows within the parking lot boundaries. Permits for exclusion and relocation of these tortoises are available in Appendix D. The Arboretum could support additional tortoises in the rosemary scrub, xeric hammock and scrubby flatwood habitats. Currently, there are tortoise burrows in and around the Lake Ray sandpit.

It is possible that other species requiring small territories could also exist. A rare species survey should be conducted within this ten-year period to determine if rare or threatened species may occur or be reasonably expected to occur as restoration progresses. JAG will report any threatened or endangered species found on the Arboretum site to appropriate Federal/State agencies.

#### 6. Beaches and Dunes

No beach or dune habitats exist on this site.

#### 7. Swamps, Marshes and Other Wetlands

In addition to the water resources described above, the Arboretum contains four types of wetland communities- bottomland forest, baygall, tidal marsh, and depression marsh. As soon as possible but definitely before restoration or landscaping activities, JAG should delineate any jurisdictional wetlands and familiarize itself with state regulations.

The wetlands on the Arboretum site protect water quality of Jones Creek and ultimately the St. Johns River, recharge groundwater, help control flooding in nearby residential areas, and preserve aquatic habitats. In the interest of maintaining these valuable resource functions, JAG will incorporate wetland restoration into the overall resource management program as opportunities arise, particularly where wetland systems have been impaired or negatively impacted by previous management activities.

Wetland restoration objectives on the Arboretum property include erosion control, restoration of hydrology and/or hydro-period and restoration of wetland plant and animal communities. To achieve these objectives, restoration activities may involve road and soil stabilization, water level control structure removal or installation, exotic species control, site reparation and re-vegetation with native wetland species, and project monitoring.

#### 8. Mineral Resources



Rutile, ilumenite, zircon and monazite, were mined from the site from 1944 until approximately 1961 by Humphrey's Gold Mining Co. No other known minerals are on-site.

## 9. Unique Features

The most obvious unique feature is the State Co-champion Loblolly Bay located in a baygall on the arboretum. Secondly, time and again, researchers visiting the Arboretum have commented on the incredible diversity of communities, at least twelve (see Natural Communities section) in such a small area. Finally, also remarkable is the fact that the area is damaged but not lost. The area is a showcase for how nature recovers from severe scarring by humans.

## 10. High Conservation Value Native Landscape

This section summarizes High Conservation Value Native Landscape (Outstanding Native Landscapes) on the site. Figure 1 shows the location of each landscape. Additional information on the habitats in these landscapes is available in the Habitat section later in this document.

To date, we have identified five areas of outstanding native landscape which should be preserved and/or restored (Figure 8). The first is at the northern end of the Arboretum abutting the mined sand is an overgrown scrubby area that could, with adherence to a burn plan, be restored to its original scrubby flatwood condition. It would be appropriate to reclaim some of the xeric hammock to increase the size of the scrubby flatwood.

The second is the rosemary scrub and the xeric hammock flanking the rosemary scrub. Though possibly a climax stage of sandhill from which fire has been excluded, it is still a remarkable area and should be maintained. A small portion of this community was mined and has since converted to rosemary scrub. It appears from aerial photographs (Appendix A) that the xeric hammock has encroached on the rosemary scrub over time. JAG should consider converting some of the xeric hammock to rosemary scrub and some to scrubby flatwood.

The third is a baygall area just northeast of the man-made lake. Amongst the canopy of towering loblolly bays is the Florida Co-Champion, Lad Hawkins Loblolly Bay.

The fourth is a slender strip of undisturbed native upland hardwood forest sandwiched between Jones Creek and the Holly Oak Lake subdivision beginning at the southern boundary and ending at the extension of boundary between 1548 and 1542 Cellars Circle. A number of hickories in excess of 24" dbh and an intact understory of indicator species make this area remarkable. The upland hardwood forest/slope forest south of the powerline has a number of junk piles that will need to be removed

The fifth area is the bottomland surrounding Jones Creek south of the Lake Ray dam. Though relatively undisturbed, it is spotted with air potato and other invasive species and thus in need of intensive restoration.

#### 11. Disturbed/Not Outstanding Landscapes

There are several areas of the Arboretum appropriate for immediate conversion to gardens (Figure 9). These are areas that have been so disturbed by mining activities that they are unrestorable or areas that in their current state are considered fire hazards.

The first is the current entrance area (#1 on Figure 9). The portion already converted to a parking lot was a previous mining site and was colonized by cogon grass, an exotic invasive. The current campfire area is a mid-1970's borrow pit.

The upland mixed forest area between the pond to the south and the xeric hammock and the pine flatwoods to the north, baygall to the east and boundary line to the west is an extremely disturbed site (#2 on Figure 9). There are a few large live oaks on the hill but the mid and understory layers are not worth salvaging as a community. There are numerous outstanding individual specimens (e.g., Chinquapin, American Holly) that should be saved. The boundary with the Turkey Oaks of the xeric hammock to the north should be flagged to prevent inadvertent disturbance of that area

The portion of bottomlands between the pond and the eastern boundary is a 1970's dam and subsequent dump area (#3 on Figure 9). This area is so overrun with invasive species including air potato, paper mulberry, tallow tree, ardesia, loquat, periwinkle, and Boston fern that it needs to be replanted.

The ravine area deserves special mention (#4 on Figure 9). The gully is the remains of a borrow pit dug in 1974 and 1975. Though recovering well, it should be augmented with plantings. The loblolly pines, planted in the early 1970's (to stabilize the base of the pit following excavation) are overstocked and should be thinned and replaced with more appropriate species. The "ridges" to the immediate north and south of the dump area are also very disturbed and are particularly good candidates for conversion to gardens.

Finally, along the western boundary in the central portion of the site is a mesic flatwood area that has not been burned for over fifty years (#5 on Figure 9). Though the trees are large and the area is a stunning example of this habitat, the duff layer is so thick that the area has become a fire hazard. If a wildfire were to start, it would smolder for months before it burned off the thick layer of rotting pine needles. It is not economically feasible to restore this area. A portion of the area was mowed July 21, 2010.

#### **IV. MANAGEMENT CONCEPTS BY NATURAL COMMUNITIES AND PROPOSED MANAGEMENT ACTIVITIES**

##### **A. Existing and Planned Uses**

The Arboretum will be managed under the multiple use concept in order to achieve the greatest benefit to the citizens of Jacksonville and their guests. Activities to occur on the Arboretum include restoration, maintenance and protection of Outstanding Natural areas, installation of gardens focusing on the native species of northeast Florida and economic and ethnobotanical selections, and creation of open areas for passive recreation (picnicking, concerts, art and eco walks, etc).

##### **1. Arboretum Boundaries: Establishment and Preservation**

Approximately 25% of the Arboretum boundary has been marked with signage. The establishment, marking, and fencing of boundaries are of utmost concern because of the frequency of trespassing incidences.

##### **2. Soil and Water Protection**

The acquisition and management of public land has several objectives including maximizing ecological restoration of outstanding natural areas and facilitating optimum public use. Overriding both these objectives is the responsibility to be exemplary stewards of the natural resources on the Arboretum. This is not limited to protecting soil and water but also to improving them when the opportunity arises. The almost 50 year history of unauthorized and unregulated dumping on the Arboretum gives us endless opportunity for both.

##### **3. Roads**

Currently JAG does not allow public access by vehicle beyond the parking lot off Millcoe Road. Occasional controlled vehicle access is managed on an as-needed basis for maintenance and event set-up. Secondary dirt roads have been created for this purpose. There is potential for public access from the north end, at the Ft. Caroline/Merrill Road intersection. This could eventually connect to the parking lot at the south end possibly by using the Millcoe Road right of way or another more scenic route. The Master Plan includes a northern parking area to provide access to hiking trails, though there are no plans in the short term to build this out. There are old roadbeds running roughly north/south through the center of the Arboretum. Portions of some of these roads may be incorporated into hiking trails, otherwise the roads will be allowed to overgrow.

##### **4. Recreation Management**

The demand for resource-based outdoor recreation within Duval County will continue to grow as the surrounding area is urbanized. Due to its central location and proximity to a major interstate highway (I-295), the Arboretum is perfectly positioned to provide quality outdoor experiences to the citizens of

Jacksonville and their guests. With increases in population and development, public and private parks will become more important than ever in providing quality outdoor recreational experiences and preserving representative and unique natural areas. JAG will attempt to minimize deterioration of the Arboretum through normal use by remaining mindful of the tolerances of various communities' usage. JAG will follow Florida State Park Carrying Capacity guidelines for all recreational activities. To this end trail length should not exceed 1 mile/25 acres or 4.8 miles/120 acres. According to Florida State Parks information trail usage in excess of 160 hikers/mile/day will result in degradation of the surrounding habitat.

a. Existing Facilities/Infrastructure/Recreational Activities

There are currently no buildings on the Arboretum except an 8' x 10' metal storage shed and an 8' x 20' shipping container near the parking lot next to the west boundary. JAG leases a portable toilet which is located at the northeast end of the parking lot. There is one entrance to the Arboretum at which a 25-space parking lot was constructed in the summer of 2008. The lot includes two accessible parking spaces. A large island in the middle is currently used for overflow parking off-pavement. As the conceptual plan suggests the middle island can be converted to additional paved parking as need and funding arises. The parking lot plan including build out potential is shown in Figure 10.

There is small truck access for contractors from the extreme west end of the parking lot around the north side of Lake Ray. There is also drop curb access for small vehicles to the south of the Lake Loop.

A 250' paved trail extends a short way around Lake Ray. The remainder of the trails are dirt, reinforced with mulch and gravel at soggy spots. There are bridges and boardwalks over creeks and large tree roots.

b. Planned Facilities

The overall plan for vertical development of the Arboretum is shown in the 2005 Conceptual Master Site Plan (Figure 2). This document was completed in 2005 and reflected JAG's understanding of the space and community needs at that time. JAG intends to revise the conceptual master site plan in 2011 to incorporate new knowledge and changes in community needs. The entry drive and first phase of parking (Figure 9) were constructed prior to the opening of the Arboretum in 2008.

The renderings of the Visitor's Center (Figure 11), a multiple-use area in the old sand borrow pit (Figures 12a & 12b), and boardwalk (Figure 13) are conceptual only and thus open to evolve in their shape, function, location and inclusion. These conceptual architectural facilities are designed to provide opportunities for botanical and environmental

research, education, outreach and appreciation. They might also provide opportunities for general community functions such as group meetings, weddings, and events.

Other facilities considered for the future, but not yet in the planning phase, include greenhouses, covered and uncovered decks and platforms for viewing natural areas, and small shelters for rest, observation or small events. Future hardscaped areas within the gardens will include bridges and boardwalks to access natural areas and gardens and an event lawn.

c. Planned Recreational Activities

(i) Public Access/Parking Public

Access to the Arboretum is currently through Millcoe Road. Additional access points, possibly along Ft. Caroline/Merrill Road, will be developed with input from user groups and other interested members of the general public.

(ii) Recreational Trails

A park the size of the arboretum can accommodate 4.8 miles of trails (1 mile/25 acres). We currently have approximately 2 miles. JAG should complete a Best Management Practices for Trail Design and Installation.

Trails are the Arboretum's opportunity to invite guests to enjoy and learn about their natural environment. Guests may include individuals in wheelchairs, cross country joggers, families with strollers, senior citizens, nature enthusiasts, and even the environmentally-challenged sector of the general public. All of them are part of our target audience. Some trails also serve a double purpose as vehicular access to inner portions of the Arboretum. To whatever extent possible, all trails will follow sustainable trail design criteria.

At the Arboretum, there are basically three levels of trails 1) multipurpose, 2) wheelchair/stroller accessible, and 3) hiking trails. Multipurpose trails, such as the new Lake Loop, have 10' tread width, 12 ft clearance, and surfaces sturdy enough to support pickup trucks and small tractors. Wheelchair/stroller accessible trails have 5' tread width, 8' vertical and horizontal clearance, and firm stable surfaces that are not degraded by use. There are currently no wheelchair/stroller trails. Most garden trails that are within the planted area will be of this type. Hiking trails will have

2' - 3' tread width and 8' vertical and 5' horizontal clearance and will follow sustainable design criteria whenever possible. All trails outside the planted collection areas will be of this type. Current examples are Ravine, Jones Creek, Live Oak and Rosemary Ridge trails. The proposed accessibility guidelines for new trail construction very nearly matches current sustainable trail design recommendations (Mike Passo, Accessibility Design, [www.americantrails.org](http://www.americantrails.org)).

For wheelchair/stroller accessible trails, the slope may not exceed 5% except for short distances (8.33% for up to 200 ft, 10% for 30 ft, 12% for 10 ft, and 14% for 5 ft if necessary for drainage structures). These slope requirements are also sustainable trail design criteria because they discourage erosion. The cross slope requirements of accessible and sustainable design overlap at 5%. Accessible design suggests 0-5% (10% if required in a drainage structure) while sustainable design suggests 5-9% (1<sup>1</sup>/<sub>8</sub>" tread width). Flat trails across soils with a shallow impervious layer retain moisture and result in a series of mud holes. Any trails or portions of trails that can not be built to sustainability/accessibility recommendations, will have posted signs in order to allow trail users to choose for themselves whether the trail meets their individual accessibility needs.

Sustainable design criteria also suggest that trails should contain frequent grade reversals and follow a curvilinear alignment. In other words, the trail should have "ups and downs" and "twists and turns" around trees, topographic contours, etc. Not only do people prefer the interest this design imparts but it also provides excellent opportunities to manage water on the trail tread. These design elements keep steeper sections of trail restricted to short distances and provide ample opportunities for resting intervals between each "up and down". These are the same key elements of the proposed accessibility guidelines.

Our guests are drawn to edges and boundaries and all of our trails should follow whatever edges and boundaries are available. How close to the edge is a very tricky decision. If the trail does not go close enough to an edge, guests blaze their own trails. If too close then the trail is potentially hazardous. The Lake Loop follows the edge of the pond, the Ravine Trail winds along the steepest portion of the old borrow pit, and the Jones Creek Trail offers gorgeous views over the edge of a slope down to the creek. A guardrail is being constructed to prevent hikers from falling down the slope. Even the Live Oak Trail follows the circuitous habitat boundary between Keshaw and Kureb soils and the

Rosemary Ridge Trail likewise has repeated views to the edge of both the fragile rosemary scrub and the tidal marsh.

Finally, our guests like the feeling of privacy but not isolation. All of our hiking trails, even those that wind back on themselves, have planned screens from nearby trails. The wheelchair/stroller accessible trails through future garden installations that require a several year site preparation process will, by necessity, have large open areas. Plant installations will restore the illusion of privacy to these trails. The multipurpose trails are designed so that vehicles are not visible from either accessible or hiking trails. The line between privacy and dangerous isolation varies widely amongst guests. Great care must be taken to keep all guests relatively comfortable. For example, the palm grove near the parking lot is viewed by some as a cool shady escape and by others as a frightening place with muggers lurking behind each tree.

The safety of our guests while on the trails is of utmost importance. Every reasonable attempt will be made to keep trails accessible re-surfacing with mulch and gravel and with permanent and temporary boardwalks and bridges. In the event that trails are flooded, or are not safe, they will be closed until they are safely passable.

Habitat preservation is obviously necessary in Outstanding Native Landscapes; without it the trails are worthless. When trails are constructed through Outstanding Native Landscapes ground disturbance will be minimal and trail clearing will be no more than the tread width and clearance of the appropriate trail class. No multipurpose trails will be constructed through Outstanding Native Landscapes areas. No wheelchair/stroller accessible trails will be constructed through Outstanding Native Landscapes areas if they require importing tread material. Boardwalks may be added to minimize habitat damage. Trails will avoid rare, threatened/endangered, and fragile plants. Additional operating and management guidelines will be continued in JAG's BMP's for trail construction and maintenance

### (iii) Fire Management

Though prescribed burning is one of the best management and restoration tools available for the southeastern United States, it is also difficult to apply in an urban setting. If we are able to use it at all, it will only be after careful planning and in strict adherence with Federal and State prescribed fire regulations.

Florida Division of Forestry has taken an active interest in prescriptive mowing in boundary areas as part of their Urban Wildfire Prevention Program. They will continue to work with JAG to design burn plans where feasible.

5. Gardens/Specimen Collections

a. Objectives

Botanical gardens usually contain various distinct collections of plants identified by scientific and common name. It is the possession of these collections that distinguish gardens from similar entities such as parks and nature preserves. JAG is currently writing the collections policy.

The ultimate purpose of a collection policy is to guide and limit what a garden collects so that collections are meaningful and relevant to the mission of the garden. The purpose of JAG's collection is to encourage the appreciation, understanding, maintenance and use of trees, woody shrubs, and other plants, in northeast Florida by demonstrating the value of plants in our daily lives. JAG's collection policy anticipates that its signature collections will include native plants with a special emphasis on the plants which are native to Duval, Baker, Nassau, Clay and St. Johns counties, "economic" plants (and plant products) that provide an economic benefit such as tea, coffee, and lumber including plants that were significant to the region historically, such as cotton, indigo and turpentine, and ethnobotanical plants.

For purposes of JAG's signature collections, "native" means plants native to Duval, Nassau, Baker, Clay and St. Johns counties. Subsequent collections may include other plants "native" to the southeast and other geographic regions.

"Economic plants" include plants with an economic value to people, again with special emphasis on northeast Florida. The term "Ethnobotanical" refers to the study of how people of a particular culture and region make use of indigenous plants. Ethnobotanists explore how plants are used for such things as fuel, food, beverages, shelter, medicine, fibers and clothing, hunting, and religious ceremonies, or simply, plants that people use in daily life. Ethnobotany has its roots in botany, the study of plants. Botany, in turn, originated in part from an interest in finding plants to help fight illness.

The economic and ethnobotanical collections map overlap to a degree and will represent a wide diversity of uses people make of plants, both native and exotic. These collections may include cultivated non-invasive plants that were transported to the Northeast Florida from other



parts of the world by early settlers and exotic non-invasive plants that are sources of products used by people in NE Florida and can be grown successfully in this area. .

Other plant acquisitions may be appropriate to the Arboretum but these plants must be screened and selected consistent with the mission of the Arboretum. By design, it is our mission to demonstrate and promote the use of plants that demand less water, less chemicals, and less maintenance. We will acquire species that are appropriate for the Jacksonville climate, are not exotic pest plants in Florida, were collected legally, support JAG's mission and goals to minimize effects on natural resources, promote research and education, conservation and preservation, and are compatible with the collection policy. As outlined above, our plant collections should be plants that are sustainable without burden to our natural resources. The use of plants that require excessive water or significant maintenance is strongly discouraged. Non-native plants which do not meet collection guidelines or which are without botanical or conservation value may be selected for temporary highlights, in landscape beds only and may not be planted as a permanent part of the Arboretum's collection. No plants included as Category I or II on the Florida Exotic Pest Plant Council List may be used. (See Voluntary Code of Conduct agreement in Appendix F).

The interim Collection Policy for the Arboretum is included in the appendix. (C)

b. Documentation Inventory System

An efficient documentation system is fundamental to maintaining a collection. This information will be stored in a systematic and organized way in a computerized database so that it is readily accessible. A hard copy of these records will be maintained and updated annually. There will be an ARCGIS file with a map which identifies the location of each plant in the collection. The associated Attribute Table will include 1) date added to the collection, 2) the scientific name of the plant, 3) the common name(s), 4) current GPS coordinates, 5) name of nearest trail, 6) origin: if purchased/donated how, when and in what form the plant was acquired; if not planted, the approximate size, age, and condition of the tree/plant when identified on the Arboretum; if collected in the wild, its original location, (including original GPS location, if available), and natural growing conditions. Origination data will be different for different plants.

Plants will be inventoried and signs checked at least annually to determine the general health and condition of the plant and to be sure that identification signage is still in place at the correct location.

Additional policies and operating guidelines will be contained in JAG's collection policy, the purpose of which is to ensure the protection and security of the collections and outline policies for acquisitions, accessions and deaccessions.

JAG will also support the nation's effort to protect, restore and preserve threatened and endangered species. Threatened and endangered data will be shared with appropriate Federal and State conservation agencies.

#### c. Landscape Plan

The overall plan for landscape of the Arboretum is shown in the 2005 Conceptual Master Site Plan. As previously discussed, this plan will be revised in 2011. We installed the first phase of the landscaping for the parking lot in the fall of 2009 (Figure 14). The Lake Ray landscape plan (Figure 15) is still under review; it will be installed beginning November 2011. The ravine and upland hardwood area are being augmented with native species appropriate to the existing communities. For example, several species of wetland forbs including blue flag and Louisiana irises, alligator flag, and spider lily now inhabit the ravine. Eastern redbud, Florida dogwood, two-winged silverbell, and sand post oak are struggling on the slope above Jones Creek.

Landscape amenities considered for the future include: gardens demonstrating indigenous and non-invasive exotic species within guidelines of our mission statement and collection's policy. Bridges and boardwalks will provide access to natural areas and gardens. Priority areas for landscaping include the parking lot, Lake Ray, invasive plant eradication site between Jones Creek and Lake Ray, highly impacted mixed uplands north of Lake Ray, and the past prime pine flatwoods between the Live Oak Trail and the western boundary of the Arboretum (a portion of which is currently designated as an event lawn). Other areas which could be designated for gardens are included later in this document under Proposed Management Activities.

#### 6. Access

Plant collections will be accessible to the public during operating hours. Restricted access may be needed to protect certain plants which could be injured by excessive foot traffic or which are located in sensitive areas. Plant records will be available to the Board, staff, and persons granted access to the records.

#### 7. Education

Public Education provides programs, exhibits, and publications about conservation, horticulture, gardening, botany, and natural history to enhance

understanding of the natural world and foster appreciation of the Arboretum's mission.

Currently programs are limited to tours, talks, and demonstrations during events, those arranged by small organizations, and the campfires and owl prowls held on winter weekend nights. There is a large three-panel information board at the entrance to the Arboretum and small panels at strategic locations along the original trails. Publications on specific topics such as gopher tortoise and invasive plants are available at the main entrance. Small metal signs (3" x 5") identify approximately 50 species along the original trails.

In the future, JAG plans to develop a core of volunteer guides to offer tours on the weekends and during the week. JAG also intends to develop a series of weekday and weekend seminars and workshops on topics that further the mission of the Arboretum after polling visitors to determine their interests. JAG is in the process of writing educational brochures about the communities along each of the trails, checklists for trees and birds and an additional topical brochure on stewardship.

JAG intends to add trail brochures, checklists and an interactive trail map to our existing website ([www.jacksonvillearboretum.org](http://www.jacksonvillearboretum.org)). Currently, there is a trail map and a photo gallery. Within the next ten years, the website will provide the opportunity to view and print maps, guides and habitat descriptions and to contact the Webmaster with suggestions. JAG may also add the capability to view and vote on other guest's comments, feedback and suggestions. Other possibilities include linking seasonal photos and Twitter and Facebook pages to the online guides and maps.

As funds become available and trails are added, we intend to produce educational signage similar to that on existing trails. Plant signs will also be added for all trails. Once JAG starts to build its specimen collection all plants in the collection, including existing native plants accessed into the collection, will have identification signs.

## 8. Events

As of December 31, 2010 events held at the Arboretum include: 1) the Grand Opening and subsequent Anniversary Events - open to the public with guided tours, live music, kid's crafts, vendors selling food, plants, and handicrafts, educational programs, and tables from other non-profits such as Florida Native Plant Society, Sierra Club, Garden Club of Jacksonville, The Nature Conservancy, and Audubon Society; 2) volunteer workdays - typically held during the second Saturday of the cooler months (Sept-May), attendees assist with site maintenance, including trail clearing and building, trash removal, and plantings; 3) numerous "Owl Prowls" - a limited number of attendees (~50) with reservations walk the trails in groups of 10-12 with a guide; 4) several full moon

campfires – guest (~60) with reservations enjoy stories, sing-a-longs, and marshmallow roasts around a small campfire in the amphitheater area close to Lake Ray; 5) Mayor's Book Club - A City event for members of the Mayor's book club, held near Arbor Day, approximately 200 children and their parents come out for a tree planting and celebration of reading including reading a story (on giant pages) while walking around Lake Ray; 5) Dog Day/Blessing of All Creatures Great and Small - held in October, involves a "blessing of the pets" and a dog costume contest; 6) Beekeeping Seminar; and 7) "Lakewatch" Training Seminar.

Future onsite events may include educational programs, weddings, private parties, concerts, festivals, fundraisers (for the Arboretum, other non-profits and special interests). Events to raise awareness, increase membership, and fundraise may be held offsite until improvements are made on site that can handle such events. A tap party (fundraiser at Seven Bridges Brewery) and Spring Art Fundraiser are planned offsite events for 2010.

Arboretum sponsored events are open to the public or Arboretum members. Private parties are open to invited guests. All events should be planned and monitored so as to keep attendees on trails and within event spaces (i.e. minimize impact on site). Overflow parking may be provided in the center of the paved parking area as well as along Millco Rd. Accommodations for disabled visitors, such as accessible restrooms and parking shall be maintained.

## 9. Research Projects

Research projects and specimen collection may be performed in certain areas of the Arboretum on a temporary or permanent basis for the purpose of obtaining information which furthers the knowledge of habitat ecology, restoration of habitats, appropriateness of species to the collection, and enjoyment of the collection by the public. The Arboretum currently cooperates with local educational institutions (e.g., Jacksonville University) in the accumulation of this information. In 2010 a Jacksonville University Plant Taxonomy Class under the direction of Dr. Nisse Goldberg began a herbarium collection.

In order for any research project to occur, it must first be approved by JAG, or its designee at that time. All requests for research or specimen collections should be submitted in writing and must outline the scope, methodology, and location of the proposed project. Specimen collections require Geographic Information System (GIS) data that can be incorporated into an ARCVIEW layer. Investigators must provide a written report of results. Long-term projects are subject to annual review.

## 10. Law Enforcement

The Jacksonville Sheriff's Office provides law enforcement services. Prior to opening the arboretum there were several trespassing incidents by people

driving recreational vehicles. Since the opening there has been one trespassing incident by partiers building campfires in the rosemary scrub. In September 2010, the EZGO cart and most of the power landscape equipment were stolen from the locked storage container.

#### 11. Wildlife and Fish Management

Judging from periodic aerial photographs, the Arboretum has not burned extensively between 1943 and the present. There was a small fire in the mid 1970's somewhere in the central portion of the Arboretum. Lad Hawkins said that deer fled the blaze by running down Holly Oak Lake Drive. Other than that fire, there has been no known burning and as a result a heavy duff layer and thick understory have developed. A mosaic-patterned prescribed burn would be beneficial to many existing ecosystems and would reduce the risk of an uncontrollable wildfire. Management techniques could include burns during the growing season and burning across transition zones. Fire should be excluded from xeric hammock and rosemary scrub areas except where needed to keep xeric hammock from encroaching on rosemary scrub. JAG intends to conduct a survey for species of special concern and write management plans for all threatened and endangered species. JAG will report any threatened and endangered species to appropriate Federal and State agencies.

Management of gopher tortoises is discussed in section III(B)(5) above.

#### 12. Non-Native Invasive Species

In response to the 2001, St. Louis Declaration on Invasive Species JAG has signed the Voluntary Code of Conduct for Botanic Gardens and Arboreta and by doing so has committed to eradicate/control existing exotic invasive populations, screen introductions for exotic invasive species and educate the public about landscape alternatives to exotic invasives. A copy of this document is included in Appendix D.

Over the years, portions of the Arboretum have become infested with invasive plant species, such as air potato, paper mulberry, tallow tree, ardesia, and sword fern (wild Boston fern). These areas require special attention to prevent their further spread. JAG will implement an invasive species eradication plan in those areas and continue to monitor the Arboretum for new infestations. The eradication plan will include a combination of herbicide applications and manual removal.

The following Florida Exotic Pest Plant Council (FLEPPC) Class 1 and 2 plants have been found at the Arboretum:

##### FLEPPC Class 1 species:

- |                               |                   |
|-------------------------------|-------------------|
| 1. <i>Albizia julibrissin</i> | mimosa, silk tree |
| 2. <i>Ardisia crenata</i>     | coral ardisia     |

- |                                     |   |
|-------------------------------------|---|
| 3. <i>Asparagus aethiopicus</i>     | asparagus fern                                      |
| 4. <i>Cinnamomum campleora</i>      | camphor tree  |
| 5. <i>Colocasia esculenta</i>       | wild taro   |
| 6. <i>Dioscorea bulbifera</i>       | air potato  |
| 7. <i>Imperata cylindrica</i>       | cogon grass (State and Federally listed)            |
| 8. <i>Lantana camara</i>            | lantana, shrub verbena                              |
| 9. <i>Ligustrum lucidum</i>         | glossy privet                                       |
| 10. <i>Ligustrum sinense</i>        | Chinese privet, hedge privet                        |
| 11. <i>Nandina domestica</i>        | nandina, heavenly bamboo                            |
| 12. <i>Nephrolepis</i>              | sword fern  |
| 13. <i>Sapium sebiferum</i>         | Chinese tallow tree (State and Federally listed)    |
| 14. <i>Tradescantia fluminensis</i> | small leaf spiderwort, white-flowered wandering Jew |

FLEPPC Class 2 species:

- |   |                          |
|---|--------------------------|
| 1. <i>Broussonetia papyrifera</i>         | paper mulberry           |
| 2. <i>Elaeagnus pungens silverthorn</i> , | thorny olive             |
| 3. <i>Melia azedarach</i>                 | Chinaberry               |
| 4. <i>Phyllostachys aurea</i>             | golden bamboo            |
| 5. <i>Sesbania punicea</i>                | purple sesban, rattlebox |
| 6. <i>Wisteria sinensis</i>               | Chinese wisteria         |

Total Acres & Treatment Areas

There are three zones based on current infestation level and thus priority for treatment:

Zone A (Priority 1) 48 acres in the southern portion of the property which has the oldest and most rampant infestations.

Zone B (Priority 2) 8 acres at the northern boundary along Merrill Road and has new infestations encroaching into the less disturbed portion of the site.

Zone C (Priority 3) 64 acres, most remote area that has not been completely surveyed but has known infestations of camphor, Chinese tallow, and Chinaberry trees. This zone needs to be surveyed.

See Figure 16 for treatment zones and mapped infestations.

Work Specifications

Control methods for all tree species (Chinese Tallow, mimosa, Chinaberry, paper mulberry, and camphor) will depend on the size of the tree, sapling or seedling. For large trees JAG prefers the tree be felled and the remaining stump immediately treated with the appropriate herbicides per label rates depending on tree species. For sapling and seedlings JAG would prefer a basal bark treatment or a foliar treatment using labeled product recommended for hardwoods. For the invasive vines (air potato and wisteria), groundcover plants

and shrubs, (wild taro, nandina, ligustrums, wandering Jew, and rattlebox) we prefer for invasives that are growing in trees and mixed with desirable plants, for the invasive vegetation to be cut and destroyed, and the remaining plants sprayed with appropriate herbicide solution for each species. For the Cogon grass, JAG prefers for either no equipment used in the treatment, or if ATVs are used, appropriate sanitation BMP's be followed such as the cleaning of equipment before leaving the site. For Cogon herbicides, JAG uses Imazapyr (Arsenal and Arsenal AC) and/or glyphosate (Roundup, Accord, etc.) products. If any additional class 1 & 2 species (E.G., old world climbing fern) not listed as occurring are found, JAG requests that these be treated as well.

All herbicides will be used in accordance with label specifications including personal protective equipment, herbicide concentrations, and used under the appropriate environmental conditions. A marking dye will be used when appropriate. After being sprayed, all exotic species will be disposed of onsite. JAG will identify areas and species to be treated, approve all control methods, coordinate access points and parking areas, and inspect the contractor's procedures, applicators, and herbicides. When services are provided by a contractor, an on-site meeting between the contractor and JAG will be conducted prior to initiation of work.

In August 2007, S.E. Greentrust (Chris Benson, owner/commercial applicator), treated air potato between Lake Ray and Jones Creek.

In November 2009, S.E. Greentrust treated cogon grass, air potato, mimosa and Chinaberry on the JEA right of way.

In May 2010 the North Florida Invasive Working Group spent a day spraying cogon grass, digging Boston fern and asparagus fern, and hacking and squirting numerous invasive tree species. In October 2010, City department of Rights of Way removed all invasives in the future garden area between Lake Ray and Jones Creek. JAG will continue to enlist assistance from all these groups in an effort to combat invasives at the Arboretum.

### 13. Habitat Health

Other than the history of mining activities, unregulated dumping, and the proximity of roads and neighborhoods, JAG does not know of any other constraints on the health of any terrestrial or aquatic communities on the Arboretum.

### 14. Utility Corridors and Easements

The use of public greenspace for utility lines, pipelines, linear facilities and transportation corridors will be discouraged to the greatest extent possible. Currently one JEA power line bisects the Arboretum in an approximate east west direction on the southern third of the site. JAG will continue to monitor possible

inadvertent introduction of invasives from activities such as mowing (e.g. cogon grass and other invasive grasses from unclean equipment) and work with corridor property owners to adhere to First Coast Invasive Working Group's (FCIWG) recommended decontamination standards to deter continued infestations.

#### 15. Ground Disturbing Activities

The Arboretum is committed to managing and protecting the sensitive resources on the property. Sensitive resources include wetlands, rare, threatened and endangered species, Outstanding Native Landscapes, and historic sites. It is our goal that these resources will not be adversely impacted by ground disturbing activities. When new activities are considered, such as recreational trails, boardwalks, or construction of roads or buildings, they will be designed and carefully constructed so as to minimize impact to sensitive areas.

#### 16. Restoration

Large portions of the Arboretum have been disturbed directly and indirectly by mining activities, exclusion of fire, dumping of household refuse and colonization by invasive species. Where it is feasible to restore natural areas at the Arboretum, JAG will focus on restoring species composition, hydrology and, if possible, fire. The management actions to achieve these goals are detailed further in this plan under the desired future conditions and restoration/management section of the community descriptions.

### B. Description of Natural Communities and Proposed Management Activities

A preliminary survey served to ground-truth aerial maps and convert Florida Land Cover Classification System (FLCCS) to Florida Natural Area Inventory (FNAI) nomenclature. To confirm that the proper natural communities were assigned and to assign acreage, a more intensive FNAI wetland delineation and ground-truth survey should take place over the course of this ten-year planning period. Some disturbed portions of the Arboretum may not be appropriate to FNAI description.

#### 1. Hardwood Forested Upland

##### a. Upland Hardwood Forest

**Current Conditions.** The upland hardwood forest is a well-developed closed canopy forest most commonly occurring along slopes or bluffs above streams and rivers. No species predominate. March-October, when the canopy is in leaf, the air movement and light penetration are low, making the



humidity high and constant. The water retention capability of the soil is increased by a thick layer of leaf mulch. Because of these conditions, mixed upland forests rarely burn.

Underlying soils are a classic gradient of Kershaw/Ortega/Ridgewood/Rutlege as the overlying light sandy horizon goes from greater than 6, to 3.5-6, to 2.5-.5, to less than .5 ft. These soils were formed by wind and water deposits in sandy marine habitats. All four soil series are acidic to very acidic. On the highest slopes the seasonal high water table (December-May) is greater than 72" in Kershaw and Ortega; as soils grade to Ridgewood and Rutlege, the seasonal high water table can be as low as 15-24" for Ridgewood and 0-6" for Rutlege.

These communities are diverse and a plant list can only begin to scratch the surface. Plants identified, thus far, in this community include: Pignut Hickory (*Carya glabra*), Southern Magnolia (*Magnolia grandiflora*), American Hornbeam (*Carpinus caroliniana*), Eastern Hophornbeam (*Ostrya virginiana*), American Holly (*Ilex opaca*), Witch Hazel (*Hamamelis virginiana*), Live Oak (*Quercus virginiana*), Laurel Oak (*Quercus hemisphaerica*), Red Cedar (*Juniperus virginiana*), Sarsaparilla Vine (*Smilax punuila*), Strawberry Bush (*Euonymus americanus*), Wild Olive (*Osmanthus americanus*), Beautyberry (*Callicarpa americana*), Horse Sugar (*Simplacus tinctoria*) Saw Palmetto (*Serenoa repens*), Cabbage Palm (*Sabal palmetto*). Other species that should also occur include Gum Bumelia (*Burmelia lanuginosa*), Hackberry (*Celtis sp.*), Persimmon (*Diospyros virginiana*), Red Mulberry (*Morus rubra*), Black Cherry (*Prunus serotina*), Laurel Cherry (*Prunus caroliniana*), Hercules Club (*Zanthoxylum sp.*), Slippery Elm (*Ulmus rubra*), Water Oak (*Quercus nigra*), Trilliums (*Trillium spp.*), Passion Flower (*Passiflora spp.*), Silverbell (*Halesia sp.*), Fringe Tree (*Chionanthus virginianus*), White Oak (*Quercus alba*), Spruce Pine (*Pinus glabra*), Sweetgum (*Liquidambar styraciflua*), Devil's Walking Stick (*Aralia spinosa*), Redbud (*Cercis canadensis*), Flowering Dogwood (*Cornus florida*), and Black Gum (*Nyssa sylvatica*).

We have not surveyed any animals in this habitat but vertebrates should include Slimy Salamander (*Plethodon glutinosus*), Cope's Gray Tree Frog (*Hyla chrysocelis*), Bronze Frog (*Rana clamitans*), Box Turtle (*Terrapene Carolina*), Eastern Glass Lizard (*Ophisaurus ventralis*), Green Anole (*Anolis carolinensis*), Broadhead Skink (*Eumeces laticeps*), Ground Skink (*Scincella lateralis*), Red-Bellied Snake (*Storeria occipitomaculata*), Gray Rat Snake (*Elaphe obsoleta spiloides*), Rough Green Snake (*Ophedryx aestivus*), Coral Snake (*Micrurus fulvius*), Woodcock (*Scolopax minor*), Barred Owl (*Strix varia*) (repeatedly observed), Pileated Woodpecker (*Dryocopus pileatus*), several shrew species, Eastern Mole (*Scalopus aquaticus*), Gray Squirrel (*Sciurus carolinensis*), Wood Rat (*Neotoma floridana*), Cotton Mouse (*Peromyscus gossypinus*), Gray Fox (*Urocyon cinereoargenteus*) and White-tailed Deer (*Odocoileus virginianus*).

There is a foot trail traversing the slope often within 6' of the steep slope down to Jones Creek. Tread width is approximately 3' and clearance approximately 10'. The slope has erosion problems.

There are several species of invasive plants threatening the area including tallow tree, ardisia, air potato, and cogon grass.

Tropical Storm Fay toppled several large hickories in August 2008 leaving a large opening in the canopy that is perfect for invasion by opportunistic species including exotics.

**Desired Conditions.** All efforts should be made to maintain and enhance this tiny remnant of upland hardwood. It is in good condition in light of its proximity to a residential development – Holly Oaks.

**Restoration/Management.** Silviculture, agriculture and industrial and residential development have already eliminated the majority of this community throughout the state. The few remnants are in urgent need of protection and management. The

upland hardwood forest is listed as one of the Arboretum's high conservation value natural areas.

Of greatest concern is the pressure on this remnant from invasive species not only those already existing inside the Arboretum boundaries but also new introductions from the residential area (Holly Oaks Lake) to the east and the utility right of way (JEA) to the south. JEA is aware of the cogon grass infestation and the Arboretum has several grant applications submitted to assist with its removal. The eastern boundary needs to be established and fenced so that the Arboretum knows what invasives can be killed with herbicides and which are on the property of neighboring residents. JAG should continue holding meetings with neighboring residents, to familiarize them with invasive species and their threat to natural areas and to encourage the use of "alterNative" species in their landscapes.

The slope to Jones Creek needs to be stabilized and fenced where the trail comes close to the edge and fenced where the slope is less steep and tempts guests to hike down the banks.

The trunks and larger branches of the toppled trees should be left as snags for woodland animals but the branches smaller than 4" should be removed to improve aesthetics. A sign discussing the value of tree snags should be considered to educate guests. The opening left by the fallen trees should be constantly monitored and any invasives should be eliminated.

b. Xeric Hammock

**Current Conditions.** Xeric hammock is a scrubby low canopy forest of mixed oaks and heaths with a sparse palmetto understory and isolated patches of reindeer moss. It is probably the fire free climax community of the local dry sandy uplands. Areas burned in the past 30 years are generally classified as sandhill, a longleaf pine community, or scrub, a sand pine community; however, it should be noted that there are no sand pines anywhere in this area of Jacksonville. Though no remnant stumps are

visible, there may have been significant numbers of longleaf pine present that did not regenerate following harvest. There are large numbers of slash and loblolly pine nearby but there are also isolated longleaf.

The underlying Kureb soil is very undeveloped fine yellow and white sand that was derived from old coastal dune systems. The water table is generally more than 72 inches below the surface. As one might predict, permeability is rapid and available water capacity low. Fertility and organic matter are also low.

Plants identified, thus far, in this community are Laurel Oak (*Quercus hemisphaerica*), Sand Live Oak (*Quercus geminata*), Turkey Oak (*Quercus laevis*), Rusty Lyonia (*Lyonia ferruginea*), Sparkleberry (*Vaccinium arboreum*), Highbush Blueberry (*Vaccinium elliotii*), Rabbiteye Blueberry (*Vaccinium ashei*), Saw Palmetto (*Serenoa repens*), Greenbriar (*Smilax spp.*), and Reindeer Moss (*Cladonia spp.*). Other common species that should also occur include Live Oak (*Quercus virginiana*), Blackjack Oak (*Quercus marilandica*), Sand Post Oak (*Quercus boyntonii*), Blue Jack Oak (*Quercus incana*), Chapman's Oak (*Quercus chapmanii*), Pignut Hickory (*Carya glabra*), Southern Magnolia (*Magnolia grandiflora*), American Holly (*Ilex opaca*), Wild Olive (*Osmanthus americanus*), Black Cherry (*Prunus serotina*), Fox Grape (*Vitis labrusca*), Beautyberry (*Callicarpa americana*), and Yaupon Holly (*Ilex vomitoria*).

We have not captured any animals in this habitat but vertebrates could include Barking Treefrog (*Hyla gratiosa*), Spadefoot Toad (*Scaphiopus holbrookii holbrookii*), Gopher Tortoise (*Gopherus polyphemus*), Worm Lizard (*Rhineura floridana*), Fence Lizard (*Sceloporus undulatus undulatus*), Black Racer (*Coluber constrictor priapus*), Red Rat Snake (*Elaphe guttata*), Diamondback Rattlesnake (*Crotalus adamanteus*), Green Tree Snake (*Dendrelaphis punctulata*), Black Rat Snake (*Elaphe obsoleta*), Screech Owl (*Otus asio*), Turkey (*Meleagris gallopavo*), Blue Jay (*Cyanocitta cristata*), Eastern Mole (*Scalopus aquaticus*), Gray

Squirrel (*Sciurus carolinensis*), and Eastern Flying Squirrel (*Glaucomys volans*).

There is a hiking trail traversing the slope on which the hammock is located. Tread width is approximately 3' and clearance is 8'. An old logging road runs down the slope in a north/south direction.

**Desired Conditions.** As is true throughout Florida, this example of xeric hammock is a small isolated patch in need of protection from wild fire and development.

**Restoration/Management.** This area is listed as one of the Arboretum's high conservation value natural areas. There are several trails planned through this habitat. Tread width should be limited to 3'. The delicate deer moss (*Cladonia and Cladonia spp*). should also be protected from foot traffic as it is susceptible to repeated trampling. Because the shrub species are encroaching on the rosemary scrub a desired boundary needs to be established and maintained with mosaic burns on a 10 – 15 year reburn period.

## 2. High Pine & Scrub

### a. Rosemary Scrub/Oak Scrub

**Current Conditions.** The rosemary and oak scrub areas are fire-maintained communities composed of evergreen shrubs found on the most infertile, dry sandy ridges of the central third of the Arboretum. Our scrub has two of the three signature species – shrubby oaks and Florida rosemary (*Ceratiola ericoides*) abundant. So far we have not found any sand pine (*Pinus clausa*).

The lower slightly moister portions of the ridge are oak scrub. Here myrtle oak (*Quercus myrtifolia*), sand live oak (*Q. geminata*), and Chapman's oak (*Q. chapmanii*) predominate. There is also rusty staggerbush (*Lyonia ferruginea*) and saw palmetto (*Serenoa repens*). The oaks form a dense cover interspersed with patchy openings that consist of bare sand with a sparse cover of herbs. Though we

have not identified the herbaceous species, we would expect to find threeawns (*Aristida* spp.), hairsedges (*Bulbostylis* spp.), and sandyfield beaksedge (*Rhynchospora megalocarpa*), as well as subshrubs such as pinweeds (*Lechea* spp.) and jointweeds (*Polygonella* spp.), and ground lichens (*Cladonia leporina*, *C. prostrata*, *Cladonia subtenuis*, and *C. evansii*). Many ground lichen species are negatively correlated with the presence of oak shrubs and leaf litter, and positively correlated with open gaps without leaf litter (Yahr 2000).

The drier upland ridge is dominated by Florida rosemary but has open bare sandy areas unlike the surrounding oak scrub. The scrub grades into scrubby flatwoods to the northwest, mesic flatwoods to the northeast and southwest, and xeric hammock to the south and east.

**Desired Conditions.** In the 1943 and 1952 aerial photographs no, or very little, rosemary scrub is apparent. JAG assumes that current scrub is a result of mining activities between 1953 and 1959. That said, the area has evolved into a relatively good example of the rosemary scrub habitat and can be restored/conserved as such. The area seems to have recovered relatively well following the mineral excavation of the mid 1900's. Mine tailings may have covered some of the seed stock for the herbaceous species.

Both oak and rosemary scrubs are fire maintained communities and fire has been excluded from the area for at least the past 60 years. Species of animals dependent on the characteristic of a fire-maintained system (e.g., Florida Mouse, and Scrub Lizard) may have been excluded during that time period. In oak scrub, the suggested fire return interval ranges from 3-20 years depending on the type of scrub; rosemary scrub burns at somewhat longer intervals every 15 and 30 years.

Florida rosemary and herbs associated with this habitat are typically killed by fire and recruit from seed in the soil seedbank (Menges et al 2008). Fire intervals that are too short can inhibit successful

seed production by such species as Florida rosemary (Menges and Kohfeldt 1995). As length of time since last fire increases, species richness, herbaceous diversity and cover, and areas of bare sand decrease. Bare sand cover decreases due to increase in leaf litter and lichen cover. Leaf litter and lichen cover can suppress recruitment of vascular plants associated with gaps (Menges et al 2008).

Biological soil crusts are found in the rosemary scrub habitat. These crusts are made of microalgae and cyanobacteria (Hawkes and Flechtner 2002). Crusts can affect germination and growth of vascular plants, and contribute to local nitrogen enrichment and moisture availability. Abundance can be greatest 10 – 15 years following a fire (Hawkes and Flechtner 2002). Disturbance (fire, animal activity) that results in removal of the crusts can take >8 years to recover (Hawkes and Flechtner 2002).

**Restoration/Management.** Undisturbed portions of this community are listed as one of the Arboretum's high conservation value natural areas. JAG needs to identify the restorable portions of this community. If the understory were found to be depleted by past mining practices we would likely introduce expected species listed above. We may also want to introduce species that distinguish peninsular from Panhandle scrubs including scrub hickory (*Carya floridana*), garberia (*Garberia heterophylla*), scrub holly (*Ilex opaca* var. *arenicola*), scrub wild olive (*Osmanthus megacarpus*), Feay's palafox (*Palafoxia feayi*), silk bay (*Persea borbonia* var. *humilis*), scrub palmetto (*Sabal etonia*), and hog plum (*Ximenia americana*).

Lichen expert (Nisse Goldberg) and rosemary scrub expert (Eric Menges) recommend that raised boardwalks be the only access to these habitats. Large patches of lichen should be excluded from fire.

Fire could be reintroduced into this area with appropriate firebreaks. Care should be taken to achieve small patchy burns approximately 200 sq.

ft. Patchy burns of rosemary scrub provide refuges for older rosemary plants and rare endemics.

Without fire, shrub cover will increase, gap cover will decrease, and species diversity of herbaceous plants will decrease (Menges et al 2008). Large patches of lichen should be excluded from fire. Ground lichen is killed by fire and can require decades to recover from disturbance (ex. fire, Yahr 2000). Similarly, abundance of microalgae and cyanobacteria can decrease following a fire but species composition can be unchanged (Hawkes and Flechtner 2002). By comparison, vascular plants such as Florida rosemary and perennials require fire for seed germination with maximum abundance within 10 years.

Yahr (2000) recommends mosaic burns that include “both open low fuel habitats where lichens can survive fires unburned and recently burned sites that are near unburned source populations. Developing such mosaics is recommended to maintain the diversity of scrub species, including besides lichens, herbs, shrubs, and animals.”

Mosaic burn regimes will also contribute to diversity in gap sizes (Menges et al 2008). Larger gaps can have greater species diversity and greater cover of bare sand. In addition, larger gaps promote the persistence of ‘gap specialists’ (Menges et al 2008). Mosaic burns that vary in time since last burn can also increase species diversity in the scrub habitat so long as the life history of the species are recognized (15 – 40 years for fire intervals is recommended; Menges and Kohfeldt 1995).

### 3. Pine Flatwoods & Dry Prairie

#### a. Mesic Flatwoods

**Current conditions.** Mesic flatwoods are fire-dependent communities characterized by an open canopy of tall pines underlain with a dense layer of low shrubs, grasses, and forbs. This area was probably a longleaf pine (*Pinus palustris*) dominated flatwoods that burned every 2-3 years. During the early twentieth century, much of the



longleaf was harvested from the area surrounding Jacksonville and a mixture of pines including loblolly (*Pinus taeda*) and slash pine (*Pinus elliotii*) seeded in. It is probable that the Arboretum area had such a history. Following harvesting, at least sixty years of fire exclusion has favored the survival of the slash and loblolly. Even in healthy mesic flatwoods, slash pine is more common in wet areas.

The shrub layer is a tangle but still includes the characteristic saw palmetto (*Serenoa repens*), gallberry (*Ilex glabra*), coastalplain staggerbush (*Lyonia fruticosa*), fetterbush (*Lyonia lucida*) and rhizomatous dwarf shrubs such as shiny blueberry (*Vaccinium myrsinites*), Darrow's blueberry (*V. darrowii*) and dwarf huckleberry (*Gaylussacia dumosa*). The grassy herbaceous layer which should include wiregrass (*Aristida stricta* var. *beyrichiana*), dropseeds (*Sporobolus curtissii*, *S. floridanus*), panicgrasses (*Dichantheium* spp.), and broomsedges (*Andropogon* spp.) has been shaded out. It is also possible that the grass roots cannot extend through the deep duff layer. There are a number of herbaceous forbs that have not been identified.

The Leon soil is an acidic, nutrient-poor fine sands with the upper layers darkened by organic matter. In some spots, the drainage is impeded probably by an organic hardpan several feet underground. The soil is alternately droughty during dry periods and saturated, or even inundated, after heavy rains. It is possible that this soil type was misidentified (see soil section III B 1).

**Desired condition.** In July 2010 DOF mowed the mesic flatwoods. JAG has followed up with an application of trichloropyr to decrease the resprout of shrubs and vines..

**Restoration/Management.** JAG may continue working with the Florida Division of Forestry to restore the area to a mesic flatwood or may develop the area as gardens or event lawn..

b. Scrubby Flatwoods

**Current Conditions.** The scrubby flatwood is a transition zone between rosemary/oak scrub to the east and mesic flatwoods along the extreme northwest corner of the Arboretum. This is typically a fire maintained community of widely spaced longleaf and slash pine with a scrubby understory of shrub oaks and saw palmetto and an herbaceous layer of grasses and numerous forbs. Because of the somewhat continuous groundcover of a healthy flatwood community, it generally burns more readily than oak scrub but less readily than mesic flatwood with any given area burning every five-15 years. Fire has been excluded from this fire maintained community for at least 75 years. There are very few longleaf pine so it is likely that the species was logged in the early twentieth century when Jacksonville was being rebuilt after the downtown fire. Currently the understory is very overgrown and the groundcover layer is very sparse.

**Desired Conditions.** Principal species in the sparse canopy of a north Florida scrubby flatwood should be longleaf pine (*Pinus palustris*) and slash pine (*P. elliotii*). The shrub layer should be very patchy and consist of a mix of species from the oak scrub (e.g. sand live oak (*Quercus geminata*), myrtle oak (*Q. myrtifolia*), Chapman's oak (*Q. chapmanii*), saw palmetto (*Serenoa repens*), rusty staggerbush (*Lyonia ferruginea*), and species of the mesic flatwood (e.g. fetterbush (*L. lucida*), gallberry (*Ilex glabra*), coastalplain staggerbush (*L. fruticosa*), and deerberry (*Vaccinium stamineum*). There should also be large patches of grasses including wiregrass (*Aristida stricta* var. *beyrichiana*), broomsedge bluestem (*Andropogon virginicus*), and little bluestem (*Schizachyrium scoparium*) and dwarf shrubs including dwarf live oak (*Quercus minima*), runner oak (*Q. elliotii*), dwarf huckleberry (*Gaylussacia dumosa*), gopher apple (*Licania michauxii*), and shiny blueberry (*Vaccinium myrsinites*). A variety of forbs, many typical of drier types of mesic flatwoods, should be present including coastalplain honeycomb-head (*Balduina angustifolia*), narrowleaf silkgrass (*Pityopsis graminifolia*), October flower (*Polygonella*

*polygama*), and sweet goldenrod (*Solidago odora*). Bare sand openings though present are small.

Healthy scrubby flatwoods are inhabited by many of the same rare animal species found in scrub. These include Florida mouse (*Podomys floridanus*), gopher tortoise (*Gopherus polyphemus*), and associated tortoise commensal species such as the Florida gopher frog (*Rana capito*).

**Restoration/Management.** In order to return this area to a scrubby flatwood, it is necessary to reintroduce fire. Of any area at the Arboretum that needs fire, this one is the most likely to be tolerated in an urban setting. We never need to burn a large area, but rather, each year there could be a very small fire until we produce a patchwork of vegetation. In some areas regrowth may be fast enough to require burning every three years. By varying the frequency and season of prescribed fires to produce a mosaic of burned and unburned patches we can rebuild and then maintain high biotic diversity typical of this community. JAG should aggressively work with neighbors to see if burning will be possible.

#### 4. Freshwater Non-Forested Wetlands

##### a. Depression Marsh

**Current Conditions.** A depression marsh is a shallow, rounded depression in sand substrate with concentric bands of herbaceous vegetation. They usually form when the overlying sands slump into depressions in the underlying limestone. The length of the hydroperiod and depth of flooding within the concentric rings determines which species will grow in each ring. The deepest zones (characteristically dominated by pickerelweed, bulltongue arrowhead or sawgrass) may have a peat substrate and a continuous layer of sphagnum moss, while shallower zones (dominated by peelbark St. John's wort) have a sandy substrate. Depression marshes typically occur in fire-maintained communities such as mesic flatwoods, dry prairie, or sandhill. In our case, it is in a scrubby flatwood.

Depression marshes are susceptible to physical disturbance and dewatering. According to FNAI, physical disturbance can destroy native species and churn the soil, which is often then colonized by pure stands of Carolina redroot (*Lachnanthes carolina*) and other weedy species. Since the depression at the Arboretum is a Carolina redroot monoculture it is likely that it was destroyed during the mining operations of the mid-1950s.

**Desired Conditions.** In a healthy depression marsh, the outer, or driest, zone is often occupied by sparse herbaceous vegetation including longleaf threeawn (*Aristida palustris*), blue maidencane (*Amphicarpum muhlenbergianum*) or sand cordgrass (*Spartina bakeri*). This sparse zone may be followed downslope by a sparse to dense zone of St. John's wort (*Hypericum spp*) and other herbs. The innermost, deepest zone is occupied by maidencane (*Panicum hemitomon*), pickerelweed (*Pontederia cordata*), bulltongue arrowhead (*Sagittaria lancifolia*), or sawgrass (*Cladium jamaicense*). There may be open water portions of the marsh.

**Restoration/Maintenance.** If we wish to restore it to its probable original condition, then we could use the FNAI Community Guide as a starting point.

b. Freshwater Tidal Marsh

**Current Conditions.** The freshwater tidal marsh is a wetland community occurring along the tidal portion of Jones Creek where salinity is less than 0.5 parts per thousand. Although there are areas downstream of the marsh that are tidally influenced, the brackish waters of the St. John's only reach about a half mile inland of the river. The tidal marsh is dominated by herbaceous vegetation with islands of shrubs. We have not thoroughly explored the marsh but would expect the freshwater portion to be dominated by sand cordgrass (*Spartina bakeri*), sawgrass (*Cladium jamaicense*), and maidencane (*Panicum hemitomon*). Where saltwater influences Jones Creek near the mouth, we would expect to find sawgrass, sand cordgrass,

needle rush (*Juncus roemerianus*), perennial glasswort (*Sarcocornia perennis*), seashore dropseed (*Sporobolus virginicus*), giant cutgrass (*Zizaniopsis miliacea*), and shoreline seapurslane (*Sesuvium portulacastrum*).

In constantly flooded areas, broadleaf emergents and floating plants, such as bulltongue arrowhead (*Sagittaria lancifolia*), bladderworts (*Utricularia* spp.), pickerelweed (*Pontederia cordata*), and yellow pondlily (*Nuphar advena*) should be found. In higher elevations, both those islands scattered throughout the floodplain area and the ecotone along the gradient to higher ground, should be prairie-like areas inhabited by a large diversity of plants. The islands of upland plants in the floodplain are critical to maintain as they provide a diversity of habitats beneficial to wildlife.

Other than occasional thickets on these islands, woody vegetation is sparse until the ecotone area where shrubs such as buttonbush, coastalplain willow, and wax myrtle (*Myrica cerifera*) are common. Cabbage palm (*Sabal palmetto*) and other flood tolerant trees are widely scattered in the marsh, and become more concentrated in the ecotone to adjacent hydric hammocks.

Soils are typically sand with an organic surface and may be saturated for most of the year. Floodplain marsh may burn periodically depending on dominant vegetation.

**Desired conditions.** We have not surveyed the marsh area for opportunistic exotic or native species that invade when hydrologic conditions are altered or fire is excluded.

As mentioned above, the upland marsh area generally has a large diversity of plants. These could include dotted smartweed (*Polygonum punctatum*), bulrushes (*Scirpus* spp.), common reed (*Phragmites australis*), tickseeds (*Coreopsis* spp.), primrosewillows (*Ludwigia* spp.), fimbries (*Fimbristylis* spp.), spikerushes (*Eleocharis* spp.), flatsedges (*Cyperus* spp.), manyflower

marshpennywort (*Hydrocotyle umbellata*), soft rush (*Juncus effusus* ssp. *solutus*), grassleaf rush (*Juncus marginatus*), beaksedges (*Rhynchospora* spp.), rosy camphorweed (*Pluchea rosea*), lemon bacopa (*Bacopa caroliniana*), spadeleaf (*Centella asiatica*), swamp rosemallow (*Hibiscus grandiflorus*), saltmarsh morning glory (*Ipomoea sagittata*), cattails (*Typha* spp.), southern cutgrass (*Leersia hexandra*), and climbing hempvine (*Mikania scandens*).

The marsh area of the arboretum is large and should be host to a variety of vertebrates including wading birds such as black rail (*Laterallus jamaicensis*), limpkin (*Aramus guarauna*), great blue heron, great egret (*Ardea alba*), white ibis (*Eudocimus albus*), little blue heron (*Egretta caerulea*), snowy egret (*Egretta thula*), tricolored heron (*Egretta tricolor*), black-crowned night-heron (*Nycticorax nycticorax*), yellow-crowned night-heron (*Nyctanassa violacea*), and glossy ibis (*Plegadis falcinellus*).

**Restoration/Management.** Prescribed fire, and maintenance or restoration of natural hydrology, may eventually be required to reduce encroachment of shrubs in the tidal marsh.

Burning is an inexpensive tool to decrease fuel loads and to maintain wildlife habitat and natural community structure. Once the herbaceous understory is lost, it is impossible to burn the marsh because there are no plants to carry the fire into the shrub layer. A single fire can decrease species, such as wax myrtle, groundsel, and red maple. However, it often requires two fires within two years to significantly decrease the population of willows. In either case, the prescribed burns should be conducted in fall and winter to avoid nesting seasons and should leave a patchwork of unburned areas to shelter wildlife.

## 5. Freshwater Forested Wetlands (Hardwood)

### a. Baygall

**Current Conditions.** As with most baygalls, the ravine and champion loblolly areas are densely forested seepage depressions at the base of sandy slopes. The evergreen canopies are dominated by loblolly bay (*Gordonia lasianthus*) but red maple (*Acer rubrum*) and sweetgum (*Liquidambar styraciflua*) abound. There are also a few swamp bay (*Persea palustris*) and sweetbay (*Magnolia virginiana*). The understories are relatively open and consist mostly of ferns [cinnamon fern (*Osmunda cinnamomea*), net-leaf chain fern (*Woodwardia areolata*), and royal fern (*Osmunda regalis*)] and occasional shrubs [wax myrtle (*Myrica cerifera*), virginia willow (*Itea virginica*), and pinxter azalea (*Rhododendron canesceus*)]. There are numerous mats of sphagnum moss (*Sphagnum spp.*) in both areas, however, neither has evolved the typical peat layer that is often associated with the baygall.

The ravine baygall is an abandoned borrow pit dug between 1972 and 1975. The soil under this area was described by NCRS-DC as gleyed, excavated Kershaw. The area rarely, if ever, floods but is constantly saturated. The wet conditions limit the rate of decomposition and make for infertile soils. The rows of loblolly pine (*Pinus taeda*) in the ravine may have been planted after the borrow pit was abandoned.

The champion loblolly baygall is underlain by Rutledge soils and forms a transition between the bottomland forests of the Jones Creek floodplain and the adjacent uplands. Again the soils are wet but rarely flooded. There are several very large diameter loblolly bays in this area including the Florida co-champion, The Lad Hawkins Loblolly Bay. There is a patch of pinxter azalea (*Azalea canescens*) at the upland edge of the baygall.

**Desired Conditions.** Baygalls often succeed to impenetrable thickets of shrubs and vines under a dense evergreen canopy. The current condition is probably preferable so that guests can more readily enjoy the views.

**Restoration/Management.** Careful selection of plants, avoiding those with a spreading or viney habit, will help maintain the current open landscape. Maintenance and restoration of the natural hydrology is critical. Artificial drainage results in changes in the plant community. JAG should correct the hydrology of the ravine (borrow pit) to approximately that of a natural baygall.

b. Bottomland Forest

**Current Conditions.** Bottomland forests border streams with distinct banks and as such flood only following extremely heavy rains. At the Arboretum, this community has a closed-canopy of water oak (*Quercus nigra*), live oak (*Quercus virginiana*), red maple (*Acer rubrum*), sweetgum (*Liquidambar styraciflua*), loblolly pine (*Pinus taeda*), cabbage palm (*Sabal palmetto*), diamond-leaf oak (*Quercus laurifolia*), southern magnolia (*Magnolis grandiflora*), loblolly bay (*Gordonia lasianthus*), and swamp tupelo (*Nyssa biflora*). The area along the eastern boundary and just south of the power line contains a number of large diameter specimen trees and is probably worth protecting as is.

In the winter, sunlight penetrates to the forest floor once the deciduous species lose their leaves. The understory is relatively sparse and includes dahoon holly (*Ilex cassine*), wax myrtle (*Myrica cerifera*), swamp dogwood (*Cornus spp.*), Florida elm (*Ulmus Americana*), stiffcornel dogwood (*Cornus foemina*), and American hornbeam (*Carpinus caroliniana*). Groundcover is composed of ferns and a variety of herbaceous species.

The Rutlege soils of our low-lying forests are a dark, loamy sand overlying a deep sandy subsoil. The seasonal high water table is never more than 6 inches below the surface. The soil is generally very acidic.

Though we have not captured any animals at the Arboretum, we would expect to find species such as marbled salamander (*Ambystoma opacum*), mole salamander (*Ambystoma talpoideum*), three-lined



salamander (*Eurycea longicauda guttolineata*), slimy salamander (*Pluthodon glutinosus*), five-lined skink (*Eumeces fasciatus*), ringneck snake (*Diadophous punctatus*), gray rat snake (*Elaphe obsoleta spiloides*), eastern king snake (*Lampropeltis getulus*), cotton mouse (*Peromyscus gossypinus*), wood duck (*Aix sponsa*), red-tailed hawk (*Buteo jamaicensis*), turkey (*Meleagris gallopavo*), yellow-billed cuckoo (*Coccyzus americanus*), screech owl (*Otis asio*), great-horned owl (*Bubo virginianus*), ruby-throated hummingbird (*Archilochus colubris*), Acadian flycatcher (*Empidonax virescens*), pileated woodpecker (*Dryocopus pilatus*), hermit thrush (*Catharus guttatus*), cedar waxwing (*Bombycilla cedrorum*), yellow-throated warbler (*Dendroica dominica*), opossum (*Didelphi virginiana*), gray squirrel (*Sciurus carolinensis*), flying squirrel (*Glaucomys volans*), raccoon (*Procyon lotor*), and perhaps mink (*Mustela vison*), gray fox (*Urocyon cinereoargenteus*), and bobcat (*Lynx refus*). The area is not large enough to support a white-tailed deer (*Odocoileus virginianus*) population.

There are invasive species such as air potato, paper mulberry, scattered throughout this community. The area between Lake Ray and the eastern property boundary is particularly bad and is addressed elsewhere. A small patch of air potato immediately behind the Lake was sprayed with herbicides in the summer of 2008. Another area south of the JEA power right of way along the banks of Jones Creek on the western edge of the property has a severe infestation of air potato. The “tubers” are transported down Jones Creek and deposited in the low-lying forests during floods.

**Desired Conditions.** The main threat to this community is from invasive exotics. As discussed elsewhere (section IV A 12) JAG will continue to apply for grants and work with North Florida Invasive Work Group to assist with removal of invasives in the Jones Creek bottomland.

The invasives on the portion of the bottomland that was filled to produce Lake Ray will be eradicated

and replaced with ornamentals as part of the Lake Loop landscape project in 2010 and 2011.

**Restoration/Management.** Grant opportunities to assist with removal and extermination of invasives should be diligently pursued. As control measures are taken, we need to evaluate the potential of each area. JAG will need to prioritize treatment areas to use limited resources in the most strategic way.

## 6. Estuarine and Marine Tidal Marsh

**Current Conditions.** The estuarine tidal marsh is a largely herbaceous community that occurs in the portion of the coastal zone that is affected by tides and saltwater but protected from large waves. Soils range from deep mucks with high clay and organic content in the deeper portions to silts and fine sands in higher areas. Tidal marshes have distinct zones of vegetation with saltmarsh cordgrass (*Spartina alterniflora*) bordering tidal creeks where the marsh is flooded daily and Needle rush (*Juncus roemerianus*) dominating the higher, less frequently flooded areas.

The estuarine marsh at the Arboretum is also influenced by freshwater influx from the headwaters of Jones Creek and therefore has colonies of less salt tolerant species such as sawgrass (*Cladium jamaicense*), saltmeadow cordgrass (*Spartina patens*), Gulf cordgrass (*Spartina spartinae*), and sand cordgrass (*Spartina bakeri*).

High in the marsh there may be salt flats that are completely isolated from freshwater influence. These flats should be dominated by species that can tolerate high salinities such as succulents {saltwort (*Batis maritima*), perennial glasswort (*Sarcocornia perennis*), annual glasswort (*Salicornia bigelovii*), and bushy seaside oxeye (*Borrchia frutescens*)} or short grasses {saltgrass (*Distichlis spicata*), seashore paspalum (*Paspalum vaginatum*), and shoregrass (*Monanthochloe littoralis*)}. We expect there is a border of salt tolerant shrubs, such as groundsel tree (*Baccharis halimifolia*), saltwater falsewillow (*Baccharis angustifolia*), marshelder (*Iva frutescens*), and christmasberry (*Lycium*

*carolinianum*) between the marsh and the xeric hammock.

Tidal marshes are some of the most biologically productive natural communities known. The base of the food chain is supplied not only by the rooted plant matter, but also by algae and detritus found on the stems of plants, on the sediment surface, and suspended in the water column of pools and tidal creeks. Commercial marine species that spend all or part of their life cycle in tidal creeks include mullet (*Mugil* spp.), spot (*Leiostomus xanthurus*), blue crabs (*Callinectes sapindus*), oysters (*Crassostrea virginica*), and shrimp (*Penaeus* spp). The smaller minnows and juvenile fish in tidal creeks provide food for many game fish, such as tarpon (*Megalops atlanticus*), snook (*Centropomus undecimalis*), red drum (*Sciaenops ocellatus*), and spotted seatrout (*Cynoscion nebulosus*).

Repeated applications of insecticides on marshes to control mosquitoes have adversely affected the marsh food chain. If MacGillivray's seaside sparrow was ever on this site, it is almost certainly gone.

**Restoration/Management.** JAG should complete a thorough biological inventory of the tidal marsh and creek, use this information to complete restoration goals, and write management plans for any threatened or endangered species that are found.

## 7. Rivers/Streams

**Current Conditions.** Jones Creek bisects the southern third of the Arboretum and then runs along the eastern boundary. There are several feeder creeks one in the ravine area, a second just south of the upland mined area, and a third just north of the upland mined area. The tidal creek and its tributaries are fed by small springs, a blackwater creek and several alluvial creeks which results in a variable system that ranges from marine to freshwater conditions (north to south).

A survey of the features of Jones Creek was conducted September 17, 2007 from the Ft. Caroline/Merrill Road edge of the Arboretum property to approximately one km upstream near the JEA right-of-way (Figure 17). There is a large tidal spartina/rush wetland near the north end of the creek (north border 30.35324, -81.5374, west border 30.35304, -81.5378). Deep, soft mud pervaded the wetland, but it is unknown whether the extent of soft mud is a natural feature. At the time of the survey, Wonderwood expressway was under construction and there were several siltation events reported by neighbors of Jones Creek to the St. Johns Riverkeeper organization and the City (Figure 18). A sedimentation gauge was installed to monitor best management practices during the rest of the construction phase. The tidal northern reaches of the creek have well-defined banks (outside of the wetlands), and have residences on the eastern side, but it becomes a shallow, canopied black water system of creeks and rivulets with small springs further south.

Basic water quality parameters, including specific conductivity, pH and BOD, were measured at mid depth (Table 1). The sampling event began at low tide near the Ft. Caroline overpass and was completed in the freshwater region of the system approximately four hours later. Dissolved oxygen ranged from 2.0-4.8 mg/L, typical of shallow, black water streams. Specific conductivity measurements indicated the transition from marine influence to spring influence on water quality of the creek. Near the St. Johns River the conductivity was similar to marine systems at 38.2 mS/cm, while upstream, the influence of freshwater tributaries on the water quality was evident with conductivities of 0.4-4 mS/cm, which is typical of Florida springs. At Site 6, unstable conductivity measurements were likely a result of a freshwater tributary feeding into the saltier creek.

While there were occasional spots with trash, except for the siltation near the mouth of the creek, there was little evidence of anthropogenic impact on the creek, particularly upstream.

Upper Jones Creek and all feeder creeks are clogged with limbs and natural debris.

**Table 1. Water quality measurements for Jones Creek September 17, 2007**

Site	Latitude	Longitude	Time p.m.	pH	Depth m	Temp °C	Specific Conductivity mS/cm	Salinity ppt	DO mg/L	Notes
1	30.35350	-81.5371	12:15	7.6	1.22	29.6	38.2	22	3.9	JC @ Ft. Caroline upstream of silt curtain; general proximity of silt gauge; sampled at ~ mid channel
2	30.35324	-81.5374								N boundary of large tidal wetland
3	30.35304	-81.5378								W boundary of large tidal wetland
4	30.35044	-81.5367	1:50	7.3	0.81	29.2	21.6	11.9	3.4	sampled ~ 7 ft off bank
Site	Latitude	Longitude	Time p.m.	pH	Depth m	Temp °C	Specific Conductivity mS/cm	Salinity ppt	DO mg/L	Notes
5	30.34936	-81.5363		7.1		29.3	21.5		4.5	~ 80-90 ft wide
6	30.34798	-81.5363		7.0		27.7	4.1	2	4.0	unstable conductivity;
7	30.34722	-81.5365	3:10	6.9	0.71	27	19.8		2.0	Rainfall; no houses
8	30.34643	-81.5366								air potato, wandering jew; undev; creek tributary confluence; heavy canopy
9	30.34612	-81.5369	4:00	7.1	0.30	26.5	0.4	0.2	4.8	creek shallow & irreg; 10-15 ft wide; heavy canopy

**Desired Conditions.** The creek appears to be in relatively good chemical condition for an urban stream.

**Restoration/Management.** Any ground disturbing activities within the streamside management zones will follow current best management practices.

Aside from educating landowners with property along the creek there is little else JAG can pursue to maintain the health of the creek since it belongs, in part, to the others. JAG will continue to monitor basic water quality and biological parameters every 3 – 5 years and keep other stream owners informed of the findings. Feeder creeks and Upper Jones Creek need to be cleared of debris.

## 8. Altered Landscapes

### a. Successional Hardwood Forest

**Current Conditions.** There are numerous areas of the arboretum that have been either altered by past mining and building or invaded by opportunistic species due to lengthy fire suppression. They are not yet recognizable as any particular FNAI habitat. These areas are at least temporarily categorized as successional hardwood forest. The canopy is dominated by fast-growing hardwoods such as laurel oak (*Quercus hemisphaerica*), water oak (*Quercus alba*), sweetgum (*Liquidambar styraciflua*) and frequently monocultures of various invasive species. In several areas, there are remnant species of the former natural community such as turkey oak (*Quercus laevis*), saw palmetto (*Serenoa repens*) and gallberry (*Ilex glabra*). Shrubs such as beautyberry (*Callicarpa americana*) and sparkleberry (*Vaccinium arboreum*) and vines such as muscadine (*Vitis rotundifolia*) are also common.

Jag conducted an initial tree survey of specimens that could be included in demonstration gardens (Table 2).

**Table 2 - Initial Tree Inventory of Successional Forest (North of Lake Ray to Xeric Hammock)**

<b>Species</b>	<b>dbh</b>	<b>Latitude</b>	<b>Longitude</b>	<b>Book</b>	<b>Narrative</b>
Quercus hemisphaerica	stand	30.34697	-81.53845	A	12, 24", several smaller dbh
Pine	15"	30.34742	-81.53865	A	
Oak	>40"	30.34758	-81.53907	A	resurrection fern, drainage ditch by oak tree, taped yellow
Quercus hemisphaerica	12"	30.34708	-81.53838	A	largest in stand
Quercus virginiana	34"	30.34687	-81.53817	B	
Quercus virginiana	stand	30.34705	-81.53813	B	30", 26", 17", 22", pawpaw /blueberry nearby
Quercus virginiana	stand	30.34730	-81.53800	B	21", 11", 12", thornless greenbriar nearby
Quercus virginiana	18"	30.34727	-81.53793	B	
Pine	13"	30.34747	-81.53830	B	
Acer rubrum	31"	30.34800	-81.53828	B	triple combined 31" dbh
Pine	21"	30.34832	-81.53797	B	orchid on S. bank
Quercus virginiana	18"	30.34698	-81.53812	B	deciduous holly nearby
Hickory	14"/13"	30.34502	-81.54062	B	14"/13" double trunk
Quercus virginiana	35"	30.34668	-81.53788	C	
Hickory	27"	30.34740	-81.53750	C	
Quercus virginiana	32"	30.34715	-81.53762	C	surrounded by palmetto patch
Hickory	14"/13"	30.34725	-81.53755	D	14/13 double trunk
Pine	30"	30.34788	-81.53758	D	
Pinus taeda	24"	30.34752	-81.53723	E	wetland edge near 300' flag, ecotoneal transition mix of wetland upland, Asimina triloba nearby
Pinus taeda	30"	30.34502	-81.54067	H	

**Desired Conditions.** These areas can be either restored to their original habitats or converted to demonstration gardens.

**Restoration/Management.** If these forests are to be restored, it will require intensive mechanical tree removal and re-introduction of fire. In many cases, especially in those areas surrounding the parking lot and Lake Ray, JAG has elected to convert the degraded forests to gardens. Notable specimens will be saved but the balance will be replaced with species which further the mission statement and collections policy.

b. Borrow Pit Pond/Clastic Upland Lake

**Current Conditions.** Lake Ray is a borrow pit pond, which was dug and dammed in the mid

1970's. It is approximately 1.4 acres varying in length from approximately 300-350' and in width from 130-225'. In response to concerns about late winter color and odor problems, JAG completed a surface water quality assessment for the pond, Lake Ray on February 16, 2009. Environmental Services, Inc., (ESI) collected samples midday at the western end of the lake and conducted analyses in their laboratories. To summarize their report, in spite of Lake Ray's proximity to both the JEA sewage treatment facility and to the Holly Oak residential subdivision, nutrient levels were typical of a lake in an undeveloped forested watershed. However, as noted in Table 3, the biological oxygen demand (BOD) was extremely high indicating elevated rates of biological decomposition and decay. The report said that abnormal oxygen levels could indicate nutrient imbalance.

**Table 3: *in situ* Field Measurements for Lake Ray on 16 February 2009**

Parameter	Unit	Recorded Value	Surface Water Criteria (FW)
Water Temperature	°C	17.91	N/A
pH	s.u.	7.29	6.0-8.5
BOD	mg/L (% Sat)	10.82 (114%)	> 5.0
Conductivity	µS/cm	275	< 1,275
Salinity	ppt	0.13	< 0.50
Turbidity	NTU	3.05	[Background] +29 NTU

Although ESI did not measure chlorophyll- $\alpha$ , the report suggested that the green tint to the color of the sample could indicate algal growth in the water column.

If the BOD were tested pre-dawn, it would likely be extremely low. The ESI report said that such instability (high BOD during the daylight and low BOD at night) indicates high eutrophication (decay). They further explained that in the presence of sunlight, algae produce oxygen through the process of photosynthesis, but that when it is dark they are only respiring and thus consuming oxygen from the water. When algae growth is abundant, eutrophication occurs, resulting in an extreme oscillation between high and low dissolved oxygen concentrations during a 24-hour period. This



condition is highly stressful for the aquatic environment and can lead to algal die off with its accompanying foul odors, and eventually to fish die-off.

There is also a high population of spatterdock in Lake Ray that needs to be removed.

There have been no studies to determine what animal species inhabit Lake Ray.

**Desired Conditions.** Though Lake Ray is a man made lake, JAG should aim to approximate the conditions of a clastic upland lake. The natural clastic upland lake is a clay bottom basin occurring in uplands. These water bodies have surface and subsurface inflow but generally only lose water through evaporation and transpiration. During drought conditions they may lose water through sinks connected to the aquifer. Clastic upland lakes generally have clay and organic substrates. Their water is clear to colored, neutral to slightly acid, and has low mineral content (especially sodium, chloride, and sulfate). Clastic upland lakes can have high (eutrophic) to low (mesotrophic) nutrient levels depending on their age and nutrient supplements from runoff.

Depending on surrounding soil types and widths of littoral and lemnetic zones, the shorelines can be dominated by hydrophytic herbaceous species, shrubs, or trees.

Clastic upland lakes are important breeding grounds for terrestrial and semi-aquatic amphibians and important feeding and nesting areas for wading birds, ducks, reptiles and fish. Human manipulations and activities must be controlled to prevent damage to this important community.

**Restoration/Management.** JAG intends to address the dissolved oxygen problem in Lake Ray as soon as possible, to annually monitor critical chemical levels, and to encourage partner research groups to do a biological inventory of the lake.

Some immediate “hard” options to alleviate the BOD condition would be to circulate the waters of Lake Ray, via a submersible pump and fountain system that would provide more oxygen to (and less stratification of) the water column. Several companies offer AC-powered or wind-driven circulators to keep the water aerated and evenly mixed, which reduce algal growth, scum accumulation, and fish mortality. “Soft” options could include a residential outreach program to limit stormwater runoff, nutrient loading of fertilizers and other nutrient sources from the surrounding areas. After doing a very basic cost/benefit analysis JAG should proceed with mitigating the BOD problems in Lake Ray.

C. Impact of Planned Uses on Resources of the Arboretum

1. Outstanding Native Landscapes

Native habitats will be protected, as well as enhanced where practical. BMP’s will be implemented when ground-disturbing activities may occur near these areas to ensure their protection. The Arboretum will focus on restoration through a combination of prescribed burns, supplemental plantings, tree thinning, and invasive species eradication, with the goal of returning these areas to more natural habitats.

2. Wildlife

Through ongoing ecosystem management and implementation of BMP’s, wildlife resources will improve. Wildlife will be managed through the enhancement and maintenance of the on-site habitats. Improvements to the property will be designed in consideration of the wildlife resources and their continued protection.

3. Water

As described in Sections III.B.3 and III.B.7, the Arboretum is committed to protecting water resources. BMP’s will be implemented during all ground disturbing activities to ensure their protection.

4. Historical/Archaeological

The Department of Historical Resources will be notified when any significant ground disturbing activities are planned in previously undisturbed areas.

## V. MANAGEMENT SUMMARY

### A. Operations Infrastructure

The annual budget for JAG's limited operating expenses is based on the relatively stable income from membership and small donations. JAG maintains a list of desired projects and their estimated cost (Table 4) and when appropriate monies become available seeks to obtain those monies. To date large capital expenses have been funded by grants from the State of Florida and locally based philanthropic organizations and by special allocations from JEA and the City.

In 2010, JAG received a number of grants and special allocations. These monies funded a temporary part-time consultant/independent contractor to handle the job of executive director, the installation of plantings in the parking lot and around the lake, the design of a new brochure and the purchase of signage and landscape equipment. This purchase included an EZGO cart and a small amount of gas powered tools. The funding for the consultant continues through July 2011.

### B. Management Needs Priority Schedule and Cost Estimates

Management priorities at the Arboretum revolve around our conservation, research, collection, education, and recreation goals. Our ability to complete the prioritized projects is controlled by availability of funding. Therefore, in the tables below, projects are categorized by both priority level and by funding category. Our funding categories are grants, operating budget, and capital campaign/naming opportunities. These are not exclusive because certainly grant-funded projects could also be smaller naming opportunities. There are also a number of projects that can be completed by volunteers or in-kind services. These projects are no less important but are listed on a separate table simply because they require time rather than dollars.

Table 4 lists the highest priority projects, their estimated costs, and the most probable funding source. Money will be sought in order of priority, however, it may not be received, and thus not spent, in that order. Table 5 lists projects, of somewhat lower need, by funding type. The projects under each funding type are prioritized; in most cases, there are also projects that were listed but were not considered priorities for the first ten years. Table 6 lists the volunteer/in-kind projects. They are grouped by current but not yet completed projects and prioritized future projects. These projects will be tackled as much as possible in priority order; however, availability of in-kind service will be a major controlling factor.

Our focus in the next ten years will be to make the entrance area and near lake area as inviting as possible. This will include aerating the lake and eradicating invasive (both native and exotic) aquatic plants, and launching a major capital campaign to fund such things as a boardwalk to the Champion Loblolly Bay, a Visitor's Center, completion of the lake plantings (including irrigation and a wedding pavilion), renovation of the sandpit area bordering the lake, an event lawn and overflow parking for events. While the capital campaign is underway, we will attempt to find funding for smaller projects

such as educational signage, observation decks and towers, a 50 person seating area for educational programs, a rules board and a plant holding area with electric and water service. We will also continue to pursue our numerous contacts and thus complete the staggering variety of in-kind and volunteer conservation and recreation projects listed in Table 5. Similarly, we will also be finding local and regional scientists to complete the research projects which support our objectives and priorities.

**Table 4 – Highest Priority Projects Requiring Funding**

<b>Project - Area</b>	<b>Grant</b>	<b>Operating Expense</b>	<b>Capital Campaign</b>
Lake aeration – Conservation	\$8,000		
Development director – Staff		\$20,000 annual	
Maintenance Staff/Service – Staff		\$36,000 annual	
Public ID signage – Education	\$1,000 annual		
Champion Lob Baygall boardwalk – (2050 ft²) Recreation			\$102,500 (treated) \$153,750 (trex)
Small amphitheater – Recreation	\$20,000		
Volunteer/Event Coordinator – Staff		\$15,600	
Visitor Center – Education			\$500,000
Complete lake planting with Pavilion (includes irrigation) – Collection			\$135,000
Sandpit renovation – Recreation			\$ estimate Lad
Event lawn – Recreation			\$ estimate Lynda
Tree protection deck south side of lake – Recreation	\$20,000		
Educational signage for all trails ) – Education	\$4,000 annual		
Hammock/Marsh Tower – Recreation	\$20,000		
Ravine Deck – Recreation	\$7,500		
Plant holding and greenhouse area (including utilities) – Collection			\$ estimate Becky

**Table 5 - Additional Items which require funding**

<b>Grants</b>	<b>Operating Expense</b>	<b>Capital Campaign</b>
Deck over lake west end connected to sand pit renovation	Office Manager	Complete Xeric garden in parking lot
Deck over lake east end		Enhance front entry
Senior or ADA vita trail/brochure/signage		Clear and plant bog garden west end of ravine
Deck over lake north end near bench		
Plant family gardens		

**Table 6 - Volunteer/In-Kind Projects**

<b>Current Projects</b>	<b>Future Projects</b>
Restrooms (Recreation)	Scenic road connecting to Lake Loop (Recreation)
Pavilion (Recreation)	Correct Ravine hydrology (Conservation)
Bridge/boardwalk to Rosemary Ridge (Conservation/ Recreation)	Collection signage (permanent ID) (Collection)
Wooden information signage (Recreation)	Clear future events lawn (Recreation)
Safety fencing along trails (Recreation)	Augment plantings in Upland Hardwood north and south of power line (Collection)
Restore Longleaf Pine between ravine and power line (Conservation)	Trail south of power line along Jones Creek and through Upland Hardwood (Recreation)
Remove invasives (Conservation)	Map jurisdictional wetlands and investigate constraints on use (Conservation)
Event parking (Recreation)	Construct trails through DOF mow area (Conservation/ Recreation)
Path through Rosemary Scrub (Conservation/ Recreation)	Gain usage of JEA parcel adjoining Arboretum (Recreation)

C. Plans for Locating Fragile, Non-Renewable Natural and Cultural Resources

Much of the Arboretum has been highly disturbed by strip-mining activities and digging borrow pits. Many of the less disturbed areas are so over grown that they are inaccessible to resource survey crews without initial mowing. Despite these constraints, JAG will make all reasonable efforts to check for significant sites prior to major ground-disturbing activities in less disturbed areas.

High conservational value native landscapes detailed in Section III B 10 are areas that we plan to protect and restore. We do not intend to undertake major ground-disturbing activities in these areas.

1. Archaeological/Historical Resources

Currently the only known archaeological/historical resource is the remains of the old JP&L railroad bed. JAG will conduct applicable surveys prior to major ground-disturbing activities in less disturbed areas to check for possible sites.

2. Soil and Water Resources

JAG will execute management activities to minimize the potential for soil erosion. If problems should arise JAG will immediately assess the situation and implement appropriate actions. JAG will work with the (SJRWMD) and Institute of Food and Agricultural Sciences (IFAS) to monitor levels and quality of ground and surface water resources.

### 3. Other Resources

JAG will conduct applicable surveys during the process of planning and implementing ecosystem management activities. JAG will remain alert for any environmentally significant resources and protective actions will be taken as necessary.

#### D. Conformation to City Lands Management Plans

As a privately administered park, the Arboretum and JAG do not report to the city of Jacksonville Recreation and Community Services Department. JAG is required by the agreement between the City and U.S. DEP to allow only passive recreation. The lease with the city imposes further restrictions on the Arboretum

#### E. Multiple-Use Potential Income Producing Activities

Multiple-use management allows for variety of activities to occur at the Arboretum, with some of these activities having income producing potential. Several of these activities are listed below:

Recreation Fees – JAG has the potential to develop a quality recreational program. Activities including hiking and picnicking could provide an annual income for the site. Income would vary depending on facilities offered and staff available for collection.

Festivals – a Fall Festival which included tours, entertainers and vendors was labor-intensive and did not produce significant income. It has been temporarily discontinued. A Plein Aire (artists' festival) is planned for April 2011. When the appropriate combination of events is found, they have the potential to generate significant income.

Environmental Education Tours – There exists the potential to receive income from the ecotourism activities associated with visiting natural habitats. Examples of these activities currently popular in North Florida include our current Owl Prowls and campfires but could extend in the future to educational seminars.