

- views to the North and South Channels Savannah River and Battery Park
- Fort Pulaski and the demilune
- open character of the fort parade ground
- mature fig and pecan trees in the parade ground
- mature trees growing up around the fort
- restored elevation of the historic dike and ditch system
- historic configuration of the dike and ditch system
- brick-faced tide gates
- historic ditches containing 18 inches of water at all times
- Spanish-American War battery Horace Hambright
- Cockspur Island Lighthouse
- archeological remains of the construction village
- cisterns, the only intact aboveground resources remaining of the construction village
- Quarantine Attendant's Quarters
- stabilized North Channel Pier
- 1938 South Channel Bridge
- current configuration of the 1938 parking area
- cemetery headstones
- cemetery's boundaries as delineated in 1999 archeological investigations
- North Pier Trail
- CCC era maintenance building
- World War II batteries
- John Wesley Memorial
- brick oil storage shed at the Tybee Knoll Lighthouse complex
- undetermined site of Fort Greene
- undetermined site of Fort George

NATIONAL PARK SERVICE MANAGEMENT OF FORT PULASKI NATIONAL MONUMENT

The first effort to convert Fort Pulaski from a surplus military property to a monument occurred in 1917 with the allocation of \$500 from the United States War Department. Colonel John Millis, District Engineer of the U.S. Army Corps of Engineers in Savannah, conferred with Thomas Purse, the Savannah Board of Trade Secretary, about making the old fort more visible to visitors to the fort by boat. Fort Pulaski was under the management of a single unpaid caretaker until 1921 and little maintenance or grounds clearing had been attempted for many years. Views of Fort Pulaski from the river channels were difficult and Colonel Millis wished to give visitors a better view. With the \$500, vegetation was cut back along the ridge surrounding the fort. Better views of the fort prompted more interest in the site as a park. By 1918, Fort Pulaski was featured in *Town and Country* magazine and Colonel Millis asked for a complete restoration of the fort and grounds. Continued interest and funding brought about the creation of Fort Pulaski National Monument in 1924 with the support of the city of Savannah and Representative Charles Edwards of the 1st District of Georgia (Meader and Binkley, 2003).

Representative Charles Edwards pursued additional funding for the complete restoration of Fort Pulaski and the surrounding grounds without success. The new national monument was minimally maintained and under jurisdiction of the War Department until 1932 with President Franklin Roosevelt's signing of Executive Order 6166. Like other War and Agriculture Department parks and monuments, Fort Pulaski was placed under the jurisdiction of the National Park Service (Meader and Binkley, 2003).

Restoration work on Fort Pulaski began in 1933 with a Civil Works Administration crew of 212 men. These men cleared vegetation from around the fort, conducted an engineering survey, and constructed a small

1 ferry landing on the South Channel Savannah
2 River. In 1934, both CCC Camp 460 and
3 Public Works Administration assistance
4 began service at Fort Pulaski. Throughout the
5 remainder of the 1930s large scale restoration
6 work was performed to prepare Fort Pulaski
7 for larger scale and more accessible visitation.
8 The dike and moat system were restored,
9 woodwork and roofing were repaired, trails
10 were carved out of the brush, restrooms were
11 built into the casemates, electricity was
12 connected, and the South Channel Bridge
13 was built connecting Fort Pulaski to
14 McQueens Island and the mainland (Meader
15 and Binkley, 2003).

16 Fort Pulaski was ignored during World War
17 II while under supervision of the U.S. Navy.
18 During this period little maintenance was
19 done and the fort and grounds began to look
20 neglected. A strong hurricane additionally
21 damaged the dike system in 1947. Not until
22 the 1960s with the opening of a modern
23 visitor's center did Fort Pulaski again receive
24 attention. The visitor center opened after
25 several delays in 1964 and included
26 additional grounds maintenance around the
27 fort to welcome visitors. Under this period of
28 Mission 66 guidance the dikes and drainage
29 system were repaired and various aspects of
30 Fort Pulaski's masonry structure were
31 repointed and restored. Modern upgrades
32 such as asphalt roads and air conditioning
33 were installed around the fort for visitor
34 comfort (Meader and Binkley, 2003).

35 After the 1960s, attention at Fort Pulaski
36 focused on smaller maintenance and historic
37 enhancement projects. The asphalt roads
38 were replaced with a pebble aggregate, power
39 lines were removed from the site lines along
40 U.S. Highway 80, and a museum storage
41 facility was constructed inside one of Fort
42 Pulaski's casemates. The South Channel
43 Bridge has also undergone repair for safety
44 and visitor access several times since its
45 construction (Meader and Binkley, 2003). In
46 2008 additional repairs to the bridge supports
47 and surface were made to increase its life and
48 improve safety.

OTHER INFLUENCES ON COCKSPUR ISLAND

49 Cockspur Island has been used by the U.S.
50 Army Corps of Engineers, United States
51 Navy, Savannah Bar Pilots Association, and
52 the U.S. Coast Guard at various times
53 throughout the modern history of Cockspur
54 Island.

55 The U.S. Army Corps of Engineers has
56 performed dredging operations in the
57 Savannah River since the 19th century.
58 Dredge spoils have been deposited on the
59 northwest shore of Cockspur Island
60 enlarging the island and filling the salt marsh.
61 Dredge spoils and the addition of a jetty to
62 the north shoreline of Cockspur Island have
63 caused extensive buildup of land along the
64 north side of Cockspur Island. The buildup
65 was so extensive after the jetty's construction
66 that Cockspur Island connected with Long
67 Island to the west (Meader and Binkley,
68 2003).

69 In 1936, the U.S. Army Corps of Engineers
70 received legal access to dump dredge spoil
71 and use 200 feet of the north shoreline of
72 Cockspur Island under the Boundary
73 Extension Act of 1936. Deposition of dredge
74 spoil damaged wetlands, the historic dike
75 system, and historic structures forming a rift
76 between the National Park Service and the
77 U.S. Army Corps of Engineers. By 1967, the
78 U.S. Army Corps of Engineers agreed to
79 deposit dredge spoil on Oyster Bed Island
80 across the North Channel Savannah River
81 from Cockspur Island, but did not give up
82 official rights to use Cockspur Island
83 (Meader and Binkley, 2003).

84 In the 1970s, Georgia Ports Authority
85 attempted to use Cockspur Island to access a
86 floating transfer dock for oceangoing vessels.
87 The project was not completed due to storm
88 damage but shoreline stabilization was
89 performed and an opportunity to remove the
90 Savannah Bar Pilots Association buildings
91 from Cockspur Island did not materialize
92 (Meader and Binkley, 2003).

The Savannah Bar Pilots continue to occupy a site with structures on the north shoreline of Cockspur Island under five-year special use permits as of 2010. Structures occupied by the Bar Pilots have been replaced by NPS-approved structures that relieved tension in the 1970s over unsightly facilities within view of Fort Pulaski National Monument (Meader and Binkley, 2003).

In 1996, the U.S. Army Corps of Engineers formally lost its right to use the north shoreline of Cockspur Island to dump dredge spoil and other activities. However, continued dredging and other provisions for the access of larger ships into the Port of Savannah present environmental concerns to Cockspur Island and Fort Pulaski National Monument. Dredging can have potentially degrading resource effects on Cockspur Island by altering Savannah River flow and unpredictably impacting shorelines and flood zones (Meader and Binkley, 2003).

The U.S. Coast Guard maintains Station Tybee on the northwestern end of Cockspur Island. This site was previously used by the U.S. Navy during World War II and remained vacant until a military use was found. The U.S. Coast Guard employs 28 personnel at Station Tybee along with a wharf for docking a U.S. Coast Guard Cutter. Station Tybee is closed to the public.

NATURAL RESOURCES

Climate

Fort Pulaski National Monument is located in U.S. Department of Agriculture (USDA) Climate Zone 8 in the Georgia coastal plain. The Zone 8 climate forms a belt along the coastal plain of the southeastern United States. This belt stretches from Virginia south into Georgia and west into Texas. Coastal plain temperatures range from the high 90s to the low 20s degrees Fahrenheit (Florida State University, 2009).

Fort Pulaski, located on an island and separated from the Atlantic Ocean by other

barrier islands, has less range in temperature than inland parts of the Georgia coastal plain. Typical summer temperatures have highs in the 90s and lows in the 70s in degrees Fahrenheit. Normal winter temperatures range from the 40s to the 60s in degrees Fahrenheit. Freezing temperatures in winter are uncommon, but do occur. The USDA rates the temperature of Cockspur Island in terms of plant hardiness in the 8b category. The 8b category describes winter lows no less than 15 degrees Fahrenheit (Cathey, 1990). Fall and spring temperatures range greatly between the summer and winter ranges.

The geographic location of Fort Pulaski on Cockspur and McQueens Island is susceptible to severe storms and hurricanes coming off the Atlantic Ocean. Hurricanes are not a frequent occurrence, but approximately every four years hurricanes significantly affect the weather conditions and approximately every ten years a more direct hurricane hit is not uncommon. Intense wind and rain storms are frequent and sudden, occurring throughout the year (Savannah, Georgia's History with Tropical Systems, 2009).

Precipitation is spread relatively evenly throughout the year at Fort Pulaski with an average total of 49.58 inches. The heaviest precipitation in the form of rain occurs in the late summer months with an average of 7.20 inches in the month of August.

Soils and Geologic Resources

All the soils identified within Fort Pulaski National Monument are dominated by sandy soils of the Capers series and the Tidal Marsh, Salty category. These soils occur in very poorly drained tidal marshes that have a clay-rich underlying layer. A third soil type on Cockspur Island, Made Land, is primarily the result of dredging and filling.

The Capers series soils consist of very poorly drained soils of the tidal marsh flats. The soils are flooded when tides are higher than normal.

Tidal Marsh, Salty series soils are covered daily by normal high tides and support indigenous salt-tolerant grasses. Within the estuaries, many tidal streams of varying size often dissect the marshland. Soils may be redistributed and/or relocated by strong tidal currents and shifting stream channels. Some areas are very unstable and do not support the weight of large animals.

Made Land consists of built-up areas that were formerly marshland. Generally, dredged materials from the coastal streams were added to low-lying areas. This occurred mainly along the Savannah River shipping channel. On Cockspur Island, some of the dredged materials are confined by dikes.

Plant Communities and Vegetation

Cockspur Island, the location of Fort Pulaski, was originally grassland subject to periodic burning before the 20th century. As a result of dredge spoilage from the Savannah River, Cockspur Island has enlarged its land area, and in 2009 includes maritime forest, grassland, and woody shrub thicket (Govus, 1998).

Much of the vegetation that had grown up immediately around the fort was removed in the 1970s and the monument has been managed as grasslands since. A number of red cedars, palmettos, and sugarberry trees remain in the diked area surrounding the fort. Around the visitor center, junipers and palmettos have been planted in mulched beds (Govus, 1998).

Much of the area surrounding the fort, large areas to the east and south of the fort, and the central portion of Cockspur Island is managed as maintained grass. This habitat occupies over 140 acres on Cockspur Island and behind salt marsh communities is the second most abundant habitat present. Cultivated grass species such as (*Cynodon dactylon*), Dallis grass (*Paspalum dilataum*), vasey grass (*Paspalum urvillei*), and Bahai grass (*Paspalum notatum*) dominate but a number of native species and a few exotic

grass species are also present. Broomsedge (*Andropogon virginicus*), bushy beardgrass (*Andropogon glomeratus*), rescue grass (*Bromus catharticus*), rabbitfoot grass (*Polypogon monspeliensis*) and Mediterranean beardgrass (*Polypogon maritimus*) are examples of other grass species that can be found in these areas. A number of herbaceous species, mostly introduced, are also associated with these lawn type habitats. Commonly found species include false dandelion (*Pyrrhopappus carolinianus*), richardia (*Richardia brasiliensis*), evening primrose (*Oenothera laciniata*), wood sorrel (*Oxalis stricta*), centella (*Centella asiatica*), pennywort (*Hydrocotyle bonariensis*) and verbena (*Verbena brasiliensis*). The proximity of Savannah, with a history of maritime trade and potential for new species from old ballast piles, makes this habitat a good site for newly introduced exotics. Grassy areas inside the fort have a manicured lawn appearance (Govus, 1998).

Over the decades, spoil deposits from the dredging of the North Channel Savannah River and mosquito ditch dredging have been dumped on various islands, including Cockspur, creating artificial hummocks. On these hummocks, woody vegetation has taken hold. Because the majority of the spoil banks are located near the shores of the islands, rings of woody vegetation surround Cockspur Island (Govus, 1998).

The following plant communities were identified on Cockspur Island in a 1998 vascular plant inventory (Govus, 1998).

Lowland Temperate Seasonal Evergreen Forest.

Live Oak — Cabbage palm forest alliance. This maritime forest community is located on central Cockspur Island within the dike system, to the northwest of the fort. It represents the most well-developed and diverse forest community for this site. It is located on the highest elevation and most protected portion of the island. It differs significantly from other examples of this association along the south Atlantic Coast in

that live oak is absent from both the canopy and understory layers of the community. The fact that Cockspur Island has been largely a product of spoil deposits in an area primarily of salt marsh has probably caused this anomaly. This forest, although now reaching maturity, has only developed since the early 1920s. The canopy is diverse and well-developed, including an even mixture of cabbage palm, coastal red cedar (*Juniperus virginiana* var. *silicicola*), sugarberry (*Celtis laevigata*), and a scattering of large American elms (*Ulmus americana*). The understory includes redbay (*Persea borbonia*) and Carolina cherry laurel. The shrub layer varies from dense thickets of yaupon to more open situations with sparse Carolina cherry laurel, wax myrtle (*Myrica cerifera*) and beauty berry (*Callicarpa americana*). This is a densely shaded habitat with few herbaceous species present. Vines are an important component of this forest and Virginia creeper (*Parthenocissus quinquefolius*), pepper vine (*Ampelopsis arborea*), smilax (*Smilax auriculata*), and muscadine vine (*Vitis rotundifolia*) represent the most common species found (Govus, 1998).

Coastal Red Cedar Forest — This is the most widespread forest type on Cockspur Island and occurs largely on the older spoil deposits to the west of the dike system and along the southwestern edge of the island within the dike system. The canopy typically is an even mixture of coastal red cedar, cabbage palm, and sugarberry, but variation does occur and the exotic species Chinese tallow (*Sapium sebiferum*) and Chinaberry (*Melia azederach*) are occasionally present. In some cases, the shrub layer is absent or sparsely developed. Hercules' club (*Zanthoxylum clava-herculis*), winged sumac (*Rhus coppalina*), and wax myrtle are common members of a sparse shrub layer. In other instances, there is a dense yaupon shrub layer. Herbaceous species are generally absent, but vines such as pepper vine, muscadine, and smilax are present. The groundcover layer is typically comprised of a dense cover of old cabbage palm leaves (Govus, 1998).

Portions of this association occur in low-lying areas within the dike system on the southern part of Cockspur Island. The canopy here includes a significant amount of Chinese tallow. In some small areas near the mosquito control pond tallow may actually dominate. Sugarberry is also a significant part of the canopy. In these wetter situations, the shrub layer is dominated by dense, tree-like stand of yaupon, with wax myrtle present to a much lesser extent. Few to no herbaceous species are present. Smilax and pepper vine are the most common vines (Govus, 1998).

Planted/Cultivated Temperate or Subpolar Needle-Leaved Evergreen Forest.

Slash Pine Planted Forest Alliance — This forest located on south central Cockspur Island was planted by the National Park Service, and is the site of the picnic area. The canopy and subcanopy are comprised solely of slash pine (*Pinus elliotii*). There are a few widely scattered shrubs or understory species including cabbage palm and Carolina cherry laurel. The groundcover is maintained grass and is regularly mowed. A few herbaceous species are mixed in with the grasses, including seaside pennywort (*Hydrocotyle bonariensis*) and frog fruits (*Phyllanthus nodiflora*). This pine dominated community is significant for nesting birds on Cockspur Island (Govus, 1998).

Temperate Broad-Leaved Evergreen Woodland.

Cabbage Palm Woodland Alliance — This alliance consists of nearly pure stands of cabbage palm located along the north edge of Cockspur Island, adjacent to the high marsh communities, in an area of high exposure to storm tides and salt spray. Coastal red cedar is occasionally a very minor component of the subcanopy layer. The shrub layer is usually very open but includes yaupon, wax myrtle, winged sumac, and Spanish bayonet (*Yucca aloifolia*). The groundcover layer is devoid of herbaceous species and largely consists of a dense carpet of palmetto leaves. Vine species include pepper vine and smilax (Govus, 1998).

Saturated Temperate Broad-Leaved Evergreen Shrubland.

1 *Wax Myrtle Saturated Shrubland Alliance* —
 2 These tree-like stands of nearly pure wax
 3 myrtle or yaupon (or a mixture of both)
 4 occur along the southern edge of Cockspur
 5 Island. They are located just above the tidal
 6 shrublands and salt pan communities of
 7 central Cockspur Island or occur within the
 8 dike system near the southeastern part of the
 9 island in very low lying areas. Occasionally,
 10 these associations include widely scattered
 11 coastal red cedars and cabbage palms. In the
 12 eastern portion (within the dike system), a
 13 substantial amount of Chinese tallow also
 14 occurs. There is not enough light to support
 15 an herbaceous layer (Govus, 1998).

Tidal Cold-Deciduous Shrublands.

16 *Groundsel Tree* — Maritime marsh elder tidal
 17 shrubland alliance. This community is
 18 widespread on Cockspur Island and occurs
 19 as a fringed shrubland between either salt pan
 20 communities and upland forests or high
 21 marsh communities and upland communities.
 22 It is especially well developed along the
 23 southern edge of Cockspur Island where
 24 extensive salt flats grade gently into the
 25 adjacent upland communities. In addition to
 26 groundsel tree (*Baccharis halimifolia*) and
 27 marsh elder (*Iva frutescens*), false willow
 28 (*Baccharis angustifolia*), sea lavender
 29 (*Limnobium carolinianum*), and fimbristylis
 30 (*Fimbristylis castanea*) are present (Govus,
 31 1998).

32
 33 *Seaside Oxeye Tidal Shrubland Alliance* —
 34 This community occurs on tidal flats adjacent
 35 to the extensive salt marsh communities of
 36 eastern Cockspur Island. Typically, this
 37 community is monospecific, being made up
 38 almost exclusively of seaside oxeye (Govus,
 39 1998).

Tidal Needle Leaved or Microphyllous Evergreen Dwarf Shrubland.

40 *Saltwort Tidal Dwarf Shrubland Alliance* —
 41 Two large examples of this association occur
 42 on hypersaline flats that grade into other salt

43 pan communities along eastern and
 44 southeastern Cockspur Island. Saltwort (*Batis*
 45 *maritima*) is by far the most dominant
 46 species, but other halophytes found here
 47 include woody glasswort (*Sarcocornia*
 48 *perennis*), sea blite (*Sueda linearis*), sea
 49 purslane (*Sesuvium portulacastrum*), and sea
 50 lavender (Govus, 1998).

51 *Woody Glasswort Tidal Dwarf Shrubland*
 52 *Alliance* — This association is particularly
 53 well developed on the broad gentle flats that
 54 lie along the south side of Cockspur Island.
 55 This is a hypersaline environment caused by
 56 the repeated evaporation of tidal water from
 57 these expansive shallow areas. Vegetative
 58 cover varies from a total absence of vascular
 59 plants to a dense concentration of halophytic
 60 herbs, particularly woody glasswort. Saltwort
 61 and salt grass (*Distichlis spicata*) are also
 62 abundant and usually interspersed with
 63 dwarf saltmarsh cordgrass (*Spartina*
 64 *alterniflora*). Additional species include sea
 65 lavender, sea blite, and sea purslane (Govus,
 66 1998).

Tidal Temperate or Subpolar Grassland.

67 *Salt Marsh Cord Grass Tidal Herbaceous*
 68 *Alliance* — This community is the largest
 69 present on Cockspur Island, covering over
 70 340 acres. It is best developed in areas
 71 between mean high and low tides that are
 72 regularly flooded. It is largely monospecific
 73 but is occasionally interspersed with patches
 74 of the needlerush (*Juncus roemarianus*)
 75 community (Govus, 1998).

76 *Salt Meadow Cord Grass Tidal Herbaceous*
 77 *Alliance* — This “high marsh” community
 78 occurs primarily along the steep terraces of
 79 north-central Cockspur Island, which receive
 80 infrequent tidal flooding. In addition to
 81 saltmeadow cordgrass (*Spartina patens*),
 82 saltgrass, and seaside oxeye, other species
 83 found here include seaside goldenrod
 84 (*Solidago sempervirens*), sea lavender, sand
 85 vine (*Cynanchium angustifolium*), knotgrass
 86 (*Paspalum distichum*), fimbristylis, and sea
 87 beach atriplex (*Atriplex arenaria* Nutt)
 88 (Govus, 1998).

Anthropogenic Habitats.

1 *Sandy Spoil Deposits* — Spoil deposits
2 comprised nearly of pure sand have been
3 placed along the north-central and
4 southwestern portion of Cockspur Island
5 until 1972, resulting in young successional
6 communities. Currently, the existing
7 vegetation consists of widely scattered trees
8 with large areas of exposed open sand,
9 sparsely inhabited by a number of
10 herbaceous species and vines. Coastal red
11 cedar, sugarberry, cabbage palm, chinaberry,
12 and white mulberry (*Morus alba*) are the
13 principal trees found in this habitat. Along
14 the north central area (east of the Bar Pilots
15 House) the canopy is pure coastal red cedar.
16 Shrubs scattered in these areas include wax
17 myrtle, groundsel tree, yaupon, winged
18 sumac, and lantana (*Lantana camara*), along
19 with a diverse herbaceous layer (Govus,
20 1998).

21 **Exotics.** Cockspur Island is home to a
22 number of nonnative species that tend to be
23 invasive to natural communities. A 1998 plant
24 inventory identified eighteen such exotics,
25 including sweet acacia, camphor tree
26 (*Cinnamomum camphora*), lantana, Chinese
27 privet (*Ligustrum sinense*), Japanese
28 honeysuckle (*Lonicera japonica*), chinaberry
29 (*Melia azedarach*), and Chinese tallow tree
30 (*Sapium sebiferum*) (Govus, 1998).

Wildlife

31 The estuarine marshes and upland areas of
32 Fort Pulaski National Monument support
33 many species of wildlife. Large populations of
34 both resident and migrant birds are present.
35 Mammals are abundant and include marsh
36 rabbit, raccoons, opossums, mink, otter, and
37 deer. Cormorants, seagulls, mergansers,
38 hawks, herons, egrets, ibis, rails, and terns
39 can be found nesting and feeding in many of
40 these areas. There are many species of
41 reptiles, of which the eastern diamondback
42 rattlesnake is poisonous. The tidal waters
43 surrounding the fort contain a great variety of
44 fish typical of southern coastal estuaries. The
45 following federally listed or state listed rare,

46 threatened, or endangered species have been
47 documented at Fort Pulaski: American
48 oystercatcher, bald eagle, gull-billed tern,
49 loggerhead sea turtle, West Indian manatee,
50 peregrine falcon, piping plover, swallow-
51 tailed kite, Wilson's plover, and wood stork.

52 Point count surveys were conducted at Fort
53 Pulaski during January, May, July, and
54 October in 1998. A total of 7,891 birds
55 consisting of 82 species were observed and/or
56 heard during 13 days of surveying. Two
57 species protected by the state of Georgia
58 were observed, the least tern (*Sterna*
59 *antillarum*) and the swallow-tailed kite
60 (*Elanoides forficatus*). Three species that were
61 observed during the surveys which are
62 considered to be rare or accidental to the
63 monument included: cliff swallow
64 (*Petrochelidon pyrrhonota*), hooded warbler
65 (*Wilsonia citrina*) and LeConte's sparrow
66 (*Ammodramus leconteii*) (Rabolli and
67 Ellington, 1999).

68 Cockspur Island is surrounded by vast salt
69 marshes interspersed by rivers and tidal
70 estuaries. These tidal marshes, which are
71 formed in conjunction with barrier island
72 development, have delicate ecological
73 characteristics including essential life support
74 systems for shrimp, oysters, clams, mussels,
75 and the usual variety of fish found in
76 southern coastal estuaries.

Aquatic Vegetation

77 No true "rooted" aquatic or floating
78 vegetation exists in or around Fort Pulaski
79 National Monument. However, during the
80 2008 site visit, the macroalgae known as sea
81 lettuce (*Ulva lactuca*) was observed in tidal
82 pools during low tide. Sea lettuce is not
83 classified as true aquatic vegetation.

Finfish Species

84 The Georgia Department of Natural
85 Resources' Wildlife Resources Division
86 manages Georgia's fish and wildlife
87 resources. The Savannah River supports
88 commercial and recreational fishing. Several

species of marine fish are found in the nearshore environment, in the vicinity of the project area. Observations from studies conducted indicate that the most abundant finfish species include the following: Atlantic spot (*Leiostomus xanthurus*), croaker (*Micropogonias undulatus*), spotted seatrout (*Cynoscion nebulosus*), silver seatrout (*Cynoscion nothus*), weakfish (*Cynoscion regalis*), southern kingfish (*Menticirrhus americanus*), various drum species, Atlantic menhaden (*Brevoortia tyrannus*), hog choker (*Trinectes maculatus*), and bay anchovy (*Anchoa mitchelli*) (GPA, 1998).

Five aquatic sites were sampled in May 1998 to identify fish utilizing the area surrounding the monument. Site F3 was located in the South Channel Savannah River adjacent to the monument and the Cockspur Island Lighthouse. The site had significant tidal influence and was similar to much of the open water areas surrounding Cockspur Island. The fish collected during the survey at this Site F3 included the following: alewife (*Alosa pseudoharengus*), Atlantic croaker (*Micropogonias undulatus*), Atlantic needlefish (*Strongylura marina*), bay anchovy (*Anchoa mitchelli*), longnose gar (*Lepisosteus osseus*), mummichog (*Fundulus heteroclitus*), striped killifish (*Fundulus majalis*), and striped mullet (*Mugil cephalus*) (Rabolli and Ellington, 1999).

Each spring and fall, the main Savannah River, Back River, Middle River, and numerous interconnecting tidal streams support the migration of three members of the herring family and include American shad (*Alosa saoidissima*), hickory shad (*Alosa mediocris*), and blueback herring (*Alosa aestivalis*) as well as the striped bass (*Morone saxatilis*). Each of these species are very important game and/or commercial fish species. The American shad is the most valuable commercial anadromous fish in the Southeast (GPA, 1998).

Shellfish

Shellfish thrive in estuaries and include oysters, clams, and mussels. Shellfish are filter

feeders, meaning they intake large quantities of water across their gills for food and oxygen. During this process, shellfish take in bacteria, viruses, and chemical contaminants that can be stored in their digestive systems.

Oyster Creek, which is located within the monument on McQueens Island, is the only area in Chatham County that is open for recreational oyster harvesting. Oyster Creek meets the high water quality standards that are necessary to allow this activity to continue (NPCA 2007). Currently, the island upon which the lighthouse stands is almost completely comprised of common oyster shells, portions of which are live reefs and other portions which are dead shell. Other shellfish observed on the island include Atlantic ribbed mussel.

Reptiles and Amphibians

Reptile species observed or captured during the 1998 through 1999 survey of the monument that could potentially use the habitat on the island include the American alligator (*Alligator mississippiensis*) and the diamond back terrapin (*Malaclemys terrapin*) (Rabolli and Ellington, 1999). The American alligator currently has a status of “threatened due to similarity of appearance” because of its likeness to other crocodilians worldwide that still receive protection. The removal from total protection status allows Georgia and other Southeastern states greater flexibility in managing alligator populations. Amphibians were also captured or observed during the 1998 through 1999 survey, but those captured were primarily terrestrial and would most likely not use the habitat on the island that houses the lighthouse.

Benthic Invertebrates

In October of 2002, a benthic study was conducted in the Savannah Harbor entrance in the shallow waters located east of Fort Pulaski National Monument and the Cockspur Island Lighthouse (USACE, 2003). The results of 30 stations indicated that the

benthic assemblages in this area were typical of assemblages found at other estuaries within the region and contained typical opportunistic and colonizing estuarine fauna; there were no hard bottom assemblages or sensitive biological taxa or taxa groups collected (USACE, 2003). The station located in closest proximity to the lighthouse (Station 39, located approximately 1,300 feet away), was comprised of the following taxa (and percentages): Annelida (88%), Mollusca (5%), Arthropoda (2.5%), Echinodermata (1%), and Other (3%). The following dominant taxa were collected at Station 39: Tubificidae, Mediomastus, and Streblospio benedicti. At Station 39, a total of 16 taxa and 157 individuals were collected, corresponding to an average station density of 3,925 organisms per square meter (USACE, 2003). Compared to the other 30 stations sampled in the vicinity of the Savannah Harbor entrance, Station 39 had the second highest total number of individuals and the second highest density (organisms per square meter).

Marine Mammals

Two marine mammals, the federally endangered West Indian manatee (*Trichechus manatus*) and the bottlenose dolphin (*Tursiops truncatus*), are found in the Savannah River in the vicinity of the project area. These marine mammals are offered federal protection under the Marine Mammal Protection Act of 1972, which is enforced by United States Fish and Wildlife Service. The act established a moratorium on the taking or harassment of marine mammal species. The West Indian manatee is further protected as a depleted stock under the act.

Special Status Species

The near-shore federally listed species that could potentially be found within the project area are the West Indian manatee, five species of sea turtles, and the shortnose sturgeon, for which detailed descriptions are provided below. It has been determined that the

remaining species of whales, with the exception of the Northern Atlantic Right Whale, would not specifically be found within the project area.

West Indian Manatee. (Federal Threatened and State Endangered) The West Indian manatees are most frequently sighted in Georgia waters from April through October in the waters of Camden, Glynn, and McIntosh counties during which time wildlife biologists with the Georgia Department of Natural Resources' Nongame-Endangered Wildlife Program monitor their activities (GADNR, 2008). This species is an uncommon summer visitor to the creeks and rivers around the monument. In recent years, manatees have been documented in the Savannah River, and likely occur in Oyster Creek (Rabolli and Ellington, 1999) as well as within the Savannah National Wildlife Refuge (NWR) (USFWS, 2008). In a letter response dated March 21, 2008, the Georgia Department of Natural Resources' Natural Heritage Database documents the manatee as using tidal waters; no records of manatee occurrences have been recorded within 3 miles of the monument.

Northern Atlantic Right Whale. (Federal Endangered and State Endangered) Northern right whales are now considered one of the most endangered large mammals in the world due to over hunting which ended in 1935. Today there are only around 300 right whales in existence, making them close to extinction. In a letter response dated March 21, 2008, the Georgia Department of Natural Resources' Natural Heritage Database documents one occurrence of the right whale, approximately 2 miles east of the monument. These whales grow to around 55 feet long and are black with a broad, flat back and no dorsal fin. The waters of the southern U.S. are the only known calving ground for this species. This area, known as critical right whale habitat is a small strip of water extending only 5–15 miles offshore from the Altamaha River in Georgia (located south of the monument) south to the Sebastian Inlet in Florida. Unfortunately, these waters contain numerous shipping

lanes and collisions with ships result in 30 to 50 percent of whale deaths annually.

Loggerhead Sea Turtle. (Federal Threatened and State Threatened) The loggerhead sea turtle is listed as threatened at both the state and federal level. Loggerheads live in marine coastal and oceanic waters. The loggerhead is the only species to nest in Georgia regularly on islands such as Jekyll Island, Sea Island, Sapelo Island, Ossabaw Island, and other barrier islands (GADNR, 2008). In a letter response dated March 21, 2008, the Georgia Department of Natural Resources' Natural Heritage Database documents two occurrences of the loggerhead sea turtle; approximately 2 miles east of the monument and 2.5 miles southeast of the monument. Therefore, the loggerhead is an uncommon visitor to the creeks and rivers surrounding the monument (Rabolli and Ellington, 1999). Although this species has not been observed using the spoils and beaches of the monument, it has been observed in Lazaretto Creek and Oyster Creek in recent years (Rabolli and Ellington, 1999). The females nest on the upper beach or in the dunes in Georgia from late May to mid-August. Loggerheads nest from one to seven times within a nesting season (mean is approximately 4.1 nests per season) at intervals of approximately 14 days. Hatchlings emerge at night approximately 50 to 60 days later and find their way to the sea (July through November). Juveniles frequent coastal bays, inlets, and lagoons (GADNR, 2008).

Green Sea Turtle. (Federal Endangered and State Endangered) Green turtles live in estuarine and marine coastal and oceanic waters. They are generally found in fairly shallow waters inside reefs, bays, and inlets. Green turtles come ashore at beaches from June to July to nest. Nesting occurs at night on the upper beach and sand dunes, similar to the loggerhead sea turtle. Hatchlings emerge and head toward sea approximately 60 days later from August through November. Green turtles are considered infrequent nesters in Georgia (GADNR, 2008). Large juveniles and adults feed on sea

grasses and algae. Juveniles can be found in coastal bays, inlets, lagoons, and offshore warm reefs.

Leatherback Sea Turtle. (Federal Endangered and State Endangered) Leatherback sea turtles are the largest of the three sea turtles occurring on the beaches in Coastal Georgia. They live in oceanic waters and come ashore to nest on the beaches during the summer months. Less than 10 leatherback nests are recorded in Georgia each year (GADNR, 2008). Hatchlings emerge and head toward sea mid-summer to early fall. They feed primarily on jellyfish (GADNR, 2008).

Hawksbill Sea Turtle. (Federal Endangered and State Endangered) The Hawksbill sea turtle is one of the smallest species of sea turtles. The Hawksbill grows up to 3 feet in carapace length and can weigh up to 180 lbs. The turtle prefers subtropical environments, and is particularly fond of clear water coral reefs and ecosystems, although they can also be found residing in rocky inland waters, mangrove-edged inlets, and bays. Hawksbill turtles do not nest in Georgia and are rarely found in Georgia's coastal waters (GADNR, 2008). It is unlikely that these turtles would use the habitat surrounding the monument. These reptiles have an unusual diet consisting of fish, snails, jellyfish, starfish, sea urchins, bryozoans, and sponges. Females nest every three to five years and demonstrate a fair degree of near site fidelity. They prefer to nest on warm, smaller beaches and generally deposit their eggs in a nest excavated within the beach-side vegetation zone. The turtles can lay anywhere between 100 to 200 small eggs the size of a ping pong ball (NOAA, 2008).

Kemp's Ridley Sea Turtle. (Federal Endangered and State Endangered) The Kemp's Ridley sea turtle is the rarest and smallest of all sea turtles. It feeds in the coastal waters of Georgia on blue crabs and other crabs and shrimp. All Kemp's Ridley turtles nest on a single stretch of beach on the Gulf Coast of Mexico (GADNR, 2008).

Shortnose Sturgeon. (Federal Endangered and State Endangered) The sturgeon family is among the most primitive of the bony fishes; the shortnose sturgeon is the smallest of the three sturgeon species that occur in eastern North America, having a maximum known total length of 4.7 feet and weight of about 50 pounds. The shortnose sturgeon is anadromous, living mainly in the slower moving riverine waters or nearshore marine waters, and migrating periodically into faster moving fresh water areas to spawn (NOAA, 2008). Shortnose sturgeon occur in most major river systems along the eastern seaboard of the U.S. and in Georgia they occur in the Savannah River (NOAA, 2008) and within the Savannah River National Wildlife Refuge (USFWS, 2008). Shortnose sturgeon spawning occurs in early February to mid-March in the Savannah River (NMFS, 1998).

Smalltooth Sawfish. (Federal Endangered and State Endangered) The USFWS placed the smalltooth sawfish on the endangered species list in April 2003. The species occurs in estuarine and coastal habitats, such as bays, lagoons, and rivers. Habitat destruction and overfishing has contributed to the declining population. The last remaining population of the smalltooth sawfish in U.S. waters is located off the coast of southern Florida (Passarelli and Curtis, 2010).

Species Listed by the State of Georgia

The Georgia Department of Natural Resources identifies 69 Special Concern Animals as potentially occurring in Chatham County, Georgia. These species are believed to be sufficiently rare as to warrant the collecting of occurrence information to better determine their status. In a letter response dated March 21, 2008, the Georgia Department of Natural Resources' Natural Heritage Database documented listed species that occur in the vicinity of Fort Pulaski National Monument. The listed terrestrial species included on the Georgia Department of Natural Resources' Natural Heritage list

were Florida wild privet (*Forestiera R. Fothergilla gardenii*) and the Northern yellow bat (*Lasiurus intermedius*). Aquatic-dependent species on this list include the following: false killer whale (*Pseudorca crassidens*) — sited approximately 1.5 miles east of the monument; black-crowned night heron (*Nycticorax nycticorax*) — sited approximately 1.5 miles east of the monument; black skimmer (*Rynchops niger*) — sited approximately 1.5 miles northwest of the monument; and least tern (*Sterna antillarum*) — sited approximately 2.5 miles northwest of site.

An examination of the habitats found at the monument in 1998 identified 11 listed species that likely use the habitats of the monument at some time (Rabolli and Ellington, 1999). Of the 11 listed species. American oystercatcher, bald eagle, gull-billed tern, least tern, loggerhead sea turtle, manatee, peregrine falcon, piping plover, swallow-tailed kite, Wilson's plover, and woodstork, only the least tern and the swallow-tailed kite were observed at the monument during the 1998 survey. However, monument staff reported observing all 11 of these species, except for the gull-billed tern (Rabolli and Ellington, 1999). Descriptions of the mobile and protected aquatic-dependent species listed by the state of Georgia (of the 11 species discussed previously) potentially found in the project area are as follows:

American Oystercatcher. (state listed as rare) This species breeds along the Georgia coast, primarily on barrier island beaches. It is reported to be an uncommon winter visitor to the monument, but it is possible that this species could nest at the monument. Almost any bare area above high tide is suitable nesting habitat.

Bald Eagle. (state listed as endangered) The bald eagle is an uncommon winter visitor to the area in and around the monument. The number of eagles nesting in Georgia continues to grow, and in 1998, 30 eagle nests were recorded throughout Georgia.

1 **Gull-billed Tern.** (state listed as threatened)
 2 This species is an uncommon summer
 3 resident along Georgia's coast. The Georgia
 4 Ornithological Society (1986) reported that
 5 nesting has occurred at Tybee Island in the
 6 past. Gull-billed Tern numbers are very low
 7 in Georgia, and it is doubtful that nesting has
 8 occurred at the monument for many years.

9 **Least Tern.** (state listed as rare) This species
 10 is a summer resident along the Georgia Coast,
 11 and may breed at the monument. The largest
 12 colonies in Georgia are found at spoil sites
 13 along the Savannah River; areas with no
 14 vegetation are good locations for nesting least
 15 terns, as well as gull-billed terns.

16 **Peregrine Falcon.** (state listed as threatened)
 17 This species is an uncommon winter visitor to
 18 the Georgia coast, and has been observed by
 19 the monument staff in recent years.

20 **Piping Plover.** (federally listed as
 21 endangered and state listed as endangered)
 22 The piping plover is a winter visitor to the
 23 shores and spoil areas at the monument. As
 24 coastal development reduces wintering
 25 habitat, these spoil habitats will grow in
 26 importance. It is recommended that these
 27 spoil areas be protected from disturbance.

28 **Swallow-tailed Kite.** (state listed as rare) A
 29 single kite was observed at the monument on
 30 May 6, 1998; the Kite had not previously been
 31 reported from the monument. It is a rare
 32 summer resident in river bottoms of the
 33 coastal plain. In Georgia, breeding is
 34 probably limited to remote areas of the
 35 Savannah and Altamaha River bottoms and
 36 the Okefenokee Swamp; the monument does
 37 not provide breeding habitat and provides
 38 limited foraging habitat.

39 **Wilson's Plover.** (state listed as rare) The
 40 Wilson's plover is an uncommon summer
 41 resident of the shores and spoil areas at the
 42 monument and this species possibly breeds
 43 on the monument spoil mounds.

44 **Woodstork.** (federally listed as endangered
 45 and state listed as endangered) This species is
 46 a regular summer visitor to the monument. It
 47 has been observed feeding in the marshes
 48 surrounding the monument by monument
 49 staff.

50 Special status species are listed according to
 51 federal and state listed species in Chatham
 52 County, Georgia. The range of individual
 53 species varies, but Cockspur and McQueens
 54 islands have the potential to be within the
 55 range of the listed species in table 10.



ALLIGATOR ON MOAT WALL

David Libman, National Park Service

TABLE 10. SPECIAL STATUS SPECIES LISTED BY FEDERAL AND STATE AGENCIES

Species	Scientific Name	Federal Status	State Status
Mammal			
Humpback whale	Megaptera novaeangliae	E	E
Right whale	Eubalaena glacialis	E	E
West Indian manatee	Trichechus manatus	E	E
Bird			
Bachman's warbler	Vermivora bachmanii	E	E
Bald eagle	Haliaeetus leucocephalus	T	E
Gull-billed tern	Sterna nilotica	No Federal Status	T
Piping plover	Charadrius melodus	T	T
Red-cockaded woodpecker	Picoides borealis	E	E
Wood stork	Mycteria americana	E	E
Reptile			
Eastern indigo snake	Drymarchon corais couperi	T	T
Gopher tortoise	Gopherus polyphemus	No Federal Status	T
Green sea turtle	Chelonia mydas	T	T
Hawksbill sea turtle	Eretmochelys imbricata	E	E
Kemp's ridley sea turtle	Lepidochelys kempii	E	E
Leatherback sea turtle	Dermochelys coriacea	E	E
Loggerhead sea turtle	Caretta caretta	T	T
Amphibian			
Flatwoods salamander	Ambystoma cingulatum	T	T
Fish			
Shortnose sturgeon ¹	Acipenser brevirostrum	E	E
Plant			
Climbing buckthorn	Sageretia minutiflora	No Federal Status	T
Narrowleaf obedient plant	Physostegia leptophylla	No Federal Status	T
Pondberry	Lindera melissifolia	E	E

Water Quality

1 The water quality of the Savannah River
 2 around Cockspur Island is variable in relation
 3 to tidal flows, runoff, and inflow from feeder
 4 waterways. The Georgia Environmental
 5 Protection Division tests tributaries and
 6 water bodies upstream specifically for
 7 drinking water quality. Most cities and towns
 8 upstream of Cockspur Island do not pull
 9 drinking water from the Savannah River,
 10 directly limiting composite data in regards to
 11 water quality at the mouth of the river.
 12 However, two mainstem water quality testing
 13 sites, in the Savannah Harbor and upstream
 14 of Savannah, can relate water quality around
 15 Cockspur and McQueens islands. The U.S.
 16 Environmental Protection Agency, in
 17 coordination with the Georgia

18 Environmental Protection Division, tests
 19 coastal waters along Tybee Island. Water
 20 quality off Tybee Island in connection with
 21 water quality data in the mainstem of the
 22 Savannah River near Savannah create a water
 23 quality profile for Fort Pulaski National
 24 Monument.

25 Beach closings on Tybee Island's north
 26 beach, the closest testing location to Fort
 27 Pulaski National Monument, between 2000
 28 and 2009 have numbered three, one closing
 29 in 2007 and two closings in 2004. Water
 30 quality during these periods of closure
 31 exceeded levels of organics established by the
 32 U.S. Environmental Protection Agency in the
 33 form of fecal coliform counts. Fecal coliform
 34 counts that exceed U.S. EPA standards for
 35 recreational waters at north Tybee Island are

a result of nonpoint runoff from septic systems and stormwater discharge. Higher turbidity from silt entering stormwater runoff after heavy rains generally accompanies higher than standard fecal coliform counts. Below standard levels of fecal coliform are emitted from point source outlets into the Savannah River (U.S. EPA, 2009).

The *Savannah River Basin Plan* published by the Georgia Department of Environmental Protection outlines the basic water quality of the entire Savannah River Basin. Water quality tests revealed that several water quality indicators exceeded recommended use levels for fishing, drinking water, and coastal fishing on the mainstem of the lower Savannah River. This segment of the river is closest in proximity to Cockspur and McQueens Island and correlates with the Savannah and Tybee Island. Freshwater and coastal fishing was not recommended due to levels of mercury in largemouth bass and channel catfish. Fecal coliform counts in the lower Savannah River Basin were high enough to discourage Savannah River mainstem water for fishing, drinking water, and recreation (Georgia Department of Natural Resources Environmental Protection Division, 2001).

Water quality near the mouth of the Savannah River, adjacent to Tybee Island, is relatively predictable and is dependent on the tidal conditions within the Savannah River (GPA, 1998). Water quality parameters such as temperature, salinity, and dissolved oxygen (DO) vary uniformly with depth and with flood and ebb conditions of the river. Salinity midway in the water column ranges from 22 to 31 parts per thousand (ppt); temperatures range from seasonal highs of 28 °C while seasonal lows can be less than 11 °C; typical values of DO in the mid-water column range from 5 to 7 milligrams per liter (GPA, 1998).

In October of 2002, water quality was collected as part of a benthic and sediment study in the Savannah Harbor entrance in the shallow waters located east of the monument and the Cockspur Island Lighthouse (USACE, 2003). The results of 30 stations

indicated that the water quality in this area was typical of shallow estuaries within the region. At depths of 0.6 to 3.6 meters, temperature ranged from 21.9 to 23.9°C; salinity ranged from 14.8 to 19.4 ppt; DO ranged from 5.9 to 6.7 mg/Liter; turbidity ranged from 8.2 to 79.4 nephelometric turbidity units. For the station located in closest proximity to the lighthouse (Station 39, located approximately 1,300 feet away), at 1.2 meters deep, the temperature was 22.0 °C, salinity was 17.1 parts per trillion, DO was 6.3 milligrams per liter, and turbidity was 25.0 nephelometric turbidity units (USACE, 2003).

The Clean Water Act requires that surface waters for each state be classified according to the state's designated uses. The state of Georgia, through its Rules and Regulations for Water Quality Control, Chapter 3913-6, Revised May 29, 1994, has classified the Savannah River from mile 0 at Fort Pulaski to the open sea (including the littoral waters of Tybee Island) as recreation waters. From Fort Pulaski to Mile 27.4 (Seaboard Coastline Railroad Bridge) the river is classified as coastal fishing (GPA, 1998).

The Georgia Water Quality Control Act (O.C.G.A. 12-5-20) grants the Georgia Environmental Protection Division authority to ensure that water uses in the state of Georgia are used prudently, are maintained or restored to a reasonable degree of purity, and are maintained in adequate supply. Through a memorandum of agreement between the Georgia Department of Natural Resources' Environmental Protection Division and the Georgia Department of Natural Resources' Coastal Resources Division, the rules and permits of the Environmental Protection Division are administered in a manner consistent with the enforceable policies of the Coastal Management Program. The Act makes it unlawful for any person to dispose of sewage, industrial wastes, or other wastes, or to withdraw, divert, or impound any surface waters of the state without a permit.

Floodplains

1 Floodplain Management, Executive Order
 2 11988 issued May 24, 1977, directs all federal
 3 agencies to avoid both long- and short-term
 4 adverse effects associated with occupancy,
 5 modification, and development in the 100-
 6 year floodplain, when possible. Floodplains
 7 are defined in this order as “the lowland and
 8 relatively flat areas adjoining inland and
 9 coastal waters including flood prone areas of
 10 offshore islands, including at a minimum, that
 11 area subject to a one percent greater chance
 12 of flooding in any given year.” Flooding in
 13 the 100-year zone is expected to occur once
 14 every 100 years, on average. In addition, NPS
 15 proposed actions that may adversely affect
 16 floodplains must comply with Director’s
 17 Order 77-2: *Floodplain Management*.

18 All federal agencies are required to avoid
 19 building in a 100-year floodplain unless no
 20 other practical alternative exists. The
 21 National Park Service has adopted guidelines
 22 pursuant to Executive Order 11998 stating
 23 that NPS policy is to restore and preserve
 24 natural floodplain values and avoid
 25 environmental impacts associated with the
 26 occupation and modification of floodplains.
 27 The guidelines also require that, where
 28 practicable alternatives exist, Class I action be
 29 avoided within a 100-year floodplain. Class I
 30 actions include the location or construction
 31 of administration, residential, warehouse,
 32 and maintenance buildings, nonexcepted
 33 parking lots, or other manmade features that
 34 by their nature entice or require individuals
 35 to occupy the site.

36 Fort Pulaski National Monument is located
 37 within a 100-year floodplain, Zone VE, which
 38 has been mapped by the Federal Emergency
 39 Management Agency on a Flood Insurance
 40 Rate Map issued in 2004. Zone VE is
 41 described as having a 1% chance of flooding
 42 per year with an additional high wind velocity
 43 potential (FEMA, 2004).

Shoreline Erosion

44 The U.S. Army Corps of Engineers recently
 45 conducted a bank erosion study for Fort
 46 Pulaski National Monument and North
 47 Tybee Island for the Savannah Harbor
 48 Expansion Study (USACE, undated).
 49 Unprotected portions of the monument are
 50 subject to shoreline erosion measurable from
 51 1.6 to 3.1 feet per year, depending on specific
 52 location. The majority of erosion is due to
 53 tide, flows, river mechanics, shape and other
 54 causes unrelated to ship traffic through the
 55 channel. Ship traffic is estimated to have a
 56 minimal but measurable impact to shoreline
 57 erosion at the monument based on the
 58 predicted fleet mix and volume (USACE,
 59 undated). It is estimated that 0.36 inch (about
 60 3/8 inch maximum) of erosion could be
 61 attributed to all ship wakes during the year
 62 2003. Using the maximum estimated erosion
 63 rate, predicting erosion for the years 2030
 64 and 2050 is a function of ship numbers and
 65 size. If 1,258 ship calls were responsible for
 66 0.36 inch of erosion at Fort Pulaski, then in
 67 the year 2030, 4,030 ship calls could be
 68 responsible for 1.15 inches of erosion.
 69 Similarly, in the year 2050, ship calls could be
 70 responsible for 2.23 inches of erosion,
 71 assuming the shoreline remains unprotected
 72 (USACE, undated). It is probable that the
 73 small island experiences similar amounts of
 74 annual erosion described previously for the
 75 shoreline of Fort Pulaski. Other sources of
 76 erosion to the island other than shipping
 77 traffic include severe nor’easter storms,
 78 hurricanes, and rising sea level.

Wetlands

79 Section 404 of the Clean Water Act and a
 80 number of state laws and provisions regulate
 81 activities in wetlands. Executive Order 11990,
 82 “Protection of Wetlands,” directs all federal
 83 agencies to avoid, to the extent possible, the
 84 long- and short-term adverse impacts
 85 associated with the destruction or
 86 modification of wetlands and to avoid direct
 87 or indirect support of new construction in
 88 wetlands wherever there is a practicable
 89 alternative. In the absence of such

alternatives, parks must modify actions to preserve and enhance wetland values and minimize degradation. Consistent with Executive Order 11990 and Director's Order #77-1: *Wetland Protection*, the National Park Service adopted a goal of "no net loss of wetlands." Director's Order #77-1 states that for new actions where impacts on wetlands cannot be avoided, proposals must include plans for compensatory mitigation that restores wetlands on NPS lands, where possible, at a minimum acreage ratio of 1:1.

The National Park Service defines wetlands as vegetated areas that are flooded or saturated for duration sufficient to allow development of at least one of the three wetland indicators described in the 1987 U.S. Army Corps of Engineers Wetland Delineation Manual (Environmental Laboratory, 1987). The three wetland indicators used include wetland hydrology, hydric soil, or hydrophytic vegetation. This definition differs from that used by the Corps to delineate jurisdictional wetlands. The Corps' definition requires the presence of all three wetland indicators for an area to be classified as a wetland. This document presents wetlands as defined by the one-parameter approach adopted by the National Park Service.

Wetlands are characterized by soil type and a diversity of vegetation, including trees, shrubs, and herbaceous ground covers. Wetlands provide a variety of beneficial functions from supplying habitat for a variety of wildlife, storage and attenuation of floodwaters, trapping silts and other sediments during floods, and biologically filtering contaminants from surface waters. The National Wetlands Inventory of the U.S. Fish and Wildlife Service produces information on the characteristics, extent, and status of the nation's wetlands and deepwater habitats. The U.S. Fish and Wildlife Service definition of wetlands is similar to the NPS definition of wetlands in that only one of three parameters (hydric soils, hydrophytic vegetation, and hydrology) is required to characterize an area as a wetland, based upon the Cowardin

Classification of Wetlands (Cowardin, 1979). National Wetlands Inventory maps are prepared by the U.S. Fish and Wildlife Service from the analysis of high altitude imagery and wetlands are identified based on vegetation, visible hydrology, and geography.

Based on the National Wetlands Inventory maps at the site from the U.S. Fish and Wildlife Service and NPS definition of wetlands, 90% of Fort Pulaski National Monument is wetlands. Of the approximately 5,400 acres that compose Fort Pulaski National Monument 4,800 acres is salt marsh. The remaining dry acreage is isolated to the built up landscape around Fort Pulaski and 500 acres of dredge spoil deposited on both McQueens and Cockspur Island. In addition, tidal flows partially submerge Cockspur Island twice every 24 hour period.

Tidal Influences

The main water body that surrounds the lighthouse is the South Channel Savannah River. The coastline in the Savannah area is classified as a mesotidal region (tidal ranges between 6 and 12 feet) (GPA, 1998). Tidal fluctuations near the project site are semidiurnal, averaging 6.8 feet at the mouth of the Savannah Harbor and 7.9 feet at the upstream limit of the Harbor. The shorelines of Cockspur Island and McQueens Island are constantly affected by tidal flows, which change four times daily with maximum tidal currents in excess of 5 knots and a tidal amplitude of 3 to 3.5 feet. Bathymetry was recorded in the immediate Cockspur Island area in 2008 and these data show that shallow waters surround the island and gradually slope from -1 to -12 feet below mean sea level (MSL).

Wilderness Resources and Values

Approximately 90% of Fort Pulaski National Monument is classified as wetland. With over 4,800 acres of salt marsh that are covered twice daily with nutrient- rich marine waters, the monument preserves and protects a

1 sizeable portion of one of the most
2 productive and prolific ecosystems known to
3 man. Located only a few miles from the
4 Atlantic Ocean, the waters within the
5 monument's boundaries are teeming with
6 shrimp, oysters, clams, mussels and the usual
7 variety of fish found in southern coastal
8 estuaries. The monument protects some of
9 the most pristine resources in the area, as
10 indicated by the presence of Class 1 waters
11 for recreational harvest of shellfish.

12 Approximately 4,500 acres of undeveloped
13 salt marsh on McQueens Island meet the
14 criteria established by law and therefore are
15 eligible for wilderness designation. These
16 lands generally appear to have been affected
17 primarily by the forces of nature with
18 minimal evidence of human activity. These

19 areas of Fort Pulaski National Monument
20 offer outstanding opportunities for solitude
21 or for primitive and unconfined recreation.

22 Although development is visible when
23 looking out into the surrounding uplands,
24 inside the marsh there are no structures or
25 other permanent improvements, i.e. the
26 imprint of humans' work is substantially
27 unnoticeable. Furthermore, the National
28 Park Service has, and will continue to, protect
29 and manage these areas so as to preserve their
30 natural conditions. Finally, some limited
31 opportunities for solitude or a primitive and
32 unconfined type of recreation exist inside
33 these areas. Opportunities are limited not by
34 a lack of primitive conditions, but by the
35 nature of the salt marsh itself.



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MCQUEENS ISLAND MARSH

VISITOR USE AND EXPERIENCE

Visitation at Fort Pulaski National Monument has been monitored since 1995. As of 2008, the mean number of recreation visitors per year since 1995 was approximately 218,153 with a median around 257,000. Recreation visits in 2008 totaled 352,636. Recreational visitation has continually been elevated in the summer months with the lowest visitation in the winter months (NPS Public Use Statistics Office, 2008). The visitation season roughly corresponds to beach based tourism along nearby Tybee Island.

TABLE 11. VISITATION AT FORT PULASKI NATIONAL MONUMENT SINCE 1995

Fiscal Year	Recreational	Non-Recreational	Total Visits	Percentage Change
2009	435,661	28,800	464,461	21.77%
2008	352,636	28,800	381,436	9.44%
2007	319,734	28,800	348,534	-1.85%
2006	326,301	28,800	355,101	8.99%
2005	297,017	28,800	325,817	-8.29%
2004	326,475	28,800	355,275	-0.40%
2003	327,915	28,800	356,715	-8.52%
2002	361,129	28,800	389,929	1.28%
2001	356,209	28,800	385,009	-0.72%
2000	359,018	28,800	387,818	-0.09%
1999	359,373	28,800	388,173	0.21%
1998	358,567	28,800	387,367	3.66%
1997	344,880	28,800	373,680	3.00%
1996	333,992	28,800	362,792	5.12%
1995	316,321	28,800	345,121	

The national monument maintains an extensive museum collection that is rotated for display as previously described. In addition to museum items, living history presentations and group tours are available throughout the year. A legacy of living history demonstrations is present at Fort Pulaski National Monument with current emphasis on maintaining Fort Pulaski resources and visitor safety.

Recreational activities at Fort Pulaski include picnicking and nature viewing as well as touring the historic site and structures. A less than one mile nature trail allows visitors to

view the subtropical vegetation and animal life of Cockspur Island in addition to viewing the lighthouse. A boat ramp and fishing pier is located on McQueens Island just off U.S. Highway 80 at Lazaretto Creek.

SOCIOECONOMIC ENVIRONMENT

Fort Pulaski National Monument is located 17 miles east of the central business district of Savannah, Georgia, on Cockspur Island in the Savannah River near the Atlantic Coast. Chatham County contains all of Fort Pulaski National Monument, the city of Savannah, and several smaller municipalities including Tybee Island to the east and Thunderbolt to the west. The Metropolitan Statistical Area of Savannah stretches south into Bryan and Effingham counties and had an estimated population of 334,353 in 2007. Shipping, manufacturing, military and tourism are the Savannah Metropolitan area's four major industries.

Two busy ports, both owned and operated by Georgia Ports Authority, operate on the Savannah River in and near Savannah, Georgia. Ocean Terminal is located immediately northwest of downtown Savannah and handles a variety of cargo from containers to bulk agricultural products with ten berths. Garden City Terminal is located approximately 3 miles northwest of Savannah in Garden City, Georgia along the Savannah River. Garden City Terminal is the fourth largest port in the United States with 50 deep water berths. Containers are the primary cargo moving in and out of Garden City Terminal. Trucking and rail services are linked to both ports and add significantly to the economic impact of the port facilities in the Savannah Metropolitan Statistical Area.

The city of Tybee Island is located 7 miles from Fort Pulaski National Monument and is primarily a tourism based city. Vacation rentals, condominiums, boating, fishing, and other beach activities are dominant. Tybee Island is a seasonal destination and tourism is greatest in the summer months although year round residents are common. Tybee Island is

1 part of the Savannah Metropolitan Statistical
2 Area.

3 Fort Stewart and Hunter Army Airfield are
4 both located within the Savannah, Georgia
5 Metropolitan Statistical Area and contribute
6 significantly to the local economy. According
7 the Savannah Area Chamber of Commerce
8 the combined military facilities employ
9 42,000 people and generate an annual direct
10 federal expenditure of \$1.4 billion dollars
11 (Savannah Area Chamber of Commerce,
12 2009).

13 Manufacturing and related manufacturing
14 support industries contribute to the
15 Savannah Metropolitan Statistical Area
16 economy. In 2005, approximately 14,498
17 workers were employed in manufacturing
18 directly and another 21,352 jobs were created
19 through manufacturing support.
20 Manufacturing workers earned an average
21 salary of \$56,300 per year. Manufacturing
22 and support industries accounted for 17% of
23 Savannah Metropolitan Statistical Area
24 employment and contributed 22% of regional
25 labor income (Toma and Bice, 2006).

26 Tourism as an industry in Chatham County,
27 Georgia and the Savannah metropolitan area
28 is expressed through maritime attractions
29 including beaches, wildlife refuges, historic
30 sites, boating, and fishing. The city of
31 Savannah attracts over 6 million tourists a
32 year to its historic downtown waterfront on
33 the Savannah River. The historic squares of
34 Savannah and other cultural attractions are
35 supplemented by a variety of shopping areas,
36 art galleries, restaurants, and festivals.
37 Lodging, dining, entertainment, and visitor-
38 related transportation account for over \$2

39 billion in visitors' spending per year and
40 employ over 17,000 (Savannah Area Chamber
41 of Commerce, 2009).

42 Population and land value trends for
43 Savannah and Chatham County are listed in
44 table 12. The city of Savannah population
45 decreased from 2000 to 2008, although
46 Chatham County's population increased by
47 more than 8% during the same time period.
48 Other statistics describe Chatham County as
49 a less racially diverse, younger, and
50 considerably wealthier area compared to its
51 county seat and regional hub of Savannah.
52 Persons below the poverty level in Savannah
53 accounted for 22.7% of the population in
54 2007 compared to 16.3% in Chatham County.

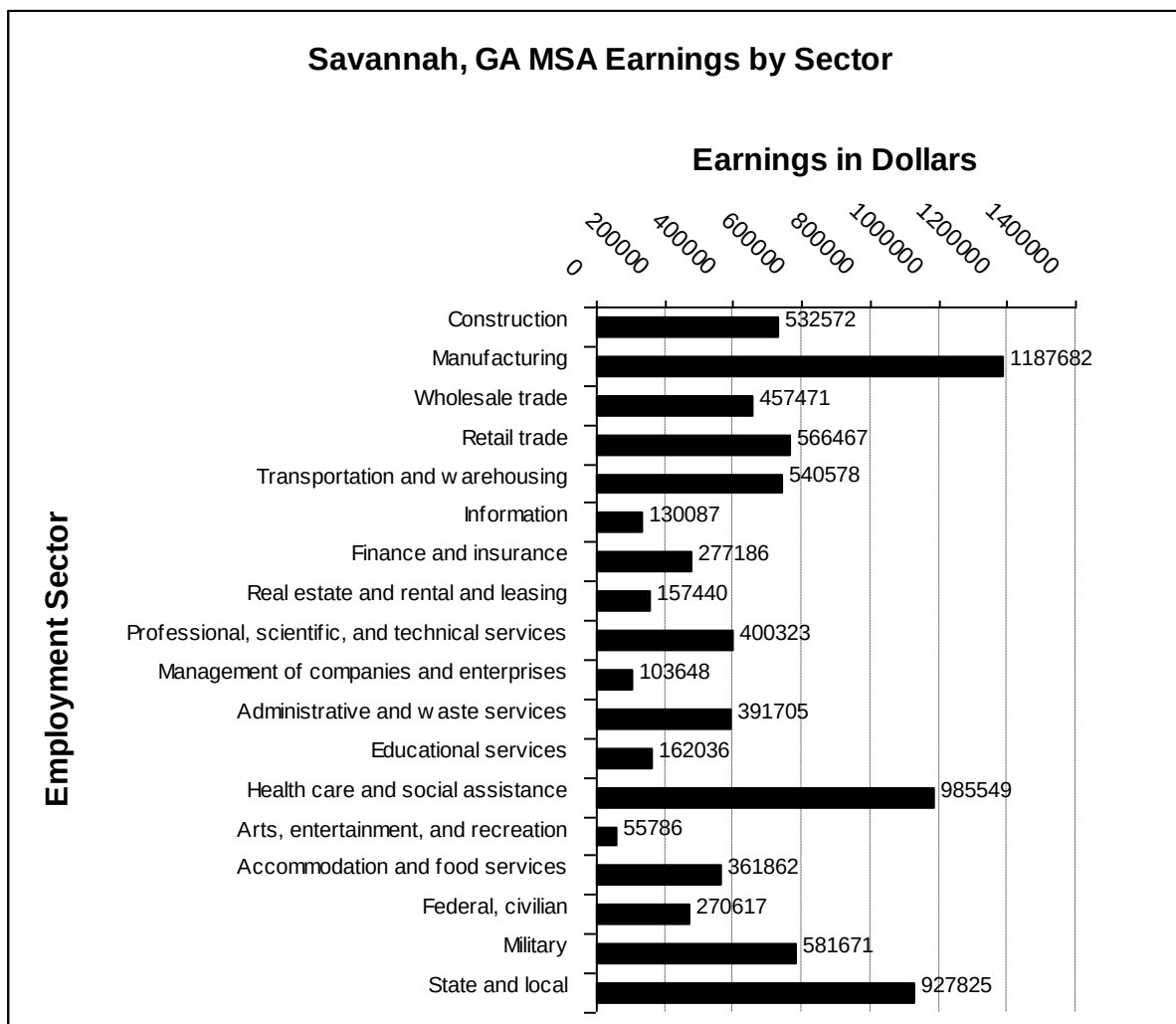
55 Employment characteristics for the
56 Savannah, Georgia Metropolitan Statistical
57 Area include the highest rates of employment
58 respectively in the retail trade,
59 accommodations and food Services, health
60 care and social assistance, and state and local
61 government sectors. Each of these sectors
62 exceeded 18,000 jobs per sector (see figure 5).
63 However, by examining employment and
64 earnings together, the retail trade and
65 accommodations and food services sectors
66 account for approximately half the earnings
67 compared to the sectors of manufacturing
68 and health care and social assistance which
69 employ fewer people (see table 12).

70 Comparing earnings and employment places
71 the health care and social services sector as
72 the most important employment sector in
73 terms of number jobs and total earnings in
74 the Savannah Metropolitan Statistical Area in
75 which Fort Pulaski National Monument is
76 located.

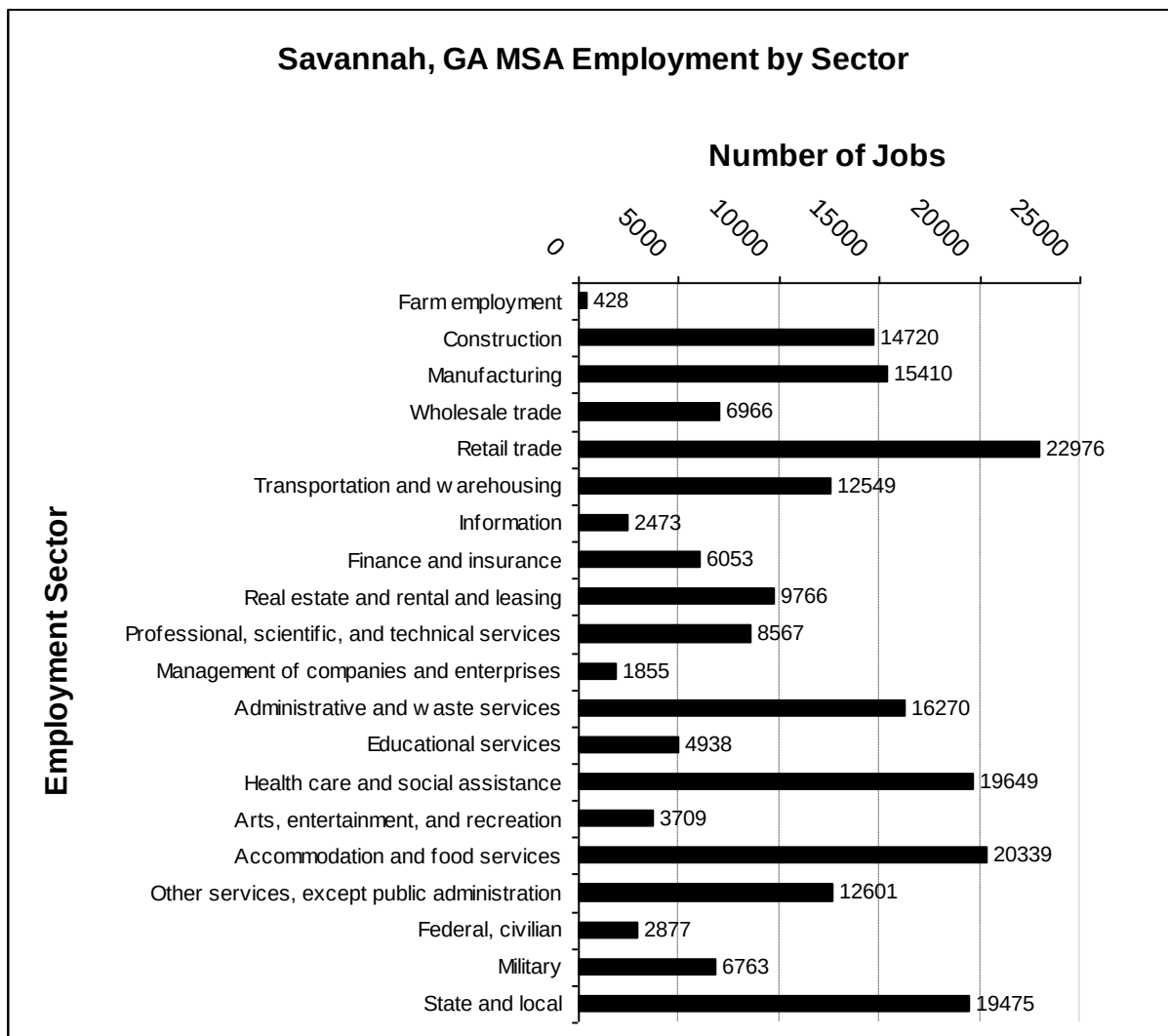
TABLE 12. COMPARATIVE SOCIOECONOMIC STATISTICS FOR CHATHAM COUNTY, GEORGIA

Location	City of Savannah	Chatham County	Georgia	United States
Population estimate 2008	130,331	251,120	9,685,744	304,059,724
Population % change 2000-2008	-0.9%	8.1%	18.3%	8.0%
White persons not Hispanic % 2007	38.1%	53.2%	58.5%	66.0%
Persons under 18 years old % 2007	25.6%	25.5%	26.5%	24.5%
Persons 65 years old and over % 2007	13.2%	12.4%	9.9%	12.6%
Housing Units 2007	60,162	113,250	3,961,474	127,901,934
Home Ownership Rate 2000	49.2%	60.4%	67.5%	66.2%
Median value of owner-occupied housing units 2000	\$125,200	\$95,000	\$111,200	\$119,600
Median household income 2007	\$32,616	\$45,124	\$49,080	\$50,740
Persons below poverty % 2007	22.7%	16.3%	14.3%	13.0%
Persons per square mile 2000	1,759.5	529.8	141.4	79.6

Data courtesy of U.S. Census Bureau, 2009

FIGURE 5. EARNINGS BY INDUSTRY IN THE SAVANNAH, GEORGIA METROPOLITAN STATISTICAL AREA 2007

Data courtesy U.S. Bureau of Economic Analysis, 2009

FIGURE 6. SAVANNAH, GEORGIA METROPOLITAN STATISTICAL AREA EMPLOYMENT BY INDUSTRY IN 2007

Data courtesy U.S. Bureau of Economic Analysis, 2009

TRANSPORTATION

Fort Pulaski National Monument is accessible via U. S. Highway 80 approximately 15 miles east of Savannah, and about 4 miles west of Tybee Island, at the mouth of the Savannah River. The monument is about 265 miles southeast of Atlanta (via Interstate Highways 75 and 16 and U.S. Highway 80), 156 miles north of Jacksonville, Florida (via Interstate Highways 95 and 16 and U.S. Highway 80), and 125 miles south of Charleston, South Carolina (via U.S Highway 17, Interstate Highways 95 and 16, and U. S. Highway 80).

The area is also served by the Savannah/Hilton Head International Airport, located about 14 miles northwest of central Savannah and 30 miles from Fort Pulaski. The airport is located strategically near the junction of Interstates 95 and 16, and the Savannah ports while being only minutes from the historic downtown Savannah tourism destinations.

Interstate 95 bisects the region from the South Carolina border in the north to the Florida border in the south. This interstate is the primary north/south corridor between New York City, New York and Miami, Florida.

1 Interstate 16 is the primary east/west
 2 connector for central Georgia, connecting
 3 Savannah in the east with Macon and access
 4 to Interstate 75 (access to Atlanta) in the
 5 west. Interstate 16 crosses Interstate 95 in
 6 Pooler, near the Savannah port facilities,
 7 making the northern part of the region a
 8 prime location for industrial development
 9 dependent upon access to multimodal
 10 transportation and infrastructure.

Port of Savannah

11 The Port of Savannah specializes in the
 12 handling of container, refrigerated,
 13 breakbulk, and roll-on, roll-off cargoes. The
 14 port includes the Garden City Terminal,
 15 Savannah's dedicated container terminal, and
 16 the 208-acre Ocean Terminal, a combination
 17 breakbulk and roll-on, roll-off facility
 18 handling forest and solid wood products,
 19 steel, automotive and heavy equipment,
 20 project shipments and heavy-lift cargoes.

22 The North Channel Savannah River and the
 23 Savannah Harbor serve the Port in Savannah.
 24 This shipping corridor requires extensive
 25 dredging in order to maintain the depths
 26 required to accommodate ocean going
 27 vessels. The millions of cubic yards of
 28 material removed in these operations are
 29 placed in "spoil areas" approved by the U.S.
 30 Army Corps of Engineers. Conditions for
 31 carrying out dredge operations and for
 32 disposing of dredge material are permitted
 33 and monitored by the regulatory branch of
 34 the Corps. Over the years, dredging and
 35 depositing discarded dredge material have
 36 raised concerns because of various
 37 environmental consequences. Until 1996,
 38 when Public Law 104-333 (110 Stat. 4188)
 39 was enacted, dredge spoil was deposited on
 40 Cockspur Island and Long Island. Other
 41 concerns include the effects of significantly
 42 deepened channels on conditions in adjacent
 43 shore and water-bottom areas, rates of
 44 erosion, and changes in the hydraulics of
 45 water movement created by dredging
 46 (Coastal Georgia Regional Development
 47 Center, 2007).

MONUMENT OPERATIONS AND MANAGEMENT

48 Fort Pulaski National Monument is accessed
 49 from the southwest by crossing onto
 50 Cockspur Island from the South Channel
 51 Bridge via U.S. Highway 80 on McQueens
 52 Island. An entrance station greets visitors
 53 upon making the turn towards the South
 54 Channel Bridge from the highway. Upon
 55 crossing onto Cockspur Island, the road
 56 passes over the dike work and enters elevated
 57 land built up to support Fort Pulaski. The
 58 monument road proceeds to the Visitor
 59 Center directly west of Fort Pulaski's
 60 demilune. A parking lot has been built on the
 61 north side of the Visitor Center, northwest of
 62 the fort and visible from Fort Pulaski's gun
 63 deck. A spur road leads to a picnic area and
 64 the Savannah Bar Pilots structures to the
 65 northwest of Fort Pulaski.

66 Fort Pulaski National Monument maintained
 67 14 full-time equivalent staff positions in 2006
 68 and up to 21 staff including temporary and
 69 part time in 2009. Full-time staff numbers
 70 have decreased from 19 to 14 since 1996. The
 71 total operating budget as of 2006 was
 72 \$991,000. Since 1996, Fort Pulaski's total
 73 budget has ranged from a low in 1996 of
 74 \$626,000 to a high in 2005 of \$1,072, 000. The
 75 mean budget from 1996 to 2006 was \$844,364
 76 and the median budget value was \$883,000.

LAND USE

77 Fort Pulaski National Monument's Cockspur
 78 Island location uses the Savannah River as a
 79 legal boundary. The whole of Cockspur
 80 Island is federally owned and used by the
 81 National Park Service with special use
 82 permits for the Savannah Bar Pilots and the
 83 U.S. Coast Guard. A western portion of
 84 Cockspur Island was formerly used by the
 85 U.S. Navy and is off limits to visitors, having
 86 been a munitions site. The U.S. Coast Guard
 87 currently occupies this site.

88 Across the South Channel Savannah River,
 89 near Goat Point, on the east shore of
 90 Lazaretto Creek, was the location of the

1 federal batteries that bombarded Fort Pulaski
 2 during the Civil War. This site is being
 3 developed as a luxury waterfront community
 4 known as Battery Row. The developer
 5 granted the monument an easement for the
 6 permanent creation of an interpretive site on
 7 the island's northern shore that allows
 8 visitors to view the damage inflicted on the
 9 southeastern angle of the fort by the rifled
 10 cannons used during the siege and reduction
 11 of Fort Pulaski on April 10-11, 1862. This
 12 viewpoint is very near the actual sites used by
 13 federal batteries to carry out the
 14 bombardment. The aerial photograph below
 15 shows the location of the Battery Park
 16 interpretive site and the line of sight to the
 17 fort.

19 Current land uses within the Cockspur Island
 20 Historic District include recreation,
 21 interpretation, administration, law
 22 enforcement, and burial. Across the South
 23 Channel Bridge on McQueens Island,
 24 Chatham County maintains a multiuse path
 25 along a former railroad corridor. Other land
 26 uses on McQueens Island include U.S.
 27 Highway 80 and its right-of-way. U.S.
 28 Highway 80 connects Savannah to Tybee
 29 Island and it is along this corridor that
 30 development is most likely to proceed. The
 31 surrounding landscape is predominantly salt
 32 marsh and flood plain, but residential
 33 development is pressing onto Goat Point
 34 along U.S. Highway 80, the location of the
 35 Civil War era federal batteries that
 36 bombarded Fort Pulaski. Damage to
 37 documented but unidentified archeological
 38 sites are a concern at Goat Point.



**BATTERY PARK SITE ON TYBEE ISLAND, SHOWING LINE OF FIRE FROM FEDERAL BATTERIES
 TO FORT'S SOUTHEASTERN ANGLE**

