CENTER for BIOLOGICAL DIVERSITY Because life is good.

Sent via email

August 15, 2017

Bradford County Board of Commissioners
P.O. Drawer B
Starke, FL 32091
bocc@bradfordcountyfl.gov

Re: HPS II Enterprises Bradford Mine, Master Mining Plan

Dear Honorable Commissioners,

On behalf of the Center for Biological Diversity, I respectfully submit the following comments to the Bradford County Board of Commissioners (Board) regarding proposed Bradford Mine Master Mine Plan (Project). We submit these comments on behalf of our staff and members, including our thousands of members and supporters who live and recreate in Bradford County, and nearby counties. We have reviewed the Bradford County Comprehensive Plan (CCP), Bradford County Land Development Regulations (LDR), and the HPS II Enterprises Master Mining Plan dated April 21, 2016 (MMP) and conclude that the Board should deny the Bradford Mine. The applicant has not shown that the Project will not irreparably harm the public's health, safety, and welfare. The Project will have significant environmental impacts on wetlands, as well as endangered species and their habitats. Finally, the Project is not in conformance with the CCP or LDR. For these reasons, we respectfully request the Board not approve the Bradford Mine.

I. Background

HPS II Enterprises (HPS II) has proposed a massive 10,775 acre phosphate mining operation spanning large portions of both Union and Bradford counties. The Bradford County portion comprises 5,352 acres of the total project area, of which HPS II has determined 2,187 acres are wetlands.[1] After Union County enacted a mining moratorium on April 18, 2016, HPS II submitted its Master Mine Plan dated April 21, 2016 for the Bradford portion of the project.

Phosphate mining in Florida generally involves open pit strip mining where a company strips approximately 10 meters of so-called overburden[2] and removes the matrix below which contains

[1] Master Mine Plan at 16 (hereinafter, MMP). A formal wetlands determination decision by the Florida Department of Environmental Protection is pending. Water – Environmental Resource Permit Formal Determination, Application No. 343024-004.

[2] Overburden: Layers of soil or rock overlaying a deposit of useful materials or ores.

Alaska . Arizona . California . Florida . Minnesota . Nevada . New Mexico . New York . Oregon . Vermont . Washington, DC

Jaclyn Lopez, Staff Attorney Florida Director • P.O. Box 2155 • St. Petersburg, FL 33731
Phone: 727-490-9190 • jlopez@biologicaldiversity.org

the phosphoric ore.[3] Beneficiation[4] of the matrix separates the phosphoric ore from the sand and the clay. The sand tailings are set aside for use in recontouring the land once mining is completed. The clay is returned to the empty pits and stored in elevated clay settling ponds (the clay is now swollen with water and chemicals used in beneficiation) where they wait to drain. These clay settling areas occupy about 40 percent of post-mining lands.[5]

The phosphoric ore is treated with sulfuric acid to produce phosphoric acid (which is used in fertilizer).[6] This process creates phosphogypsum, a radioactive byproduct for which the Environmental Protection Agency requires that it be stored in stacks indefinitely because of its radioactivity. It is radioactive due to the presence of naturally occurring, but artificially concentrated and released, uranium, radium-226, and thorium. It may also contain high levels of cadmium.

In 2003, Judge Johnston, in adjudicating a case regarding phosphate mining in neighboring Charlotte County found that "…phosphate mining in this area is accomplished through utter destruction of the local natural environment from ground surface down to a depth of approximately 50 feet."[7] Unfortunately, that is true wherever phosphate is mined in Florida. The Peace and Myakka river basins have been substantially altered by open pit mining for phosphate, changes in land use for mining, and groundwater use for phosphate mining.[8] It is beyond dispute that phosphate mining has forever altered the natural landscape, including streams and drainage. For example, in some areas of the upper Peace River basin, the surficial aquifer does not even exist because phosphate mining has removed the surface sediments[9]. In addition to scarring the landscape, groundwater pumping for phosphate mining has been implicated in the creation of sinkholes in the upper Peace River[10], and storage of the acidic, radioactive waste generated by the process has also caused sinkholes.[11]

Despite the ruin the industry has imparted on the face of Florida the applicant has requested a permit to engage in phosphate mining in the Santa Fe River basin with an unproven and unsupportable promise to restore the land's function once it is done mining. The requests that accompany this application include:

1. rezone 5,352.62 acres from existing agriculture to mining;

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[3] Matrix: a mixture of phosphate pebbles, sand and clay.
[4] Beneficiation: A mechanical process called washing is used to separate the larger phosphate pebbles from the ore. A process called flotation is used to recover the finer particles of phosphate from sand.
[5] Brown, M.T. 2005. Landscape restoration following phosphate mining: 30 years of co-evolution of science, industry and regulation. Ecological Engineering 24 (2005) 309-329.
[6] https://www.epa.gov/radiation/subpart-r-national-emission-standards-radon-emissions-phosphogypsum-stacks.
[7] *Charlotte Co. v. IMC-Phosphates Company*, Case No. 02-4134 (Aug. 1, 2003), Recommended Order.
[8] Metz, P.A. and B.R. Lewelling. 2009. Hydrologic Conditions that Influence Streamflow Losses in a Karst Region of the Upper Peace River, Polk County, Florida: U.S. Geological Survey Scientific Investigations Report 2009-5140, 82 p. at 1, 2. Additionally, the surficial aquifer is a vital component of the groundwater system; Rain recharges the surficial aquifer which then percolates downward to the water table.
[9] Metz, 2009.
[10] Metz, 2009.
[11] Bernard, P. 2016. Massive sinkhole drains contaminated water into Floridan aquifer. http://wfla.com/2016/09/15/contaminated-water-flows-into-floridan-aquifer-after-sinkhole-opens-at-mosaic-facility/.

2. special approval to mine and disturb 2,187.55 acres of wetlands in the Suwannee River District's Upper Santa Fe Watershed Basin;
3. impact three aquifer systems through degradation of water quality and water use for the beneficiation process; and
4. impact the 100-year floodplain of the wetlands of the Santa Fe River.

The Santa Fe River Basin is home to a wide variety of wildlife, including the federally endangered oval pigtoe and red-cockaded woodpecker, and the federally threatened flatwoods salamander and eastern indigo snake.[12] The gopher tortoise and striped newt, candidate species for Endangered Species Act listing, are also present, as well as the gopher frog and alligator snapping turtle, which the U.S. Fish and Wildlife Service (Service) is considering for listing.[13] All eight of these species may be found within or near the project area and may suffer harm if the Board permits the proposed phosphate mine.[14] For example, the entire length of the New River running through the middle of the proposed project is designated critical habitat for the oval pigtoe.[15] The downstream portions of the New River, as well as the confluence with the Santa Fe River and portions of the Santa Fe River immediately downstream from the project area are also designated oval pigtoe critical habitat.[16]

The applicant has failed to present substantial and competent evidence to overcome the presumption that mining activities will negatively impact Bradford County resources. Given the decades of damage and the lack of credible science proving that phosphate mining and beneficiation will not permanently alter the environment for the worse, the Board must protect the public's health, safety, and welfare and deny the Bradford Mine.

II. The Board must deny the Bradford Mine as it is inconsistent with the Bradford County Comprehensive Plan and Land Development Regulations

Florida's Community Planning Act states "that no public or private development shall be permitted except in conformity with comprehensive plans, or elements or portions thereof."[17] The introduction of the CCP states that a special permit will be issued if "controlled as to number, area or location, would promote the public health, safety, welfare, morals, order, comfort, convenience, appearance, prosperity, or general welfare" of the community. The proposed mine is to be located in an area that is not zoned for mining, in direct violation of Comprehensive Plan Policy I-3.3. Further, the MMP does not comply with the requirements set forth by the CCP regarding submission under Policy I-3.3. This is evident in the lack of an adequate reclamation plan and complete disregard of the requirement of a delineation of the areas to be restored. Before granting the permit, the County must make specific findings that the permit use will not adversely affect public interest, one of these findings in consideration of

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[12] U.S. Fish & Wildlife Service Environmental Conservation Online System, http://ecos.fws.gov/ecp/.
[13] *Id.*
[14] Florida Fish and Wildlife Conservation Commission, Florida Fish and Wildlife Research Institute, GIS Data and Mapping Downloads, http://geodata.myfwc.com/.
[15] 72 Fed Reg. 220 (2007).
[16] *Id.*
[17] Fla. Stat. § 163.3161 (6).

general compatibility with natural resources. Mining activities are prohibited if involving the filling of land or water areas without first obtaining a special permit. The MMP violates the overall goals of conservation and protection of the Suwannee River System as seen in CCP Goal V and S, respectively. The proposed mine will have adverse effects on wetlands, endangered species, and water quality.

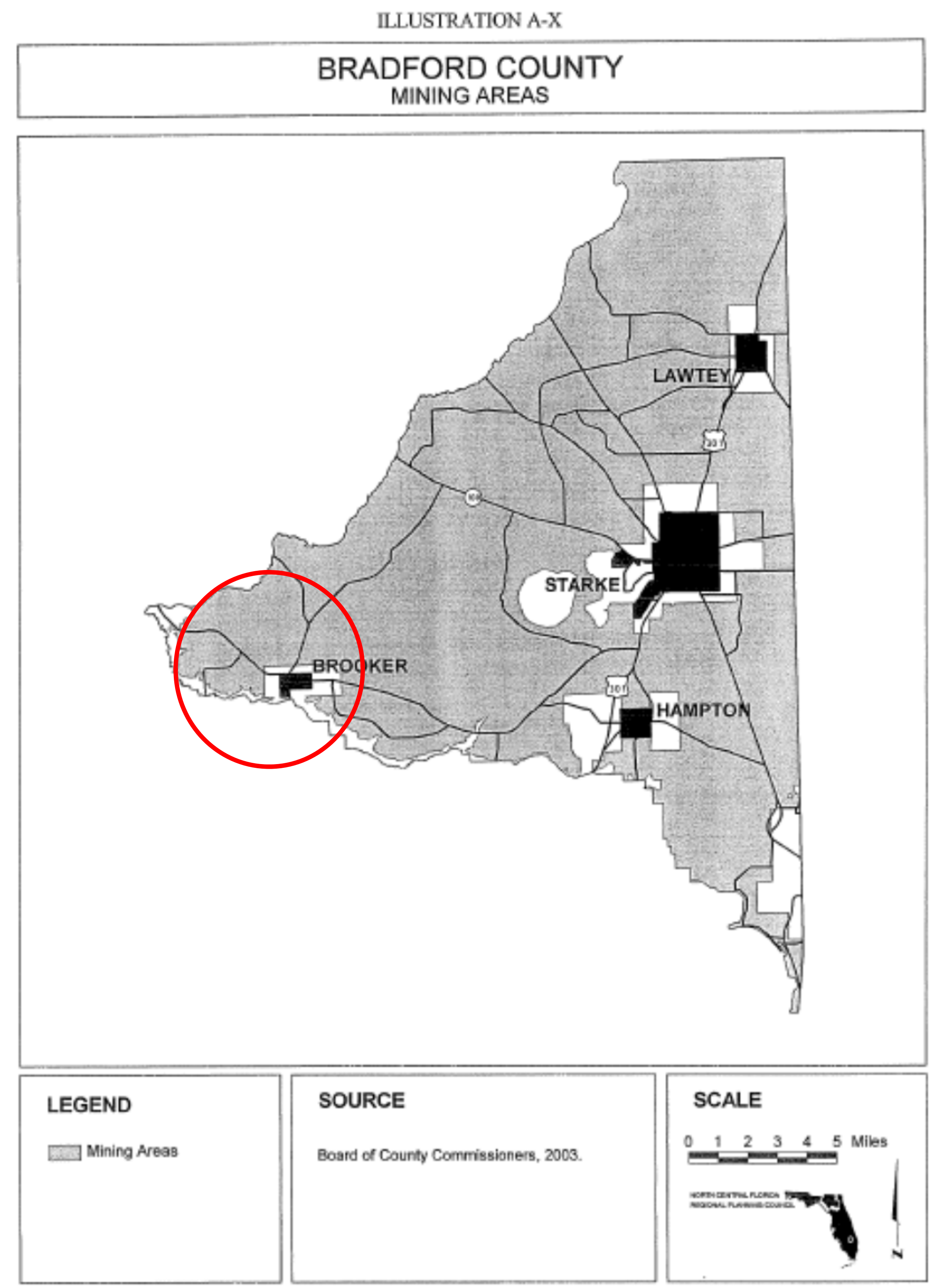
A. The Project is inconsistent with Comprehensive Plan Policy I.3.3 regarding the location of mining operations

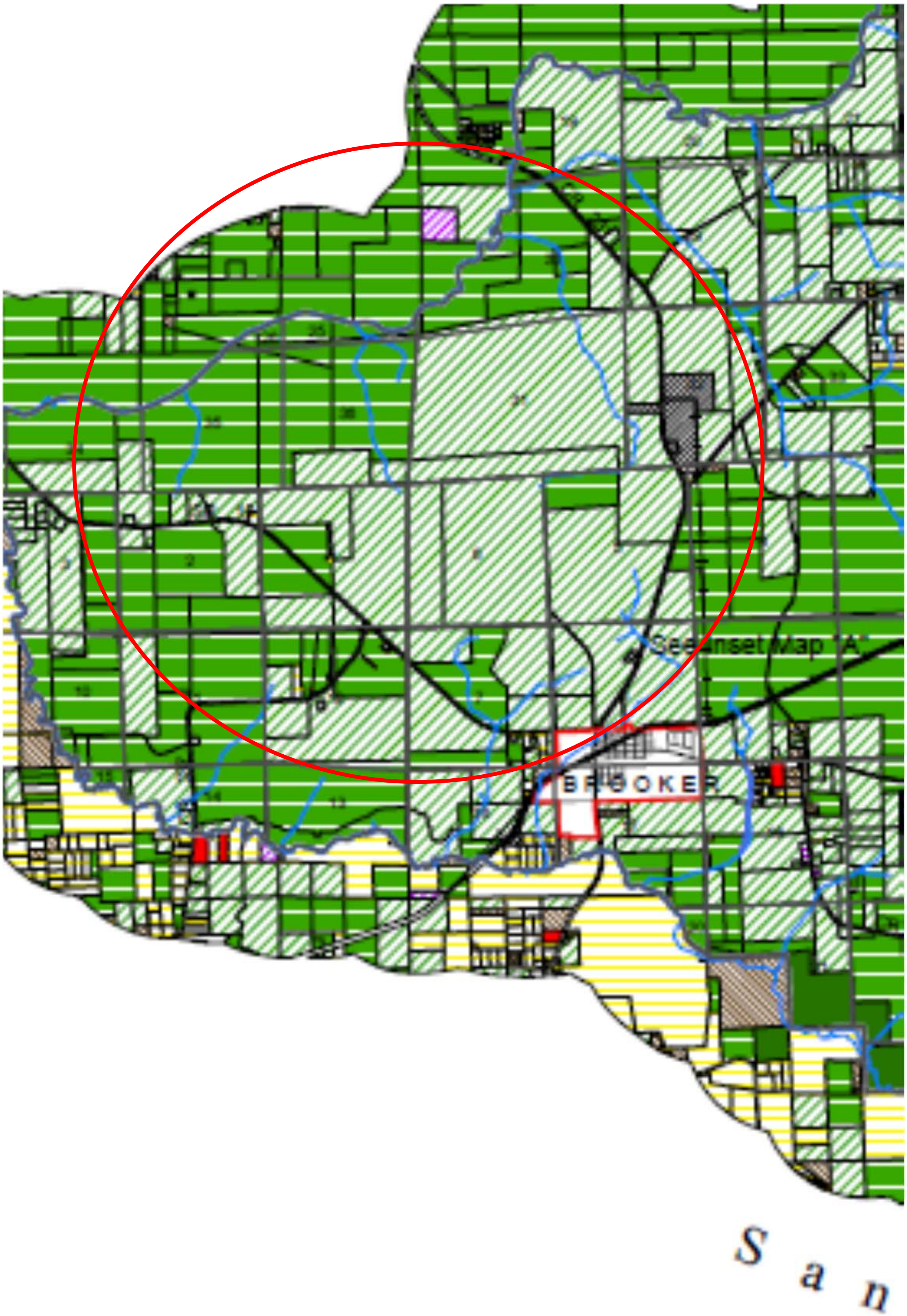
Policy I.3.3 limits mining to Appendix A of the Future Land Use Map Series of the Comprehensive Plan entitled Mining Area, and requires a Comprehensive Plan amendment to authorize mining outside that area.[18]

Due to the poor quality of the County map, it is unclear, but appears that the Project may at least partially be outside the designated mining areas. *See* Figure 1. If the Project does fall outside the designated area, a Comprehensive Plan amendment will be necessary to authorize the Bradford Mine.

[18] Bradford County Comprehensive Plan (2016) p. I-20. (hereinafter CCP).

Figure 1: Mining Areas Map of the Bradford County Future Land Use Series, Bradford County Comprehensive Plan, Appendix A

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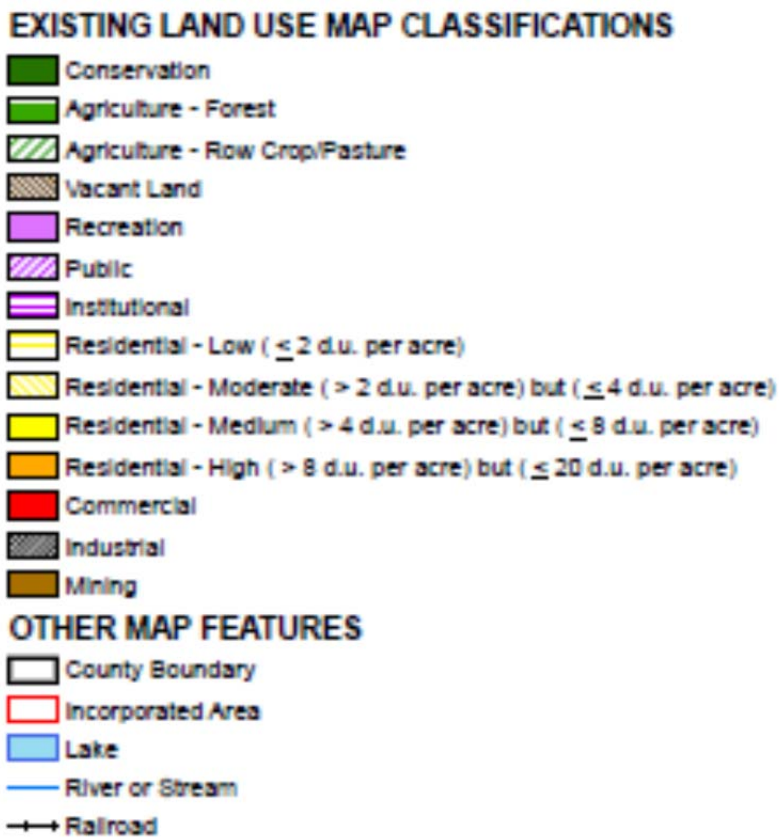
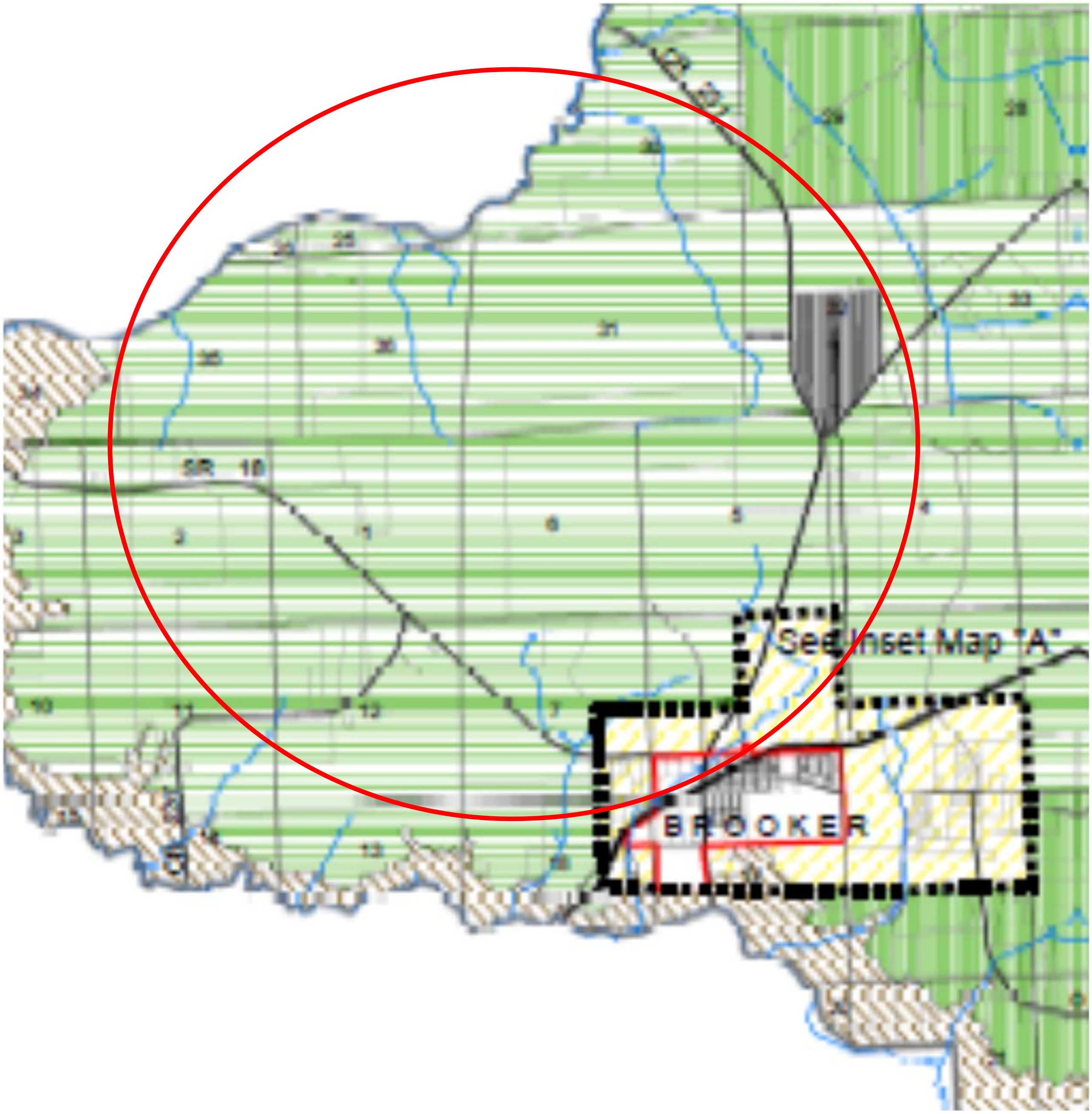


Figure 22: Bradford County Existing Land Use Plan Map 2010, available at http://ncfrpc.org/MapsAndPlans.html

Furthermore, the Existing Land Use Planning Map, as well as the Future Land Use Planning Map 2021, show that at least part of the Bradford Mine is and will continue to be zoned agricultural, with the Future Land Use Planning Map 2021 making no mining land use designations at all. *See* Figures 2 and 3, respectively.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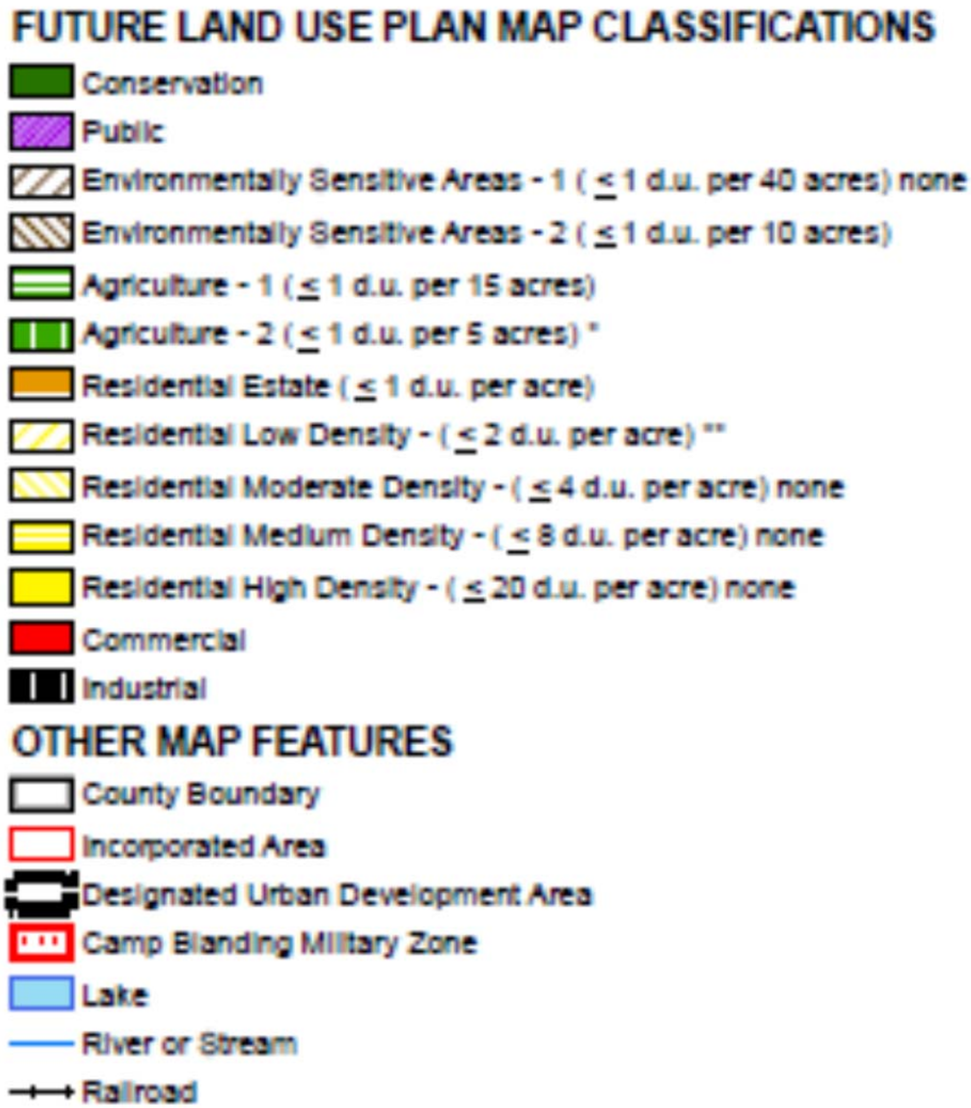

Figure 33: Bradford County Future Land Use Plan Map 2-1212, available at http://ncfrpc.org/MapsAndPlans.html

Policy I.3.3.2(e) prohibits any mining, regardless of its location, if it results in:

> an adverse effect on environmentally sensitive lands, such as surface water and groundwater resources, wetlands, floodplains, endangered, threatened or species of special concern wildlife habitat, as designated by Florida Fish and Wildlife Conservation Commission within the publication entitled Critical Wildlife Conservation Areas, and rare or unique vegetative communities which cannot be restored based upon competent and substantial scientific evidence presented to the County at the time the Master Mining Plan is reviewed by the Board of County

> Commissioners. [Such lands], which can be restored shall be restored to the same type, nature and function ecosystem.[19]

Here, it is evident that the Bradford Mine would adversely affect environmentally sensitive lands and that restoration will not be possible. For these reasons alone, the Board should deny the Bradford Mine.

i. The Bradford MMP does not comply with the CCP's requirements regarding MMP submissions.

A requirement of the CCP in submitting a MMP is a description of the reclamation process that will be conducted after mining, including the delineation of areas to be restored.[20] Policy I-3.3 states that:

> mining shall be prohibited which will result in an adverse effect on environmentally sensitive lands, such as surface water and groundwater resources, wetlands, floodplains, endangered, threatened or species of special concern as designated by the Florida Fish and Wildlife Conservation Commission…and rare or unique vegetative communities which cannot be restored based upon competent and substantial scientific evidence presented to the County at the time the Master Mining Plan is reviewed by the Board of County Commissioners. Environmentally Sensitive Lands, such as wetlands, floodplains…which can be restored, shall be restored to the same type, nature and function ecosystem.[21]

It is vital to understand that *the* leading cause of extinction is habitat loss[22], and that native habitats in Florida are rapidly disappearing[23]. This has resulted in the extirpation or extinction of 13 vertebrates over the last 150 years.[24] Habitat loss and fragmentation, coupled with human encroachment, have resulted in populations of species that are increasingly isolated from each other.[25] Large mammalian carnivores are particularly vulnerable to habitat loss and fragmentation because of their relatively low numbers, large home ranges, and interactions with humans.[26] Their low fecundity and long generation times result in reduced levels of genetic

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[19] CCP p. I-21/22.
[20] CCP p. I-20.
[21] CCP p. 1-21/2.
[22] Harris, L. 1984. *The fragmented forest: Island biogeography theory and the preservation of biotic diversity.* Chicago: The University of Chicago Press., Meffe, G.K. 1997. *Principles of conservation biology.* Sunderland, MA: Sinauer Associates, Inc.
[23] Kautz, R.S. and J.A. Cox. 2001. Strategic Habitats for Biodiversity Conservation in Florida. *Conservation Biology*, 15(1): 55-77, pp. 56.
[24] Kautz, 2001 at 56.
[25] Dobey, S., D.V. Masters, B.K. Scheick, J.D. Clark, M.R. Pelton, and M. Sunquist. 2002. Population ecology of black bears in the Okefenokee-Osceola ecosystem. Final report to Study Cooperators, pp. 68.
[26] Noss, R. 1996. Conservation biology and carnivore conservation in Rocky Mountains. *Conserv Biol*, 10(4): 949-963., Woodroffe, R. and J.R. Ginsberg. 1998. Edge effects and the extinction of populations inside protected areas. *Science*, 280, 2126-2128.

variation.[27] Habitat loss and fragmentation can lead to increased mortality[28]; reduced abundance[29]; disruption of the social structure of populations[30]; reduced population viability[31]; and isolated populations with reduced population sizes and decreased genetic variation.[32] Loss of genetic variation may reduce the ability of individuals to adapt to a changing environment; cause inbreeding depression;[33] reduce survival and reproduction[34]; and increase the probability of extinction.[35]

The applicant must provide with sufficient specificity what effect the permanent loss of the original habitat will have, or the effect the modified (so-called "reclaimed") land will have after it is finally "reclaimed" many years after it is destroyed.

The CCP defines restoration to be "recontouring and re-vegetation of lands, which will return the type, nature, and function of the ecosystem to the condition in existence immediately prior to mining operations."[36] It defines revegetation in reclaimed mining areas as "a cover of vegetation consistent with land from created and future land uses."[37] The MMP states that the land will be "reclaimed" to pre-mining land use designation of agriculture, citing the County and State rules as well as the LDR.[38] However, reclamation and restoration are different standards, and

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[27] Roelke, M.E., J.S. Martenson, and S.J. O'Brien. 1993. The consequences of demographic reduction and genetic depletion in the endangered Florida panther. *Curr Biol*, 3(6), 340-350., Lowe, W.H. 2012. Climate change is linked to long-term decline in a stream salamander. Biological Conservation 145:48-53.

[28] Jules, E.S. 1998. Habitat fragmentation and demographic change for a common plant trillium in old-growth forest. *Ecology*, 79(5): 1645-1656.

[29] Flather, C.H and M. Bevers. 2002. Patchy reaction-diffusion and population abundance: the relative importance of habitat amount and arrangement. *Am Nat*, 159(1): pp. 40-56.

[30] Ims, R.A. and H.P. Andeassen. 1999. Effects of experimental habitat fragmentation and connectivity on root vole demography. *J. Anim Ecol*, 68(5): pp. 839-852., Cale, P. 2003. The influence of social beavior, dispersal and landscape fragmentation on population structure in a sedentary bird. *Biol Conserv*, 109: 237-248.

[31] Harrison, S. and E. Bruna. 1999. Habitat fragmentation and large scale conservation: what do we know for sure? *Ecography*, 22(3): 225-232.; Srikwan, S. and D.S. Woodruff. 2000. Genetic erosion in isolated small-mammal populations following rainforest fragmentation. In A. a. Young, *Genetics, Demography, and Viability of Fragmented Populations*. New York: Cambridge University Press. pp. 149-172.; Cale (2003); Lindenmayer, D. and J. Fisher. 2006. *Habitat Fragmentation and Landscape Change: An Ecological and Conservation Synthesis.* Washington, D.C. Island Press.

[32] Frankham, R. 1996. Relationship of genetic variation to population size in wildlife. *Conser Biol*, 10: 1500-1508.

[33] Ebert, D. C. 2002. A selective advantage to immigrant genes in a Daphnia metapopulation. *Science, 295*, 485-488.

[34] Frankham (1996).

[35] Saacheri, I., M. Kuussaari, M. Kankare, P. Vikman, W. Fortelliua, and I. Hanski. 1998. Inbreeding and extinction in a butterfly metapopulation. *Nature*, 392: 491-494.; Westemeier, R.L., J.D. Brawn, S.A. Simpson, T.L. Esker, R.W. Jansen, J.W. Walk, E.L. Kershner, J.L. Bouzat, and K.N. Paige. 1998. Tracking the long-term decline and recovery of an isolated population. *Science*, 282, 1695-1698.; Kramer-Schadt, S., E. Revilla, T. Wiegand, and U. Breitenmoser. 2004. Fragmented landscapes, road mortality and patch connectivity: modeling influences on the dispersal of Eurasian lynx. *Journal of Applied Ecology*, 41: 711-723.; Letcher, B.H., K.H. Nislow, J.A. Coombs, M.J. O'Donnell, and T.L. Dubreuil. 2007. Population response to habitat fragmentation in a stream-dwelling brook trout population. *PLoS ONE* 2(11): e1139.; Ruiz-Gutierrez, V., T.A. Gavin, and A.A. Dhondt. 2008. Habitat fragmentation lowers survival of a tropical forest bird. *Ecological Application*, 18(4): 838-846.; Sherwin, W.B. and C. Moritz. 2000. Managing and monitoring genetic erosion. In A. a. Young, *Genetics, demography, and viability of fragmented populations*. New York: Cambridge University Press. pp. 9-34

[36] CCP p. I-22.

[37] CCP p. I-22.

[38] MMP p. 34.

reclamation is not the only standard of the County per the CCP.[39] Further, the LDR uses the language of restoration as well as reclamation, which is not addressed anywhere in the MMP.[40] The LDR follows closely to the language of the CCP defining restoration in mining operations as "the recontouring and re-vegetation of lands, which will return the type, nature, and function of the ecosystem to the condition in existence immediately prior to mining operations," matching near exact wording on the definition of re-vegetation as well. Restored lands are ones that assist in the reestablishment of natural communities, habitat, species, or other ecological attributes that have been eliminated or greatly reduced by phosphate mining. Reclaimed lands are those that are disturbed by phosphate mining that are rebuilt to provide some beneficial land use. Reclamation has not been proven to provide the same ecosystem benefits as restoration. At least one author has compared the restoration of phosphate mined lands to Everglades restoration, saying "the restoration of phosphate mined lands may be a far greater challenge."[41]

It is important to note the meaning of the word "reclaimed," especially in the context of "restored." Restored lands are ones that assist in the reestablishment of natural communities, habitat, species, or other ecological attributes that have been eliminated or greatly reduced by phosphate mining. In contrast, reclaimed lands are lands disturbed by phosphate mining that are rebuilt to provide some beneficial land use. Reclamation has not been proven to provide the same ecosystem benefits as restoration.

This distinction is important for local governments considering permitting deviation from their own ordinances that prohibits mining in certain watersheds or floodplains. Competent and substantial evidence has shown that mined river basins do experience impacts to water quantity. A 1993 study comparing non-mined river basins with reclaimed river basins in west central Florida found the following[42]:

- Peak runoff rates from the reclaimed basins generally were higher than those from the unmined basins during intense, short-duration storms;
- Reclaimed basins backfilled with clay sustained no base flow to streams;
- The depth to the water table in the surficial aquifer in the three reclaimed basins was greater than the unmined basins; and
- Recharge from the surficial aquifer to the underlying aquifer was greatly reduced.

Other studies have found impacts to water quality. Florida Industrial and Phosphate Research Institute (FIPR) (2001) explains that the major reagents used in phosphate beneficiation include fatty acid (to collect the phosphate), amine (to collect the sand), fuel oil (as an extender), sodium silicate (to depress sand), soda ash or ammonia (to modify pH), and sulfuric acid (for washing away the collector on the rough concentrate). Multiple pounds of each of the above additives are used per each ton of phosphate, and since phosphate operations produce millions of tons annually, millions of pounds of the reagents are used annually. It is estimated that 30 percent of

[39] CCP p. I-21/22.
[40] LDR p. 14-6.
[41] Brown (2005).
[42] Lewelling, B.R. and R.W. Wylie. 1993. Hydrology and Water Quality of unmined and Reclaimed Basins in Phosphate-Mining Areas, West-Central Florida. U.S. Geological Survey, Water-Resources Investigations Report 93-4002.

the reagents are unaccounted for and may be released into the environment. This same study detected fuel oil in groundwater samples of surficial aquifer and intermediate aquifer wells that had been installed in active and inactive sand tailing areas (FIPR 2001).

Zhang (2012)[43] found that "[c]lay-settling areas ("CSAs") are one of the most conspicuous and development-limiting landforms remaining after phosphate mining."[44]. The clay-lined bottom of the CSA limit their recharge capacity, evaporating instead of recharging the groundwater system, which is a loss of water from the upper Peace River basin that did not occur before mining operations began.[45] This Project calls for the construction of a clay settling area.

The applicant has not submitted competent and substantial evidence that the Project will not cause a degradation of water quality and will not cause adverse impacts on water quantity within the affected watershed. Instead, the evidence before the Board suggests that the Project may cause adverse impacts and that the public would be best served by maintaining the existing land use.

The CCP and LDR both state that the County will take into consideration technological and economic considerations to restore environmentally sensitive lands, but "such considerations shall not result in environmentally sensitive lands…not being restored to the same type, nature and function ecosystem."[46] The Project should be denied because the applicants put forth no evidence to prove that they have the ability to restore the land to these standards, and the reclamation process they are using is without scientific credibility.

Further, a study done by Minkin and Ladd in 2003[47] shows that restored wetlands do not have the same benefits as ones that have been undisturbed. The study was conducted on the effectiveness of compensatory mitigation projects (creation and restoration) required for permitted impacts in New England and to determine what programmatic improvements might be necessary. Their study found that forty of the mitigation projects (67%) were determined to meet permit conditions and would be considered successful by that standard; however, only 10 (17%) were considered to be adequate functional replacements for the impacted wetlands. They attribute the failure of mitigation projects to compensate for wetlands losses in part to the inadequacy of the amount of mitigation required for permitted impacts and for inappropriate functional replacements, e.g., replacing forested wetlands with open water, emergent, and/or scrub-shrub systems. They also raised the issue of whether created or restored wetlands could replace those of natural systems and concluded that 1:1 mitigation ratios were inadequate.

They also considered the results of other studies in reaching a conclusion that greater mitigation ratios are required:

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[43] Zhang, J. and M. Ross. 2012. Hydrologic simulation of clay-settling areas in the phosphate mining district, Florida. Florida Hydrol. Process, Vol. 26:3770-3778. Doi: 10.1002/hyp.9439.
[44] Zhang (2012).
[45] Metz (2009).
[46] CCP p. I-22; LDR p. 14-6.
[47] Minkin, Paul and Ruth Ladd. 2003. Success of Crops-Required Wetland Mitigation in New England. U.S. Army Corps of Engineers. New England District.

> He [Whigham] questioned whether there is any scientific justification for the underlying assumption of mitigation, that restored and created wetlands function similarly to natural wetlands with regard to biodiversity and nutrient cycling. He also noted that concentrating on replacing lost acreage amounts fails to account for the wetland degradation and functional loss resulting from creation and restoration of mitigation wetlands of lower functional value. In this regard, *greater compensatory mitigation acreage is required to replace the lost functions of impacted systems, i.e., mitigation to impact ratio must be greater than 1:1.*

As far as wetland reclamation is concerned, the MMP is incomplete. The functional assessment is not complete on the wetlands and surface waters so the applicants cannot be sure to what extent they are responsible for restoring the land.[48] The MMP discusses protected wildlife, but states once again that further research needs to be done before discussion can happen in the permitting process.[49] In discussing water use, the MMP states that the Water Management District is to evaluate and authorize the water uses and assure that there will be no adverse impact to nearby water supplies.[50] This is yet another area of incomplete research that shows that it would be impossible for the County to approve this plan without having even a majority of the relevant information.

In the MMP, applicants state they are using standards set forth from LDR Section 14.6 paragraph 2.[51] In section 14.6 there is no paragraph 2, but it can be inferred the applicants are referring generally to the section. The applicants make a blanket statement that they intend to reclaim the land to its pre-mining use of agriculture and enable the return of agricultural operations, however they do not show how this will be done to the standard of the CCP, nor do they describe the delineation of the areas to be restored.

The applicants allude to this new process for restoration done by FIPR after admission that previous reclamation processes left the land unsuitable for reclamation as the remaining clay and sands will not mix back together. However, they further admit that this process has not been tested on an industrial scale.[52]

In the Final Report of the Pilot Project conducted for HPS on this new methodology, it was noted that technical personnel from the Florida phosphate industry had visited the project site and were concerned that additional pilot testing would be needed because the project used rehydrated clay instead of fresh clay from a beneficiation plan, otherwise the results could not be confirmed. The project team agreed with those concerns and recommended additional testing.[53] This study was finished in April 2017, and since then there has been no notice of confirmation of the results, nor does it appear the MMP has been updated or amended. This method has not been tested in a meaningful way that would allow the Board to rely that this would reach the standards of

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[48] MMP p. 16.
[49] MMP p. 18.
[50] MMP p. 31.
[51] LDR p. 14-4 – 14-6.
[52] MMP p. 34-35.
[53] HPS Final Report p. 47.

reclamation set forth by the CCP. There is no science or study to show that this new method of reclamation would allow for the land to convert back into the agricultural use it sustained before approving the special use permit for mining, especially not to the elevated standards for that of the environmentally sensitive lands in the Suwannee River System, and it should therefore be denied.

Furthermore, many portions of the reclamation plan set forth in the MMP do little more than simply state that what is supposed to happen is going to happen. For example, under the section labeled "Post-Mining Groundwater Features" the applicants simply state "Groundwater tables are anticipated to return to pre-mining conditions," and go on to discuss very briefly that there will be a post-mining monitoring of the reclaimed wetlands and certain uplands "as deemed warranted," but give no further detail nor explanation as to what will be deemed warranted.[54] The MMP also states that the wetland mitigation has previously been described, however nowhere in the MMP does the applicant discuss in detail how wetlands will be reclaimed to the environmentally sensitive area standard the CCP holds it to.[55] The CCP requires competent and substantial evidence as to the restoration levels of the mined land before it can be approved.

The applicants claim in the MMP that they will be able to reclaim the land to a standard that it can be used once again for agriculture, to the same standard as prior to mining.[56] A 2002 study by the Central Florida Regional Planning Council for the Hardee County Board of Commissioners on the proposed Ona Mine found that reclaimed lands would produce vastly inferior soils for agricultural and urban uses.[57] In this study, investigators developed a land suitability index applicable to all potentially developable lands post-reclamation in Hardee County, Florida. The study was not an examination of reclaimed lands, rather it identified reclaimed lands and associated soil attributes with them from the Natural Resources Conservation Service's Soil Survey Geographic Database. It then assessed how the conversion of present soil to reclaimed mine land would likely affect the soil and different land uses, including agricultural, urban, and agricultural-urban.[58] While the report focused on the proposed Ona Mine, it noted that an estimated 100,000 acres, or one quarter of Hardee County was owned by mining companies.[59]

The USDA-MRCS's National Soil Survey Handbook explains the following soil class types:[60]

Class 1	soils have slight limitations that restrict their use.
Class 2	soils have moderate limitations that reduce the choice of plants or require moderate conservation practices.
Class 3	soils have severe limitations that reduce the choice of plants or require special conservation practices, or both.

[54] MMP p. 35.
[55] MMP p. 37.
[56] MMP p. 34.
[57] Central Florida Regional Planning Council. 2002. Land Use Suitability Index for Use in Hardee County. Adopted by Resolution No. 03-05, Nov. 14, 2002.
[58] CFRPC (2002).
[59] CFRPC (2002).
[60] CFRPC (2002).

Class 4	soils have very severe limitations that restrict the choice of plants or require very careful management, or both.
Class 5	soils have little or no hazard of erosion buy have other limitations, impractical to remove, that limit their use mainly to pasture, range, forestland, or wildlife food and cover.

The report found that ¾ of the lands in Hardee County scored a 2 or higher on the existing agricultural suitability sub-index.[61] It found that 77 percent of the county rates as Class 4 for urban lands, largely due to the prevalence of low-lying topography and poorly drained soils.[62] Looking only at Ona Mine, the report projected that there would be a "significant downward shift in agricultural suitability."[63] In fact, it found that Class 1 lands would be reduced by approximately 1,300 areas, Class 2 lands by over 12,600 acres, and Class 3 lands by 850 acres, and would be replaced by Class 4 and Class 5 lands.

Table 7. Comparison of agricultural suitability between existing (pre-mining) and future (post-reclamation) conditions at IMCP's proposed Ona Mine.

Index	Pre-mining (acres)	% of Property	Post-mining (acres)	% of Property	Difference (acres)	% Change
0	5.2	<0.1	0.0	<0.1	-5.2	<0.1
1	1,758.3	7.6	461.1	2.0	-1,297.2	-5.6
2	14,695.7	63.5	2,043.0	8.8	-12,652.7	-54.7
3	2,271.9	9.8	1,421.6	6.1	-850.3	-3.7
4	1,568.4	6.8	11,984.4	51.8	10,416.0	45.0
5	2,834.8	12.3	7,225.6	31.2	4,390.8	18.9

Note: "0" denotes unrated soil mapping units (i.e., water and pits)

Furthermore, a comparison of Figures 6 and 7, showing existing and future agricultural suitability also demonstrate the loss of higher quality lands to lower quality, reclaimed lands.

This report notes that aside from the MLARD studies and Mislevy's research "there is little published research relating to the agricultural potential or productivity of reclaimed mine lands. Most such research was funded by FIPR, and is now somewhat dated."[64] It concluded that while the MLARD project found that phosphatic clays are fertile soils capable of growing forage grasses, tropical cultivars, and biomass crops, a difficult problem to overcome is the inability to work the clay when wet, limiting farming to dry conditions with specialized, non-conventional farming technologies.[65] It also found that despite the optimistic studies, most of the reclaimed

[61] CFRPC (2002).
[62] CFRPC (2002).
[63] CFRPC (2002).
[64] CFRPC (2002).
[65] CFRPC (2002).

lands have not been used for agriculture, rather they've been used as improved pasture,[66] concluding that "[s]imply stated, agricultural production on phosphatic clay is a risky venture."[67]

The applicants discuss reclaiming the physical land, but it is concerning that they do not discuss reclamation as it pertains to animals. Restored lands reestablish natural communities, habitat, and species impacted by mining, yet applicant, in claiming they can reclaim wetlands, cannot explain how the animals will thrive, as mentioned in the discussion on the lack of delineation in the mining request. A study on reclamation observed sites that were supposedly reclaimed from mining operations. While it did not observe the species before the mining occurred, the study only found eastern indigo snakes on 3 of the 62 chosen reclaimed sites, less than five percent.[68] This study does not purport to show that wildlife diversity can be reestablished on reclaimed land. In fact, it indicates, through findings, that reclamation fails to bring lands back to their former function, and that species richness is more likely in natural, un-mined lands.[69] There are no peer-reviewed scientific studies to show that native wildlife will return to reclaimed mining sites to meet the requirements set for the CCP and LDR, that "environmentally sensitive lands… [are] being restored to the same type, nature and function ecosystem."[70]

B. The Project is inconsistent with Comprehensive Plan Goal V regarding conservation

The introduction of this section of the CCP states that conservation land is areas "designated for the purpose of conserving or protecting natural resources or environmental quality."[71] This is done through application for permits through the Florida Department of Environmental Protection (FDEP), something the applicant has yet to do. The applicant also fails to consider impacts to endangered species as a result of filling the wetlands. In their limited analysis, the applicant either states that more research needs to be done or impacts are unlikely because while suitable habitat was located, the species itself was not physically observed.[72] It further states that the Future Land Use Plan Map series may identify these areas by land cover features and not land uses, for example, wetlands, flood prone areas, and minerals. While these areas are identified by land cover features and not designated as conservation area, the "constraints on future land uses of these natural resources are addressed in the following goal, objectives, and policy statements" in the same way as if they were designated conservation by land use.[73]

[66] CFRPC (2002).
[67] CFRPC (2002).
[68] Durbin, D.J., S. Gonzalez, H. Mushinsky, E. McCoy, R. Moore, N. Halstead, K. Robbins. 2008. Wildlife habitat and wildlife utilization of phosphate-mined lands. Bartow (FL): Florida Institute of Phosphate Research. FIPR Publication nr 03-147-230.
[69]Durbin et al. 2008 at 34, 55.
[70] CCP p. I-22; LDR p. 14-6.
[71] CCP p. V-1.
[72] MMP p. 18-24.
[73] CCP p. V-1.

i. The applicant has not completed the required FDEP permitting process in compliance with Objective V.3.

Goal V of the CCP is to "conserve, through appropriate use and protection, the resources of the county to maintain the integrity of natural functions."[74]

Objective V.3 aims to implement this goal by requiring the County to coordinate special mining permits with the FDEP. special mining permits (FDEP) (CCP V-7). To date, upon information and belief, the applicant has not responded to Requests for Additional Information regarding pending FEDEP permits. Until the applicant has completed its FDEP process, the Board cannot approve the application.

Moreover, Objective V.4 requires the County to:

> continue to cooperate in measures to identify and protect native wildlife and their habitats, including state and federally protected plant and animal species (endangered, threatened and species of special concern) within proposed development sites and protect these natural resources from the impacts of development by the use of the Florida Fish and Wildlife Conservation Commission Critical Wildlife Conservation Areas, Florida Natural Areas Inventory, and North Central Florida Strategic Regional Policy Plan Regionally Significant Natural Resources map series to identify habitats which potentially contain endangered, threatened or species of special concern, and rare or unique vegetative communities prior to granting development approval. (CCP V-8)

In implementing this objective, Policy V.4.4. requires the County to address mitigation of development activities within environmentally sensitive areas. Those areas include areas identified as regionally significant within Appendix A of the CCP. The policy also states that "[a]ll new development will maintain the natural functions of environmentally sensitive areas, including but not limited to wetlands and 100-year floodplains" so that the environmental integrity, economic impact, and recreation value of these lands is maintained in the long term under the floodplain and wetland protections in this section of the CCP. (CCP V-8/9) Further, Objective V.6 of the same section aims to protect "the most sensitive resources in the springshed," listing groundwater contribution and recharge within its protection goals. (CCP V-12)

While the proposed mining site is not labeled as a conservation area, it should be afforded the same protections. The Wetlands Map in the Appendix shows that roughly 2,187.55 acres of the project site are wetlands.[75] Further, 50% of the land is located in Flood Zone A, a flood zone in the 100-year floodplain area.[76] Wetlands and flood prone areas are two of the explicitly stated land areas that are protected by these objectives and policies as if they were labeled conservation areas on the maps.

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[74] CCP p. V-1.
[75] MMP p. 16.
[76] MMP p. 13.

ii. Imperiled species will be impacted

Substantial and competent evidence shows that wetlands are a dominant feature in Florida's landscape and represent a greater percentage of the land surface in Florida than in any other state in the conterminous United States.[77] There are an estimated 11.4 million acres of wetlands, occupying 29% of the area of Florida. Semlitsch and Bodie (1999) argue that even small wetlands are crucial for maintaining regional biodiversity in a number of plant, invertebrate, and vertebrate taxa, like amphibians.[78] A consequence of losing these wetlands lies in potential changes to the metapopulation dynamics of the remaining wetlands, including a reduction in the number or density of individuals dispersing and an increase in dispersal distances among wetlands. A reduction in wetland density can decrease the probability that a population can be "rescued" from extinction by a neighboring source population because of lower numbers of available recruits and greater distances between wetlands. Remaining wetlands could face increased probabilities of population extinctions.

Here, the wetlands that would be impacted by the Project support a host of imperiled and iconic species. The applicant states that the following species have the potential to occur on the mine site: eastern indigo snake, Florida pine snake, gopher frog, gopher tortoise, Suwannee cooter, American alligator, Suwannee moccasinshell, and oval pigtoe.[79] Additionally, the applicant states the following Florida Fish and Wildlife Conservation Commission (FWC) species of special concern have the potential to occur on the mine site: Florida mouse, Sherman's fox squirrel, limpkin, Florida burrowing owl, little blue heron, tricolored heron, snowy egret, white ibis, southeastern American kestrel, Florida sandhill crane, short-tailed snake, and Suwannee cooter. The Bradford Mine would frustrate the goals and objectives of the CCP in protecting these species.

Eastern indigo snake (*Drymarchon couperi*)

Eastern indigo snakes are wide-ranging creatures that travel into various habitats throughout the year, with most of the activity occurring in the summer and fall.[80] In the summer, adult male snakes can travel as far as 224 hectares, and females can travel as far as 158 hectares.[81]

The eastern indigo snake's behavior is driven by its need to feed, breed, and shelter, and so those activities dictate when and to what extent the snakes are active. Eastern indigo snakes generally breed between November and April, though breeding period may be extended in south Florida, and female snakes deposit 4–12 eggs during May or June.[82] They are active predators on land

[77] Haag, K.H. and T.M. Lee. 2010. Hydrology and Ecology of Freshwater Wetlands in Central Florida-A Primer, U.S. Geological Survey Circular 1342, pp. 138.

[78] Semlitsch, R.D. and J.R. Bodie. 1999. Are small, isolated wetlands expendable? Conservation Biology 12:1129-33.

[79] MMP p. 19-24.

[80] U.S. Fish & Wildlife Service [USFWS]. 1999. Multiple Species Recovery Plan for South Florida: Eastern Indigo Snake, *Drymarchon corais couperi*, U.S. DEPARTMENT OF INTERIOR, 4-567, http://www.fws.gov/verobeach/msrppdfs/easternindigosnake.pdf.

[81] USFWS (1999).

[82] USFWS (1999).

and underground.[83] An adult snake's diet may include lizards, turtles, turtle eggs, juvenile gopher tortoises, small alligators, birds, and small mammals.[84] Juvenile eastern indigo snakes eat mostly invertebrates.[85]

Eastern indigo snakes face many threats, which must be taken into account to contextualize the Project's impact on the species. Habitat loss from development and agriculture, habitat degradation due to suppression of natural fires, and collection for the pet trade have led to significant declines in eastern indigo snake populations.[86] Development in all forms will continue to impact the eastern indigo snake because it displaces native indigo snake populations and permits growing human populations to move into indigo snake habitat, resulting in increased snake mortality from vehicle collisions and contact with domestic animals and humans who misunderstand and fear them.[87] Development also places eastern indigo snakes in closer contact with agricultural pesticides and rodenticides, which bioaccumulate in the snake's prey and can harm or kill the snakes.[88]

Habitat fragmentation from development of natural land also threatens eastern indigo snakes. Development of structures and roadways also causes habitat fragmentation, which can lead to increased road kills and genetic isolation. Though roads only account for a small area of landscapes, their influence can extend across large areas because they restrict dispersal and gene flow.[89] Transportation infrastructure fragments the landscape, isolating habitat and populations of animals and forcing them to cross roads in an effort to evaluate and access resources, mate with members of other populations, or escape unfavorable circumstances. If snakes cannot successfully move from one "fragment" of habitat to another, the isolation will eventually affect the species' fundamental population and community dynamics.[90] Though not specifically addressed in scientific literature, the development of mine sites is equally disruptive to the eastern indigo snake's fundamental behavior patterns, acting as a barrier to food sources, shelter, and mates. Just as a road may be impassible to a snake, so is a deep open-mining pit or clay settling pond.

The threat of road kills is especially high for the large-bodied eastern indigo snake, especially in areas with increased vehicle traffic. Andrews and Gibbons (2005) investigated the behavior of various species of snake near roads.[91] The study showed the eastern racer (Coluber constrictor), a species of snake that shares the subfamily Colubrinae with the eastern indigo snake, readily crosses roads.[92] Though this information suggests lower risk of habitat fragmentation from road

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[83] USFWS (1999).
[84] USFWS (1999).
[85] USFWS (1999).
[86] Johnson, S.A. and M.E. McGarrity. 2016. "Black Snakes": Identification and Ecology. UF IFAS Extension, University of Florida, *available at* http://edis.ifas.ufl.edu/pdffiles/UW/UW25100.pdf.; USFWS (1999).
[87] USFWS (2009).
[88] USFWS (2009).
[89] Clark, R.W., W.S. Brown, R. Stechert & K.R. Zamudio. (2010). Roads, interrupted dispersal, and genetic diversity in timber rattlesnakes. Conserv. Biol. 24, 1059–1069.
[90] Andrews, K.M. & J.W. Gibbons. 2005. How Do Highways Influence Snake Movement? Behavioral Responses to Roads and Vehicles. Copeia 2005(4): 772–782.
[91] Andrews & Gibbons (2005).
[92] Andrews & Gibbons (2005).

avoidance; it also suggests higher likelihood of road mortality, which would contribute to population reduction and genetic isolation.[93] The study also concluded that snake species with higher mass-to-length ratios (thick-bodied snakes) are more likely to cross roads at a slower rate of speed, subjecting them to a higher risk of road mortality when they cannot cross quickly enough to avoid collision.[94] The scientists found that even snakes that rely on rapid flight to escape predators (e.g., Coluber constrictor) exhibited higher immobilization responses to oncoming vehicles than hypothesized.[95] Because eastern indigo snakes are heavy-bodied snakes of a subfamily that is more likely to cross roads, there is potential for great harm from increased roadways and traffic. Additionally, because eastern indigo snakes range over large areas (as far as 224 hectares), they are more likely to encounter roads and the risk of direct mortality or isolation.[96]

Breininger et al. (2012)[97] have concluded that habitat fragmentation is likely a critical factor for the eastern indigo snake's persistence and that eastern indigo snakes are vulnerable to extinction in conservation areas bordered by roads and developed areas. More than half of known snake mortalities documented in the study were caused by humans, directly or indirectly, along roads.[98] Because snakes are a maligned group of animals, the increased visibility of snakes on roadways subjects them to increased intentional killing by humans.[99]

For those indigo snakes that avoid being directly killed on roads, road development and urbanization can lead to negative population-level impacts, such as skewed population structure via altered sex ratios and composition of age classes and restricted gene flow that results in decreased genetic diversity.[100] The negative impacts of these effects may take decades to become apparent,[101] at which point it may be too late to remedy them.

Climate change and sea-level rise also threaten the eastern indigo snake. Amphibians and reptiles are considered to be highly sensitive to anthropogenic climate change.[102] As ectothermic animals, all aspects of their life history are strongly influenced by the external environment,

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[93] Andrews & Gibbons (2005).
[94] Andrews & Gibbons (2005).
[95] Fahrig, L. & Rytwinski, T. 2009. Effects of roads on animal abundance: an empirical review and synthesis. http://www.ecologyandsociety.org/vol14/iss1/ art21.
[96] USFWS (1999).
[97] Breininger, D.R., M.J. Mazerolle, M.R. Bolt, M.L. Legare, J.H. Drese & J.E. Hines, 2012. Habitat fragmentation effects on annual survival of the federally protected eastern indigo snake. NASA *Publications*. Paper 106.
[98] Breininger et al. (2012).
[99] USFWS (1999).
[100] Andrews, K.M., J.W. Gibbons & D.M. Jochimsen. 2008. Ecological effects of roads on amphibians and reptiles: a literature review. In *Urban herpetology. Herpetological Conservation*. Vol. 3. Jung, R.E. & Mitchell, J.C. (Eds). Salt Lake City, UT: Society for the Study of Amphibians and Reptiles.
[101] Andrews et al. (2008).
[102] Corn, P.S. 2005. Climate change and amphibian. USGS Staff -- Published Research. Paper 90. http://digitalcommons.unl.edu/usgsstaffpub/90; Blaustein, A.R., S.C. Walls, B.A. Bancroft, J.J. Lawler, C.L. Searle, and S.S. Gervasi. 2010. Direct and indirect effects of climate change on amphibian populations. Diversity 2:281-313.; Mitchell, N.J. and F.J. Janzen. 2010. Temperature-dependent sex determination and contemporary climate change. Sexual Development 4:129-140.; Li, Y., Cohen J.M., and J.R. Rohr. 2013. Review and synthesis of the effects of climate change on amphibians. Integrative Zoology 8:145-161.

particularly temperature and moisture.[103] Climate change is expected to affect amphibians and reptiles at the individual and population levels though a number of pathways including shifts in phenology (seasonal life-cycle events) and range; habitat alterations including changes in hydrology, vegetation, and soil; changes in pathogen-host dynamics, predator-prey relationships, and competitive interactions which can alter community structure, all of which can affect a species' survival, growth, reproduction and dispersal capabilities.[104]

In addition, global climate change poses a serious threat to terrestrial ectotherms like the eastern indigo snake simply because they rely on the external environment to regulate and stabilize their body temperatures. It is predicted that large areas of the planet will experience a variance in thermal regimes, mean temperatures, and precipitation.[105] Although Florida's climate is predicted to warm less than other regions in North America, a climate inventory over the past 35 to 108 years indicated Florida is experiencing greater climate extremes, with trends of increased summer and fall maximum temperatures and decreased winter and spring minimum temperatures.[106] Terrestrial ectotherms in particular are at risk from these changes because they are less effective at buffering their body temperature than other creatures. Changes in ambient temperature have been shown to impact growth, locomotion, and reproduction in terrestrial ectotherms because these processes are strongly dependent on body temperature.[107] An inability to buffer body temperature may alter essential behaviors of reptiles like the eastern indigo snake, including feeding, breeding, and searching for shelter, and alterations could result in increased vulnerability to predators and extreme climate. The future survival of these species will be entirely dependent on their ability to adapt to a rapidly changing climate. Sears et al. 2016 recently found ectothermic species' success at regulating their body temperatures in a warming climate also depends on the distribution and accessibility of cool microclimates, factors previous reptile studies have failed to assess.[108] Thus, it is possible that estimates of future reptile extinctions are much higher than previously thought.

Though past studies of reptiles indicate they will have difficulty adapting to warmer climates in the future, these studies may underestimate the full impact to these ectothermic species. Sears et al. (2016) recently found ectothermic species' success at regulating their body temperatures in a warming climate depends not only on the availability of cool microclimates but also on the distribution and accessibility of those microclimates, factors previous reptile studies have failed to assess. Specifically, the study found that when shaded areas were liberally interspersed with nonshaded areas, reptiles were able to successfully maintain stable temperatures; however, when shaded areas were clumped together, reptiles had a difficult time regulating and maintaining

[103] Case, M.J., J.J. Lawler, and J.A. Tomasevic. 2015. Relatively sensitivity to climate change of species in northwestern North America. Biological Conservation 187:127-133.
[104] Corn 2005; Blaustein et al. 2010; Mitchell & Janzen 2010; Li et al. 2013.
[105] Aubret, F. & R. Shine. 2009. Thermal plactisicty in young snakes: how will climate change affect the thermoregulatory tactics of ectotherms. The Journal of Experimental Biology: 242, 242–244.
[106] Reece, J.S., et al. 2013. Threatened and Endangered Species with Vulnerable Ecological Traits Have High Susceptibility to Sea Level Rise and Habitat Fragmentation. PLOS ONE.
[107] Reece et al. (2013).
[108] Sears, M.W., M.J. Angilleta, M.S. Schuler, J. Borchert, K.F. Dillplane, M. Stegman, T.W. Rusch, and W.A. Mitchell. 2016. Configuration of the thermal landscape determines thermoregulatory performance of ectotherms. PNAS, www.pnas.org/cgi/doi/10.1073/pnas.1604824113.

stable temperatures.[109] Because the location and proximity of shaded and nonshaded areas for thermoregulation is key for ectotherms like the eastern indigo snake, the Board should consider the Project's impact on accessibility of appropriate microhabitat for thermoregulation. It is likely that the large footprint of the Project will create a barrier, causing snakes to expend excess energy and subject themselves to increased risk of predation to travel from one "clump" of microhabitat to another.

Because eastern indigo snakes are rare and face numerous threats, they are listed as Threatened under the federal Endangered Species Act[110] and Florida's Endangered and Threatened Species Act. Despite these protections, habitat loss and degradation throughout the eastern indigo snake's range continues to cause the decline of this rare, beautiful, and important snake.[111]

The Service's recovery plan for the eastern indigo snake highlights monitoring as an essential tool for attaining the snake's recovery.[112] The Project area should be resurveyed to determine the relevant locations and habitat use of eastern indigo snakes. The applicant should also develop a monitoring plan for the life of the mine, which would allow the Service to identify severe population declines and take action.

When assessing the Project's impacts on eastern indigo snake habitat, the Board should not only consider broad habitat types used by the eastern indigo snake (e.g., upland habitat) but also availability of essential microhabitat required by the species. For example, Hyslop et al. (2009) found that "[r]eduction in suitable underground shelters caused by habitat degradation and loss, which reduces or eliminates populations of [gopher tortoise], is likely an important factor in extirpation of the species from areas *otherwise perceived as suitable habitat*."[113]

Further, the Board must consider a recent study showing that the eastern indigo snake could be the Gulf Coast indigo snake.[114] The study shows that the eastern indigo snake is two distinct species, essentially dividing the already small population of snake into two smaller populations, effectively making it more endangered. This project will impact the snake beyond the scope currently considered. The study uses morphological and molecular analysis to show the species differences at the genetic level, distinguishing the Gulf Coast indigo snaked from the federally threatened eastern indigo snake.[115] The applicant must provide substantial and competent evidence proving that the Project is not incompatible with the either snake or its respective habitat.

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[109] Sears et al (2016).
[110] 43 Fed. Reg. 4026 (Jan. 31, 1978).
[111] Johnson & McGarrity (2016).
[112] *Eastern Indigo Snake* at 4-579, 4-581.
[113] Hyslop, N.L., R.J. Cooper & J.M. Meyers. 2009. Seasonal Shifts in Shelter and Microhabitat Use of *Drymarchon couperi* (Eastern Indigo Snake) in Georgia. Copeia 3:458–464.
[114] Krysko, K.L., M.C. Granatosky, L.P. Nuñez & D.J. Smith. 2016. A cryptic new species of Indigo Snake (genus *Drymarchon*) from the Florida Platform of the United States. Zootaxa 4138(3): 549–569.
[115] Krysko (2016).

Florida pine snake (*Pituophis melanoleucus mugitus*)

The Florida pine snake is a large, heavy-bodied constrictor snake that can reach up to 84 inches in length.[116]It is one of three subspecies of pine snakes found in the southeastern United States.[117] Florida pine snakes are beautifully patterned with dark brown or rust-colored blotches on a light cream to tan background.[118] When approached, pine snakes may hiss loudly or make a rattling noise by rapidly shaking their tails in dry leaves; however, they are nonvenomous and become defensive only when they feel threatened.[119] Because of their coloring and the rattling noise they make with their tails, Florida pine snakes are sometimes confused with the venomous eastern diamondback rattlesnake.[120] Florida pine snake populations are beneficial to humans, as they help to regulate rodent populations that spread disease.[121] Resourceful predators, pine snakes forage for prey above and below ground, where they sometimes constrict prey by pinning it against the walls of the burrow.[122]

Florida pine snakes are found in the extreme Southeastern Coastal Plain of the United States, from the southern tip of South Carolina west thorough southern Georgia and extreme southeastern Alabama, and south through most of peninsular Florida.[123] These pine snakes prefer dry, upland areas with well-drained, sandy soils. Their preferred natural habitats include upland pine forests and sandhills, but they are also found in scrubby flatwoods, oak scrub, dry oak forests, old fields, and agricultural borders.[124] Florida pine snakes require large tracts of land to search for food and mates and cannot thrive in small habitat patches; male snakes may ranges as far as 400 acres.[125]

Florida pinesnakes are most active in the spring and early fall, and they become nearly inactive during the cold winter months.[126] They are must active during the day when they forage for food, seek mates, and bask in the sun to regulate their temperature.[127] Otherwise, these snakes spend the majority of their time underground in the burrows of small mammals, particularly those of the pocket gopher (*Geomys pinetis*).[128] Pine snakes will also take refuge in gopher tortoise

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[116] Florida Fish and Wildlife Conservation Commission [FWC]. 2013b. A Species Action Plan for the Florida Pine Snake *Pituophis melanoleucus mugitus*, Tallahassee, Florida, *available at* http://myfwc.com/media/2738822/Florida-Pine-Snake-Species-Action-Plan-Final-Draft.pdf.; Florida Fish and Wildlife Conservation Commission [FWC]. Undated c. Florida Pine Snake: *Pituophis melanoleucus mugitus*, http://myfwc.com/wildlifehabitats/imperiled/profiles/reptiles/florida-pine-snake/.; Miller, G.J., S.A. Johnson, L.L. Smith, and J.W. Jones. 2009. The Florida Pinesnake: *Pituophis melanoleucus mugitus*. Wildlife Ecology and Conservation Department, UF/IFAS Extension. WEC 251, *available at* http://edis.ifas.ufl.edu/pdffiles/UW/UW29600.pdf.

[117] Miller et al. (2009).

[118] Miller et al. (2009).

[119] FWC 2013b; Miller et al. (2009).

[120] Miller et al. (2009).

[121] Miller et al. (2009).

[122] Miller et al. (2009).

[123] Miller et al. (2009).

[124] Miller et al. (2009).

[125] Miller et al. (2009).

[126] Miller et al. (2009).

[127] Miller et al. (2009).

[128] Miller et al. (2009).

burrows.[129] Because they have spade-like heads with large scales at the tips of their snouts, Florida pine snakes are skilled diggers and can be observed digging into existing burrows or even constructing their own.[130]

Pine snakes are powerful constrictors that are able to subdue a variety prey including mice, cotton rats, rabbits, and pocket gophers.[131] Resourceful predators, pine snakes forage for prey above and below ground, where they sometimes constrict prey by pinning it against the walls of the burrow.[132] Pine snakes mate in spring and early summer.[133] Males will travel across large areas of suitable habitat in search of mates.[134] Female Florida pine snakes retreat underground to lay 4–8 very large, white, leathery eggs in June or July.[135] The eggs hatch in approximately 2 months, requiring a much longer incubation period than most snake eggs.[136]

The Florida pine snake is now considered uncommon over most of its range, and many herpetologists believe that this species is in decline.[137] Unfortunately, development and fragmentation of native habitat has caused Florida pine snakes to become much less common in the landscape.[138] Commercial and residential development, silviculture, mining, and road construction all threaten pine snakes' habitat.[139] Because Florida pine snakes travel throughout large ranges, they require large, uninterrupted tracts of habitat.[140] Habitat degradation is also a threat to Florida pine snakes because their pine habitats require periodic fire to remain healthy.[141] Because humans have suppressed fire, the conditions of Florida's pine forests have changed and become inhospitable for pine snakes.[142]

Since pine snakes are most active in the daytime, they are often killed crossing Florida's increasing network of highways as they search for mates or pretty.[143] Additionally, Florida pine snakes are persecuted by people who mistakenly believe that all snakes are dangerous.[144] As human infrastructure moves into natural areas, there will be more interactions between pine snakes and humans, which will lead to higher risk of purposeful killings. The Florida pine snake is listed as Threatened under the Florida Imperiled Species Management Plan. FWC's main conservation objective is to maintain and increase the amount of habitat for the Florida pine snake.[145]

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[129] Miller et al. (2009).
[130] Miller et al. (2009).
[131] Miller et al. (2009).
[132] Miller et al. (2009).
[133] Miller et al. (2009).
[134] Miller et al. (2009).
[135] FWC, undated c; Miller et al. (2009).
[136] Miller et al. (2009).
[137] Miller et al. (2009).
[138] FWC, undated c; Miller et al. (2009).
[139] FWC 2013b; FWC undated.
[140] Miller et al. (2009).
[141] FWC 2013b; Miller et al. (2009).
[142] Miller et al. (2009).
[143] Miller et al. (2009).
[144] Miller et al. (2009).
[145] FWC 2013b.

The Board should consider the impacts of habitat destruction and degradation on the Florida pine snake when assessing the impacts of the Project. When assessing the Project's impacts on the Florida pine snake's habitat, the Board should be sure to consider essential microhabitat for this species, which includes gopher tortoise and pocket gopher burrows. The applicant must provide substantial and competent evidence proving that the Project is not incompatible with the snake or its habitat.

Gopher frog (*Lithobates capito*)

The gopher frog is a relatively large, brown-spotted frog that can grow to be between 2.5 and 4.4 inches long.[146] Their tadpoles are greenish gold with dark spots scattered over the body and tail.[147] Gopher frogs typically live in dry, well-drained upland habitats that are occupied by gopher tortoises and close to shallow, temporary, fishless breeding wetlands.[148] They have been found in a variety of habitats including sandhills, upland pine forests, scrub, flatwoods, dry prairies, pastures, and various other disturbed habitats that still host gopher tortoises.[149] Gopher frogs spend the majority of the year in the dry uplands, where they shelter in gopher tortoise burrows and hunt insects and small frogs.[150]

Gopher frogs have very specific habitat needs for breeding. They generally breed in the summer in central and south Florida, though they can breed any time of the year with heavy rains.[151] Male frogs attract females to the breeding pools by calling, and females deposit a fist-sized mass of 500-5,000 eggs, which the male then fertilizes.[152] The eggs hatch in 4–5 days and develop as tadpoles for 3–7 months.[153] Newly metamorphosed frogs then migrate back into the uplands where they shelter in burrows.[154]

Even with the appropriate habitat conditions, successful reproduction—and thus population viability— can be difficult. Gopher frog longevity in the wild is unknown, though tadpoles face many predators, ranging from water snakes to predatory fish to insects, as they develop.[155] One study found that nearly 75% of froglets leaving a pond were killed by snakes or mammals.[156] Adult frogs are preyed upon by water snakes and possibly turtles.[157] Thus, having accessible,

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[146] Florida Fish and Wildlife Conservation Commission. 2013. A species action plan for the Suwannee cooter *Pseudemys concinna suwanniensis*. Tallahassee, Florida, *available at* http://myfwc.com/media/2738286/Suwannee-Cooter-Species-Action-Plan-Final-Draft.pdf.
Florida Fish and Wildlife Conservation Commission [FWC]. 2015. Gopher Frog, http://myfwc.com/wildlifehabitats/imperiled/profiles/amphibians/gopher-frog/.
[147] FWC (2013).
[148] FWC (2013).
[149] FWC (2013).
[150] FWC (2013).
[151] FWC (2013).
[152] FWC (2013).
[153] FWC (2013).
[154] FWC (2013).
[155] FWC (2013).
[156] FWC (2013).
[157] FWC (2013).

suitable wetland habitat for breeding and upland habitat for feeding and shelter is imperative to the gopher frog's survival.

Unfortunately, the gopher frog has experienced drastic population declines because of habitat loss and degradation, and the species now occurs only in scattered populations in the southern United States.[158] Populations in the Florida peninsula are relatively secure, but the species is declining in other parts of its range and in some parts of Florida.[159] Surdick (2013) studied gopher frogs in the Big Bend Wildlife Management Area on the Gulf Coast of Florida and remarked that the frog is "of conservation concern because most populations have gone locally extinct across the geographic distribution."[160] Likewise, the gopher frog's range in North Carolina has contracted dramatically,[161] and sparse records of the gopher frog exist in Tennessee.[162]

Habitat loss leads to isolated populations, which itself is another threat to the survival of the gopher frog. Greenberg (2001) studied influences on success of juvenile recruitment for gopher frogs, and he found that the condition of longleaf pine-wiregrass sandhills surrounding ponds may influence levels of juvenile recruitment.[163] Greenberg's study illustrates the role of multiple ponds in sustaining gopher frog populations. This finding is important, as roads often fragment essential amphibian habitats and can lead to road mortality. Cosentino et al. (2014) found that "road disturbance was almost universally important in that it constrained total species richness and the distribution of most species" of amphibians they studied.[164] Though not specifically covered in scientific literature, the excavation of a mining pit and clay settling pond could easily create similar impacts to a gopher frog's ability to access and use suitable breeding and sheltering habitat. Aside from destroying the utility of any habitat at the Project site itself, mining activities would also create a barrier between suitable isolated wetlands on adjacent land. It could also physically separate members of a gopher frog population, genetically isolating them.

Climate change is and will continue to be a major threat to the gopher frog, impacting availability of water and altering the frog's behavior. For amphibians, water availability is a key resource that affects survival, reproduction, activity levels, and dispersal, while temperature can

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[158] Humphries, W. J. and M. A. Sisson. 2012. Long Distance Migrations, Landscape Use, and Vulnerability to Prescribed Fire of the Gopher Frog (*Lithobates capito*). Journal of Herpetology 46(4) 665–670.
[159] FWC (2013).
[160] Surdick, J.A. 2013. An Amphibian and Reptile Drift Fence Survey of Big Bend Wildlife Management Area, Gulf Coast of Florida. Florida Scientist 76 (3/4): 436.
[161] Humphries & Sisson (2012).
[162] Tennessee Wildlife Resources Agency [TWRA]. undated. Gopher Frog *Lithobates capito*, *available at* http://www.tnwatchablewildlife.org/details2.cfm?sort=aounumber&uid=10051110144257231&commonname=Gopher%20Frog&DISPLAYHABITAT=&typename=Amphibian&Taxonomicgroup=Amphibian%20-%20Frogs%20and%20Toads.
[163] Greenberg, C.H. 2001. Spatio-temporal Dynamics of Pond Use and Recruitment in Florida Gopher Frogs (*Rana Capito aesopus*). Journal of Herpetology 35(1): 74–85, p. 84.
[164] Cosentino, B.J., D.M. March, K.S. Jones, J.J. Apodaca, et al. 2014. Citizen science reveals widespread negative effects of roads on amphibian distributions. Biological Conservation. 180: 31–38, p. 36.

affect timing of breeding, hibernation, and the ability to find food.[165] Climate change is driving greater variability in precipitation, increasing the frequency of extreme weather events, and increasing surface water temperatures.[166] As a result, climate-change-related changes in hydrological regimes (i.e., alterations in stream flow, lake depth, amount and duration and winter snow pack, pond hydroperiods, soil moisture) and warming temperatures are predicted to have largely negative effects on amphibian breeding success and survival, dispersal, and habitat suitability.[167]

Gopher frogs will likely experience a number of other behavioral shifts which could lead to climate-change induced population declines. Numerous studies have documented climate-associated shifts in amphibian phenology, range, and pathogen-host interactions,[168] with emerging evidence for climate change-related declines.[169] Li et al. (2013) reported the results of 14 long-term studies of the effects of climate change on amphibian timing of breeding in the temperate zone of the U.S. and Europe.[170] This meta-analysis indicated that more than half of studied populations (28 of 44 populations of 31 species) showed earlier breeding dates, while 13 showed no change, and 3 populations showed later breeding dates, where spring-breeding species tended to breed earlier and autumn-breeding species tended to breed later. Several studies indicate that shifts in timing of breeding can have fitness and population-level consequences. For example, amphibians that emerge earlier in the spring can be vulnerable to winter freeze events or dessication if they arrive at breeding sites prior to spring rains.[171]

In addition, global climate change poses a serious threat to terrestrial ectotherms like the gopher frog simply because they rely on the external environment to regulate and stabilize their body temperatures. Although Florida's climate is predicted to warm less than other regions in North America, a climate inventory over the past 35 to 108 years indicated Florida is experiencing greater climate extremes, with trends of increased summer and fall maximum temperatures and decreased winter and spring minimum temperatures.[172] Because gopher frogs rely on the external environment to regulate and maintain their body temperatures (thermoregulate), they will have difficulty surviving as temperatures rise.[173] This threat will only be compounded by habitat destruction and fragmentation, which will force gopher frogs to travel farther distances to concentrated areas of habitat with the appropriate microclimate to thermoregulate.[174]

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[165] Corn (2005); Blaustein et al. (2010); Lawler, J.J., S.L. Shafer, B.A. Bancroft, and A.R. Blaustein. 2010. Projected climate impacts for the amphibians of the Western Hemisphere. Conservation Biology 24:38-50.
[166] Melillo, J.M., T.C. Richmond, and G.W. Yohe (Eds.). (2014). *2014: Climate Change Impacts in the United States: The Third National Climate Assessment.* doi:10.7930/J0Z31WJ2, U.S. Global Change Research Program.
[167] Blaustein et al. (2010); Walls, S.C., W.J. Barichivich, and M.E. Brown. 2013. Drought, deluge and declines: the impact of precipitation extremes on amphibians in a changing climate. Biology 2:399-418.
[168] Corn (2005); Blaustein et al. (2010); Li et al. (2013).
[169] Lowe (2012); Rohr, J.R. and B.D. Palmer. 2013. Climate change, multiple stressors, and the decline of ectotherms. Conservation Biology 27:741-751.
[170] Li et al. (2013)
[171] Li et al. (2013)
[172] Reece et al. (2013
[173] Reece et al. (2013).
[174] Sears et al. (2016).

The gopher frog is also threatened by sea-level rise, which will cause human populations to move into previously unaltered habitats to escape coastal areas.[175] The gopher frog is no longer listed in Florida due to a phase out of the Species of Special Concern listing status. The species is currently part of the Imperiled Species Management Plan.

The Board should consider the effects of habitat destruction, degradation, and fragmentation on the gopher frog when considering the impacts of the Project. Specifically, it should consider how mining activities will destroy existing wetland and upland habitat, degrade surrounding habitat, and prevent movement between isolated habitat fragments surrounding the Project area. Likewise, the Board should take microhabitat into account—specifically, the need for shallow, fishless, ephemeral wetlands for mating, as well as dry, sandy gopher tortoise burrows in the uplands for shelter. The Board should also consider how the Project's impacts will exacerbate the effects of climate change on the gopher frog. The applicant must provide substantial and competent evidence proving that the Project is not incompatible with the gopher frog or its habitat needs.

Gopher tortoise (*Gopherus polyphemus*)

The gopher tortoise is a relatively large, land-dwelling turtle with a domed shell that can grow up to almost 15 inches in length. Gopher tortoises have brown, gray, or tan shells; short, elephantine hind limbs; shovel-like fore limbs; and short tails.[176] They may be best known for digging deep, elaborate burrows that provide refuge from extreme weather and predators.[177] These burrows are essential to the survival of individual tortoises and the populations to which they belong because of their key roles as shelters and nesting sites.[178] Tortoises have been documented using between two and seven burrows per active season, depending on the sex and location of the tortoise.[179] These burrows also offer refuge to hundreds of other species, called "burrow associates," including the threatened eastern indigo snake, gopher frog, and eastern diamondback rattlesnake.[180]

Gopher tortoises are found in the southeastern Coastal Plain from southern South Carolina, Georgia, Florida, Alabama, Mississippi, and extreme southeastern Louisiana.[181] In Florida, tortoises exist in all 67 counties, but they prefer high, dry, sandy habitats such as longleaf pine-

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[175] Cameron Devitt, S.E., et al. 2012. *Florida Biodiversity under a Changing Climate*, FLORIDA CLIMATE TASK FORCE 1, 7.; Mellilo et al. (2014); Karl, T.R., J.M. Melillo, and T.C. Peterson. 2009. *Global Climate Change Impacts in the United States.* Global Change Research Program. New York: Cambridge University Press.; Florida Fish and Wildlife Conservation Commission [FWC]. Undated a. *Chapter 4: Florida Adapting to Climate Change*, myfwc.com, http://myfwc.com/media/2652458/Chapter4_AdaptingtoClimateChange.pdf.
[176] NatureServe. 2015. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia, *available at* http://www.natureserve.org/explorer.
[177] NatureServe (2015).
[178] NatureServe (2015).
[179] NatureServe (2015).
[180] NatureServe (2015).
[181] Florida Fish and Wildlife Conservation Commission [FWC]. Undated b. Gopher Tortoise: *Gopherus polyphemus*, my fwc.com, http://myfwc.com/wildlifehabitats/imperiled/profiles/reptiles/gopher-tortoise/.; FWC (2016).

xeric oak sandhills.[182] They may also be found in scrub, dry hammocks, pine flatwoods, dry prairies, coastal grasslands and dunes, mixed hardwood-pine communities, and pastures.[183] The most important habitat elements for gopher tortoises are dry, sandy soil; open-canopied forests, and access to leafy, green plants, fruits, and flowers to eat.[184] Gopher tortoises spread seeds of many plants in their droppings, filling an important role in the ecosystem.[185]

Gopher tortoises are especially prone to environmental threats because they have long lives, low rates of reproduction, and high rates of egg and hatchling mortality. Gopher tortoises are slow to reach sexual maturity. In Florida, female tortoises may mature in 9–11 years.[186] Male tortoises seek females for mating from May to July, and there is some evidence that dominant males breed with several females.[187] Nesting occurs from late April to mid-July and clutch size can range from 5–9 eggs.[188] Adult females generally produce one clutch per year, though some adults do not nest every year.[189]

Juvenile gopher tortoises and eggs are also highly vulnerable to nonnative and human-subsidized predators such as raccoons and armadillos.[190] Studies in Georgia indicate that an average female gopher tortoise produces a successful clutch of eggs approximately once per decade because about 90% of their nests are destroyed annually.[191] Between the time an egg is laid and the time the hatching reaches one year of age, a gopher tortoise is estimated to have a staggering mortality rate of 94.2% in north Florida and 92.3% in central Florida.[192]

Gopher tortoise populations have generally declined consistently with loss of upland habitat, and many populations are considered to contain fewer individuals than the number needed to be viable. Gopher tortoises often live in isolated colonies of up to about 57 individuals, which are smaller than the generally accepted minimum viable population of 250 individuals.[193] A comprehensive study of 50 tortoise populations in Florida has found that populations residing on sites that have greatly reduced in size (more than 25% over the last 20 years), or occurred on sites with unsuitable tree canopy (more than 50% coverage), or occurred on sites of small size (less than 2 hectares) tended to have reduced demographic profiles, which suggested low

[182] FWC, undated.
[183] FWC, undated.
[184] FWC, undated; FWC (2016).
[185] FWC (2016).
[186] NatureServe (2015).
[187] NatureServe (2015).
[188] NatureServe (2015).
[189] NatureServe (2015).
[190] NatureServe (2015).
[191] NatureServe (2015).
[192] NatureServe (2015).
[193] NatureServe (2015); Gopher Tortoise Council. 2013. Gopher Tortoise Minimum Viable Population and Minimum Reserve Size Working Group Report. www.gophertortoisecouncil.org/download/reports/MVP_Report_Final-1.2013.pdf.; Gopher Tortoise Council. 2014. Gopher Tortoise Minimum Viable Population and Minimum Reserve Size Working Group Report II. http://www.gophertortoisecouncil.org/download/reports/MVP%20II%202014%20GTC%20report%20group_final.pdf.

survival of juvenile tortoises and abandonment of the site by larger, mature individuals.[194] In sites with larger areas and more open canopy, populations tended to demonstrate more individuals of larger size and evidence of recruitment of young into the population.[195] Tortoise densities and movements have also been critically linked to the amount of leafy, green ground cover available for them to eat.[196]

The most serious threats to gopher tortoises are habitat destruction, degradation, and fragmentation caused by land development and poor forest management.[197] Agriculture and urban development destroy and degrade suitable habitat for gopher tortoises.[198] In many other areas within the tortoise's range, mining for phosphate, limestone, and sand have destroyed countless acres of habitat.[199] Even when tortoises are not fully ejected from land, habitat fragmentation caused by surrounding development and roads leads to increased road mortality and genetic isolation of populations.[200] Habitat loss will become an even greater concern as global climate change transforms the environment, potentially making once suitable areas uninhabitable.[201]

Gopher tortoises are also vulnerable to harmful pathogens, including upper respiratory tract disease (URTD), herpesvirus, and iridovirus.[202] In the 1990s, scientists associated relatively large die-offs with URTD, though it is unclear whether the disease has caused recent declines in gopher tortoise populations.[203] This disease has been of particular concern because it can be spread when gopher tortoises are translocated as part of state conservation efforts.

The gopher tortoise is protected as Threatened under the Florida Endangered and Threatened Species Act west of the Mobile and Tombigbee Rivers in Alabama, Mississippi, and Louisiana;[204]; however, gopher tortoises in Florida are only candidates for federal protection because of a 2011 Service finding that listing was "warranted" and yet "precluded by higher priority actions."[205]

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[194] NatureServe 2015 citing McCoy, E.D., and H.R. Mushinsky. 1988. The demography of *Gopherus polyphemus* (Daudin) in relation to size of available habitat. Unpublished report to Florida Game and Fresh Water Fish Commission, Nongame Wildlife Program, Tallahassee. Pp. 71.
[195] NatureServe 2015, citing McCoy & Mushinsky (1988).
[196] Enge, K.M., J.E. Berish, R. Bolt, A. Dziergowski, and H.R. Mushinsky. 2006. Biological Status Report: Gopher Tortoise, Florida Fish and Wildlife Conservation Commission, available at http://www.myfwc.com/media/969926/Gopher_Tortoise_BSR.pdf. Pp.3.
[197] Enge et al. (2006) at 4.
[198] Enge et al. (2006) at 4.
[199] Gopher Tortoise Council. Undated. About the Gopher Tortoise, The Gopher Tortoise: A Species in Decline, Legal Status, http://www.gophertortoisecouncil.org/about-the-tortoise/.
[200] Enge et al. (2006) at 4.
[201] Moreno-Rueda, G., J.M. Pleguezuelos, M. Pizarro, and A. Montori. 2011. Northward Shifts of the Distributions of Spanish Reptiles in Association with Climate Change. Conservation Biology 26: 278–283.; Whitfield, S. M., K.E. Bell, T. Philippi, M. Sasa, F. Bolanos, G. Chaves, J.M. Savage, and M.A. Donnelly. 2007. Amphibian and reptile declines over 35 years at La Selva, Costa Rica. PNAS 104:8352-8356.; Sinervo, B. et al. 2010. Erosion of lizard diversity by climate change and altered thermal niches. Science 328: 894–899.
[202] Enge et al. (2006) at 2, 5.
[203] Enge et al. (2006) at 5–6.
[204] 52 Fed. Reg. 25376 (July 7, 1987).
[205] 76 Fed. Reg. 45130 (July 27, 2011).

In Florida, gopher tortoises are protected and must be relocated before any land clearing or development takes place, and property owners must obtain permits from the FWC before capturing and relocating tortoises.[206] Though tortoises are sometimes relocated from proposed development sites to other areas, this strategy introduces its own set of problems. Relocation can disrupt population dynamics, spread disease, and lead to eventual tortoise mortality.[207] The Gopher Tortoise Council explains that "[r]elocated tortoises rarely stay at the new site and many are killed crossing roads as they attempt to navigate back to their original range."[208] Even when tortoises are not fully ejected from land, habitat fragmentation caused by surrounding development and roads leads to increased road mortality and genetic isolation of populations.[209]

The Board must consider the Project's impact on the gopher tortoise and its habitat when considering the environmental impacts of the Project. Additionally, the Board must consider the impacts to other imperiled species that rely on gopher tortoise burrows for shelter should gopher tortoises be relocated from any portion of the project site. Finally, the Board should consider the risks to local and receiving gopher tortoise populations if relocation is required for the Project site. The applicant must provide substantial and competent evidence proving that the Project is not incompatible with the tortoise or its habitat.

Suwannee cooter (*Pseudemys concinna suwanniensis*)

The Suwannee cooter is the largest of all pond turtles (family Emydidae) and has a yellow or cream head with black stripes, and a mostly black shell with faint, concentric yellow lines.[210] The plastron (lower portion of the shell) is yellow-orange and usually has black pigment that presents as a few bands or as a complex pattern along the seams.[211]

Suwannee cooters live in rivers, large streams, and associated permanent freshwater habitats.[212] Key habitat features include moderate current, aquatic vegetation, and areas like fallen logs for basking.[213] Suwannee cooters have been documented in rivers as far north and west as the Ochlockonee River in the Florida panhandle and as far south as thee Alafia River in Hillsborough County.[214] However, Heinrich et al. (2015) only recently presented new evidence confirming that a reproducing population exists in the Alafia river, suggested the importance of an accurate delineation of the species' distribution, and identified the need for additional surveys farther south in the Little Manatee and Manatee Rivers.[215]

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[206] Fla. Admin. Code r. 68A-27.003(2)(d)(3.); *see also* Florida Fish and Wildlife Conservation Commission, Gopher Tortoise Permitting Guidelines, Tallahassee, Florida (revised Feb. 2015), *available at* http://myfwc.com/media/2984206/GT-Permitting-Guidelines-FINAL-Feb2015.pdf.
[207] Gopher Tortoise Council, undated.
[208] Gopher Tortoise Council, undated.
[209] Enge et al. (2006).
[210] FWC (2013).
[211] FWC (2013).
[212] FWC (2013).
[213] FWC (2013).
[214] FWC (2013), Figure 3.
[215] Heinrich, G.L., D.R. Jackson, T.J. Walsh, and D.S. Lee. 2015. Southernmost Occurrence of the Suwannee Cooter, *Pseudemys concinna suwanniensis* (Testudeines: Emydidae). Journal of North American Herpetology 2015(1):53–59.

Suwannee cooters feed on a wide diversity of aquatic plants and algae.[216] Female turtles require 10–15 years to sexually mature, but their lives may exceed 30 years.[217] The nesting season extends from late March to early August, and female turtles may lay as many as 4–5 clutches of 8–27 eggs; however, few nests survive predation from raccoons and other predators.[218]

Threats to the Suwannee cooter include unlawful human collection, water pollution, riverine habitat degradation (impoundment, channel dredging, snag removal, siltation), collisions with motorized boats, and predation (both turtles and nests).[219]

The Suwannee cooter is currently state listed as a Species of Special Concern by the Florida Fish and Wildlife Conservation Commission, though it will lose this status once the FWC adopts Florida's Imperiled Species Management Plan, which is in the process of phasing out "Species of Special Concern" as a listing status.[220] It is currently unlawful to take Suwannee cooters from the wild.[221]

The Board must consider the Project's impact on the Suwannee cooter and its habitat when considering the environmental impacts of the Project. Specifically, the Board must consider the impacts to freshwater rivers and streams, as well as essential microhabitat such as basking logs. The applicant must provide substantial and competent evidence proving that the Project is not incompatible with the Suwannee cooter or its habitat.

American alligator

The Service listed the American alligator as an endangered species in 1967.[222] The alligator gained status as an endangered species in response to a massive decline in individuals, most of which was attributed to hunting and habitat destruction.[223] In 1987, the Service determined that the species was recovered and removed it from the endangered species list; however, the alligator is still protected under the ESA as "threatened due to similarity of appearance," to the American crocodile.[224] Due to its status as a threatened species, the Service continues to regulate the hunting, trade, and any goods made from the species.[225]

Alligators are greatly valuable to other animals that share their ecosystems. They create "gator holes," depressions in the marsh that retain water in the dry season.[226] Other species, including

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[216] FWC (2013).
[217] FWC (2013).
[218] FWC (2013).
[219] FWC (2013).
[220] FWC (2013); FWC (2016).
[221] FWC (2013).
[222] U.S. Fish & Wildlife Service, *American Alligator:* alligator mississippiensis, DEPT. OF INTERIOR, https://www.fws.gov/endangered/esa-library/pdf/alligator.pdf (Feb., 2008).
[223] FWS (2008).
[224] FWS (2008).
[225] FWS (2008).
[226] FWS (2008).

snakes, birds, and fish, use the gator holes as a source of water during the dry season or times of drought.[227] American alligators also play an important role in the native food webs as both predators and prey, linking aquatic and terrestrial food webs. Adult alligators are opportunistic feeders that prey on a wide range of species throughout their lives, including insects, mollusks, crustaceans, fish, amphibians, reptiles, birds, and mammals.[228] Small alligators serve as prey for many species, including the northern crested caracara and the eastern indigo snake.[229] The applicant must provide substantial and competent evidence proving that the Project is not incompatible with the alligator or its habitat.

Suwannee Moccasinshell

The Suwannee Moccasinshell is a freshwater mussel listed as threatened[230] under the US Endangered Species Act after being rediscovered in 2012 from a 16-year hiatus.[231] It is a small mussel usually not longer than 2 inches, oval in shape, with a greenish yellow or brown shell, turning browner as it matures.[232] This species appears to be restricts to the Suwannee River and its tributaries, from as far north as the Withlacoochee River System in southern Georgia to as far south as Manatee Springs.[233] The Suwannee Moccasinshell is a filter feeder, providing valuable ecological services by filtering water and providing food for other animals.[234] The US Fish and Wildlife Service issued a 12 month species assessment and proposed the Moccasinshell for listing as a threatened species under the Endangered Species Act.[235]

The decline of the species in the connected river basins is due to several factors. Among those is a shift in hydrologic flow combined with evidence of deteriorated water and habitat quality. This theory is also supported by the fact that the middle Suwannee subbasin is hydrologically stable and has mediated water quality from groundwater inputs that doesn't occur as frequently in the other subbasins of the Suwannee River Basin.[236]

Studies have shown that even the slightest disturbance in the turbidity of the basin can impact the behavior of the species.[237] In addition, land use changes in the Suwannee River basin can alter the hydrological flow and increase sediment and nutrient loads. These disturbances can lead to extinction and vulnerability of species like the Moccasinshell through habitat deterioration. As

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[227] FWS (2008).
[228] NatureServe. 2015. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia, http://www.natureserve.org/explorer.
[229] National Park Service, *Everglades National Park, Eastern Indigo Snake: Species Profile*, U.S. DEPT. OF INTERIOR, http://www.nps.gov/ever/learn/nature/easternindigosnake.htm [hereinafter *Everglades Eastern Indigo Snake*]; U.S. Fish & Wildlife Service at 4-223.
[230] US Fish and Wildlife Service. [2016]. Environmental Conservation Online System. Species profile for the Suwannee Moccasinshell (Medionidus walker) *available at* https://ecos.fws.gov/ecp0/profile/speciesProfile?spcode=F03T.
[231] Johnson, et al 1.
[232] FWS (2017).
[233] Johnson, et al, 6.
[234] Johnson, et al. at 1.
[235] Johnson, et al. at 2.
[236] Johnson, et al. at 9.
[237] Johnson, et al.

demands for water resources in development increase, the water tables degrade and threaten the species' survival.[238] Listed among these potential human-driven negative impacts is mine tailing pond failures, a "catastrophic event" that could lead to mortality of an already rare species.[239]

The Suwannee Moccasinshell depends on fish populations for gene dispersal. Human intervention into the river habitat can lead to a decrease in the host fish population, which as a result would lead to fragmentation of the darter. This is also impacted by any affects to the hydrological flow.[240]

Oval Pigtoe

The Oval Pigtoe is a small, freshwater mussel that can reach the length of 2.4 inches, with an oval-shaped yellow-brown shell and a pink inner section. The species has two large teeth. It filter-feeds on plankton and organic matter. The Oval Pigtoe is found in mid-sized rivers and small creeks with moderate currents and sandy or gravel beds. It is found in the Suwannee River System, as well as other river systems in Florida and Georgia.[241]

Human population and development pose several threats to the Oval Pigtoe. These freshwater filter feeders face threats with any concerns of chemical pollution since they ingest directly from their habitat. Further, any sort of habitat fragmentation separates the population and divides the mussels from algae and their host fish.[242]

This species is federally listed under the Endangered Species Act and is a Federally Designated Endangered Species by Florida's Endangered and Threatened Species Rule. It is one of the target species in a 7-species Florida Recovery Plan which specifies actions needed to recover the species per US Fish and Wildlife Service.[243]

iii. The Project does not comply with CCP objectives regarding the Suwannee River System 100-Year Flood Plain Special Planning Area

The impacts to occur to the Suwanee River System, including the wetlands and water quality impacts, are numerous. The County set out a specific set of policies and objectives to impact what the State of Florida has designated to be a body of water that warrants special protection. The mine will impact the wetlands, critical habitat for endangered species, water quality standards, and the public health at large. The BOCC should deny the permit in consideration of the protection of the Suwannee River System.

The Overall Goal of this section is:

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[238] Johnson, et al. at 2.
[239] Johnson, et al. at 10.
[240] Johnson, et al.
[241] Florida Fish and Wildlife Conservation Commission [FWC]. Undated d. Oval Pigtoe. http://myfwc.com/wildlifehabitats/imperiled/profiles/invertebrates/oval-pigtoe/.
[242] FWC, Undated.
[243] FWC, Undated.

> to protect and maintain the natural functions of the Suwannee River System (defined as the 100-year flood plain of the Santa Fe River as shown on the Future Land Use Plan Map) including flood water storage and conveyance, water quality assurance, and fish and wildlife habitat, while allowing for the appropriate use and development of the land.[244]

The Overall Goal of this section is:

> to protect and maintain the natural functions of the Suwannee River System (defined as the 100-year flood plain of the Santa Fe River as shown on the Future Land Use Plan Map) including flood water storage and conveyance, water quality assurance, and fish and wildlife habitat, while allowing for the appropriate use and development of the land.[245]

Objective S.2 states that the County shall take action to protect unique natural areas within the Suwannee River System including, critical habitat for fish and wildlife and unique vegetative communities.[246] Further, Policy S.3.1 states that the lands within its jurisdiction lying within the 100-year floodplain of the Suwannee River System are designated Environmentally Sensitive Areas.[247] Due largely to the incomplete maps presented in the CCP, the applicant has not, to date, conducted analysis in the MMP related to environmentally sensitive areas or flood zone and wetlands impacts.

The Suwannee River has been designated an "Outstanding Florida Waterway" by the Florida Department of Environmental Protection. Under Florida Statute Section 403.061(27), this designation affords special protection to a special category of waterbodies in the state because of their natural attributes. Activities or discharges which significantly degrade one of these Outstanding Florida Waterways must meet a more stringent public interest test, with a standard requiring that it is "clearly in the public interest." There are seven factors that must be considered in determining if the activity is not contrary to public interest under Section 373.414(1)(a). Included among these factors is "whether the activity will adversely affect the conservation of fish and wildlife, including endangered or threatened species, or their habitats."[248] It is clear from the above analysis that allowing this special permit would adversely affect what Florida has labeled to be a body of water that deserves special protections.

In other parts of the state, phosphate mining has proven detriment to water bodies. Metz (2009) found that the Peace River's flow has declined because much of the natural drainage system of its tributaries have been altered by phosphate mining.[249] The study found that tributaries like the Peace Creek Drainage Canal, Saddle Creek, Six-Mile Creek, Cedar, Bear, Hamilton, and Barber

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[244] CCP p. I-37.
[245] CCP p. I-37.
[246] CCP p. I-38.
[247] CCP p. I-39.
[248] Florida Department of Environmental Protection [FDEP]. 2015. Factsheet about Outstanding Florida Waters *available at* http://www.dep.state.fl.us/water/wqssp/ofwfs.htm.
[249] Metz (2009).

Branches, and Phosphate Mine Outfall CS-8 have all been altered as a result of phosphate mining.[250] The study makes a stark finding that:

> [a] component of the inflow to the upper Peace River has been lost because of altered drainage patterns, impoundment of water into clay-settling areas, and losses from these ponds due to evaporation.

The study also found that groundwater and surface-water interactions have been substantially altered because of groundwater use. Simply put, groundwater withdrawals for phosphate mining have reduced the potentiometric surface of the Upper Floridan aquifer, which has in turn affected how the Peace River and the underlying groundwater system interact. The Floridan aquifer is one of the world's most productive aquifers and serves Georgia, Alabama, South Carolina, and Florida – including Bradford County.[251]

Phosphate rock mining leads to reallocation and exposure of several heavy metals and radionuclides that become airborne or enter waterbodies. Yang (2014) found elevated levels of lead, manganese, and mercury in house dust, attributable to nearby phosphate mines.[252] Abdalla (2011) found wells downstream of phosphate mining activities had high concentrations of heavy metals, such as lead, cadmium, zinc, and nickel, when compared with upstream wells.[253] In general, the release of these heavy metals can have serious health implications.[254] Other studies have demonstrated that airborne fluorosis from phosphate mining can damage plants and kill animals.[255] And yet other studies show evidence of total phosphate and dissolved fluoride exceedances in waterways related to phosphate mining activities in the Hillsborough and Alafia river watersheds.[256]

Fluorides are found naturally in phosphoric ore. Fluoride dust dispersed from phosphorous mining can travel miles.[257] Fluorosis can be a chronic disease caused by continued small, but toxic amounts of fluorine consumed over a long period of time, or can manifest as acute poisoning due to inhalation of fluorine containing dust by the phosphate industry.[258] Effects of

[250] Metz (2009) at 77.
[251] Barr (1996).
[252] Yang, Q., H. Chen, and B. Li. 2014. Source Identification and Health Risk Assessment of Metals in Indoor Dust in the Vicinity of Phosphorus Mining, Guizhou Province, China. Archives of Environmental Contamination and Toxicology. Vol. 68. Iss. 1. pp 20-30.
[253] Abdalla, F.A. and I.H. Khalifa. 2011. Effects of phosphate mining activity on groundwater quality at Wadi Queh, Red Sea, Egypt. Arabian Journal of Geosciences. Vol. 6, Iss. 4, pp 1273-82.
[254] Al-Hwaiti, M., M. Al Kuisi, G. Saffarini, and K. Alzughoul. 2013. Assessment of elemental distribution and heavy metals contamination in phosphate deposits: potential health risk assessment of finer-grained size fraction. Environ Geochem Health.
[255] Dewey, S.H. 1999. The Fickle Finger of Phosphate: Central Florida Air Pollution and the Failure of Environmental Policy, 1957-1970. The Journal of Southern History, Vol. 65, No. 3 (Aug. 1999), pp. 565-603.
[256] Khare, Y.P., C.J. Martinez, and G.S. Toor. 2012. Water quality and land use changes in the Alafia and Hillsborough Watersheds, Florida, USA. Journal of the American Water Resources Association. Vol. 48, No. 6.
[257] www.merckvetmanual.com/mvm/toxicology/fluoride_poisoning/overview_of_fluoride_poisoning.html.
[258] Ulemale, A.H., M.D. Kulkarni, G.B. Yadav, S.R. Samant, S.J. Komatwar, and A.V. Khanvilkar. 2010. Fluorosis in Cattle. Veterinary World. Vol. 3(11): 526-27.

fluorosis include tooth and bone loss and lesions, and degenerative changes to the kidney, liver, adrenal glands, heart muscle, and central nervous system.[259]

Additionally, a study done by FIPR in 2001 discusses impacts to water quality, explaining that the major reagents used in phosphate beneficiation include fatty acid (to collect the phosphate), amine (to collect the sand), fuel oil (as an extender), sodium silicate (to depress sand), soda ash or ammonia (to modify pH), and sulfuric acid (for washing away the collector on the rough concentrate). Multiple pounds of each of the above additives are used per each ton of phosphate, and since phosphate operations produce millions of tons annually, millions of pounds of the reagents are used annually. It is estimated that 30 percent of the reagents are unaccounted for and may be released into the environment. This same study detected fuel oil in groundwater samples of surficial aquifer and intermediate aquifer wells that had been installed in active and inactive sand tailing areas (FIPR 2001).

The applicant has not submitted competent and substantial evidence that the Project will not cause a degradation of water quality and will not cause adverse impacts on water quantity within the affected watershed. Instead, the evidence before the Board suggests that the Project may cause adverse impacts and that the public would be best served by maintaining the existing land use. An acceptance of this MMP would be an acceptance that the Project will not degrade water quality without any explanation or proof. They merely state that there will be monitoring implemented in the reclamation process.[260] This monitoring statement is without details or a showing that this will restore the land to its quality prior to mining, a standard upheld by the CCP.[261]

III. The Board must deny the Project because it is not in the best interest of the public's health, welfare, or safety

The Board should take into consideration the benefits and detriments of phosphate mining when making a permitting decision. Phosphate mining produced phosphogypsum, as described above, which could take decades to reclaim. Further, there is no guarantee that the land will return to its pre-mining state once the land is considered "reclaimed." As described previously, water quality impacts affect the health of the community, leading to bone and central nervous complications, among other health concerns discussed in the Mapham 2010 study. Further, stock in phosphate mining companies is declining, and there are fewer phosphate mining companies today than there were a mere 20 years ago. Future assessments predicate this business to decline further as the years go on. The Board should take into consideration the amount of detriment done to the future of the community for the benefit of an industry with an uncertain future.

There are about 1 billion tons of radioactive phosphogypsum in Florida. That's enough to give every man, woman and child in Indonesia, Brazil and Pakistan, one ton of phosphogypsum each. The phosphogypsum is stored in 25 stacks scattered around Florida. The industry produces and

[259] Mapham (2010).
[260] MMP p. 33.
[261] CCP p. I-21/2

will continue to produce about 30 million more tons each year.[262] In 1994, 150-foot deep sinkhole opened up beneath a central Florida stack containing 80 million tons of radioactive waste which slipped directly into the aquifer below it. One stack can cover 500 acres and be 240 feet tall.

The MMP does not mention the use of phosphogypsum stacks, however, the Board has some responsibility to consider the fact that the radioactive byproduct of the phosphate mining that will occur on the project site will have to be sent and stored somewhere. There's no long term solution for what will be done with the 1 billion tons (and growing) of radioactive waste generated by the process. Indeed, the EPA's recent settlement agreement with Mosaic, calling for $2 billion to remedy violations with respect to existing phosphogypsum stacks is a stark reminder that while the applicant may not be here forever, the environmental damage left in its wake will.

Also relevant to the public interest question is the future longevity of phosphate mining in Florida and this applicant in particular. There is consensus that the world's phosphate rock supply is finite and that in order to meet global demand for the agricultural sector, greater recycling of and sustainable use of phosphorus will be necessary.[263]

In 1990, there were 11 phosphate companies operating in Florida; by 2004, there were three.[264] Today there appears to be only two, Mosaic and HPS II (which has yet to break ground). The stock for Mosaic, the largest phosphate company in the United States, has gone down 63% in last five years.[265] Chatsko argues that Mosaic's stock could continue to fall because the phosphate market is depressed, which has caused Mosaic to increase volume to maintain revenue levels. Furthermore, in 2014, when Mosaic was 283 on the Fortune 500, it was rated the 7th worst stock investment in a top 20 worst stock investment list by Fortune after it settled class action lawsuits for violating antitrust laws and share prices declined 15 percent.[266] Another, August 2016 assessment, predicted that Mosaic's earning would drop 81 percent this year.[267]

Conclusion

Please give due consideration to the overwhelming public opposition to this proposed mine, the potential harm to endangered species and their habitats, and the requirements of the CCP and LDRs. In light of this information, the Board must deny the permit, or alternatively, implement a moratorium on processing mining permit applications to allow for further consideration and the enactment of an adequate land development regulation scheme.

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[262] www.fipr.state.fl.us/about-us/phosphate-primer/phosphogypsum-and-the-EPA-ban/.
[263] Cordell, D. and S. White. 2013. Sustainable Phosphorous Measures: Strategies and Technologies for Achieving Phosphorus Security. Agronomy 3, 86-116.
[264] Brown (2005).
[265] Chatsko, M. 2016. 3 Reasons why the Mosaic Company's stock could fall. The Motley Fool. June 9, 2016.
[266] Gandel, S. 2014. Fortune 500: 20 biggest stock loses. Fortune.com. June 2, 2014. Fortune.com/2014/06/02/500-worst-stocks/.
[267] Amigobulls. 2016. Time to Take Chance on the Fertilizer Stocks? Amigobulls.com/news/time-to-take-a-chance-on-the-fertillizer-stocks.

Thank you for considering these comments. Please do not hesitate to contact me any questions or concerns at jlopez@biologicaldiversity.org or 727-490-9190.

Sincerely,

Jaclyn Lopez
Florida Director, Senior Attorney
Center for Biological Diversity
P.O. Box 2155
St. Petersburg, FL 33731
727-490-9190
jlopez@biologicaldiversity.org