Sept 16, 2022

Open letter to the Georgia Community:

Currently, the Georgia Environmental Protection Division (EPD) is reviewing permits that would authorize Twin Pines Minerals LLC, an Alabama mining company, to extract heavy minerals from Trail Ridge that forms the eastern border of the Okefenokee National Wildlife Refuge.

As members of the scientific community, we are in no position to opine on the ultimate question – whether the mine is in the best interests to the people of Georgia; however, we are sufficiently familiar with the environmental complexities of the region, including the water system and the geology, that we are compelled to voice our concerns about the environmental impacts of this mine.

Most of us have experience studying various aspects of the Okefenokee Swamp. All of us appreciate the need to preserve and protect iconic natural resources like the Okefenokee, which contribute so much to the recreational economy, educational capital, and social fabric of South Georgia.

Although we are not opposed to mining *per se,* it does give us pause when a mine is located close to a water body that has major recreational, economic, environmental, and scientific value. In 1986 the Okefenokee National Wildlife Refuge was designated as a "Wetland of International Importance" by the RAMSAR Wetlands Convention. The 165,000-hectare (ha) Okefenokee Swamp includes 6 wetland classes and 18 subclasses, and its 143,000 ha of designated wilderness make it the third largest federal Wilderness Area east of the Mississippi River.

There is debate on the effect of the mine on the hydrology of the area, but *even if the water levels do not drop*, mining in the vicinity of the Okefenokee will cause the following issues:

1. Mining will impact the tourism and economy dependent on Okefenokee Swamp.
2. Mining will substantially degrade the dark night skies for which the area around the Swamp is famous and which attract amateur astronomers from long distances.
3. As reported for other National Wildlife Refuges, nearby development activities will disturb habitat use by birds in Okefenokee.
4. Mining will destroy habitat for threatened and endangered species including gopher tortoises, indigo snakes, round-tailed muskrat, red-cockaded woodpecker, and possibly flatwoods salamanders, and habitat with the Swamp ecosystem.

With regards to the hydrology of the Okefenokee region, the scientific evidence tells us:

1. Trail Ridge acts as an earthen dam that creates the swamp itself. It does this by redirecting surface water drainage and slowing surficial groundwater movement, creating a backwater effect.

2. Digging up Trail Ridge and then replacing it post mining will mix the existing layered sands, clays, and organic matter. This makes Trail Ridge more porous and thus more conductive to water, lessening its ability to hold water. This will alter groundwater flows through Trail Ridge and possibly lead to permanently lower water levels in the Swamp, depending on the spatial extent

of such modification. The leakage through the modified Trail Ridge means that water pumped by the mining activity will largely derive from the Okefenokee Swamp.

3. The mining permit proposes to pump 1.44 millions of gallons per day (MGD) of groundwater, which is the approximately daily need of a town of 19,000 people. This is projected to cause the water table in the Floridan Aquifer underlying the swamp to lower by as much as 9 feet. One-year post-pumping, the aquifer under the swamp will still be 1.3 feet lower than pre-pumping levels. This aquifer drawdown will create a downward hydraulic gradient from the Swamp and will cause a drop in Swamp water levels as a result.

4. Mining will directly destroy wetlands and intermittent streams on Trail Ridge, replacing them with poor soils and low productivity forests.

Therefore, we are concerned that by both destroying the structural integrity of Trail Ridge and pumping the underlying aquifer, the water level of Okefenokee Swamp will go down. Lowered water levels cause the following issues:

1. Mining will make the Okefenokee Wilderness Canoe Trails impassable, eliminating access to the swamp for outdoor recreation and natural resources management. The average water depth in the Okefenokee is 1.64ft, and the Okefenokee at St Mary's are very sensitive to drought, making minor changes in water inflows noticeable.
2. Mining will impact the water quality of the Okefenokee Swamp and downstream rivers, including the St Mary's and Suwannee Rivers, through release of stored chemicals, including toxic heavy metals.
3. Mining will increase fire risk to both the swamp and nearby private property, including timber and blueberry farms.

Twin Pines has produced reports to analyze the impact of the proposed mine. In our opinion, these studies are flawed in that:

1. The groundwater recharge rate used to model groundwater flow is too low and improper;
2. The connectivity of the underlying aquifers is not clearly established;
3. These studies do not align with established research, and they have not been peer-reviewed.

The US Fish and Wildlife Service has stated:
"concerns that the proposed project may pose risks to the Okefenokee National Wildlife Refuge (OKENWR) and the natural environment due to the location, associated activities, and cumulative effects of similar projects in the area. We opine that the impacts are not sufficiently known and whatever is done may be permanent."

Official documentation surrounding the mine and permit process can be found here:
https://epd.georgia.gov/twin-pines

It is important to note that this proposal is for a "demonstration mine" and that Twin Pines plans to continue mining after this initial ask. Given the complexity of the water system and geology in and around the Okefenokee Swamp, this plan cannot be viewed in isolation, but rather as the start of a larger operation.

The geographic features underlying the area have been shaped over the past several thousand years by powerful coastal forces. Unless a comprehensive study is performed that takes a hard look at the hydrologic functions of this region, it will be impossible to say that the proposed mine, which would be located less than three miles from the Okefenokee, will not jeopardize the Swamp and surrounding areas. There is certainly no agreement that the mine will not be harmful – which should be enough to give pause to any mining permits.

Importantly, a majority of the established research supports the claims that mining close to the swamp has a high likelihood of causing permanent damage to the swamp and surrounding areas.

We stand by to offer additional scientific expertise and advice on this issue.

Until the science proves otherwise, we are opposed to mining in the vicinity of the Okefenokee Swamp. In science,

1. Amy Sharma, PhD, Vice President, Science for Georgia
2. Rich Adams, Assistant Professor of Bioinformatics
3. Carla Atkinson, PhD in Ecology and Evolution
4. Heidi Banford, PhD, Associate Professor, University of West Georgia
5. David Bechler, Retired Biology Professor
6. Michael Bender, PhD in wildlife ecology
7. Jon Benstead, Professor of Biological Sciences
8. Bradley J. Bergstrom, PhD, Professor of Biology, Valdosta State University
9. Emily S Bernhardt, James B. Duke Professor of Biology
10. Marsha C. Black, PhD Ecology, Assoc Prof Emeritus, UGA
11. Dr. Michael S. Bodri, Professor of Biology, Director of the Environmental Leadership Center, University of North Georgia, resident of Hall County, GA
12. Jamie Bucholz, PhD student in Biological Sciences, The University of Alabama
13. Christian B. Burch, Graduate Student, Valdosta State University
14. Aram JK Calhoun, Professor Emerita Wetland Ecology and Conservation
15. Ron Carroll, PhD Ecology, Professor Emeritus University of Georgia
16. Burchard D. Carter, PhD, Emeritus Professor of Geology, resident of Americus, GA
17. Alan P. Covich, PhD in Ecology, Professor Emeritus, University of Georgia
18. Christopher Craft, Janet Duey Professor of Rural Land Policy, O'Neill School of Public and Environmental Affairs, Indiana University, Bloomington
19. Janice Crook-Hill, PhD, Assistant Professor of Biology, resident of Cumming, GA
20. Evan H. DeLucia, G. William Arends Professor Emeritus of Plant Biology
21. Ms. Paula Denissen
22. Dominic L. DeSantis, Ph.D. in Ecology and Evolutionary Biology, Assistant Professor, Georgia College & State University
23. Dereth Drake, PhD, Professor, Valdosta State University
24. Andrew Edelman, PhD, Associate Professor of Biology, Certified Wildlife Biologist, resident of Carrollton GA
25. John Elder, Professor of Biology
26. Jason Evans, Institute for Water and Environmental Resilience, Stetson University
27. Frank M. Fontanella, PhD, Associate Professor, University of West Georgia

28. Janet Genz, Ph.D., Associate Professor of Biology, University of West Georgia
29. Stephen W Golladay, PhD in Aquatic Biology, resident of Bainbridge GA
30. Erin Grabarczyk, PhD
31. Theresa Grove, PhD, Marine Biology, resident of Valdosta, GA
32. Randa Harris, Geology Senior Lab Coordinator
33. Vincent Harvey, Student, Georgia Institute of Technology
34. Joseph J. Hendricks, PhD in Ecology, resident of Carrollton, GA
35. David W Hicks, Georgia PG 001624, U.S. Geological Survey (ret), Jones Environmental Research Center (ret)
36. Charles Hopkinson, Professor Emeritus, UGA, Athens, GA
37. Garrett Hopper, PhD in Biology, resident of Tuscaloosa, AL
38. C. Rhett Jackson, John Porter Stevens Distinguished Professor of Water Resources
39. Leslie S. Jones, PhD, Associate Professor of Biology, Valdosta State University
40. Betty Jean Jordan, PE, resident of Monticello, GA
41. Kasey Karen, PhD in Microbiology, resident of Milledgeville, GA
42. Debra Kean, Professor
43. Leeann Kelley, MS, Senior Lecturer of Biology, resident of Millledgeville, GA
44. Elizabeth King, PhD, Associate Professor of Ecology, resident of Athens, GA
45. Chris Kodani, Associate Professor of Biology, Clayton State University
46. Lora L.Smith, PhD in Wildlife Ecology, resident of Bainbridge, GA
47. J. Mitchell Lockhart, PhD, Professor of Biology, Valdosta State University
48. Dennis W. Marks, Ph.D., Professor Emeritus of Physics, Astronomy, and Geosciences, resident of Valdosta GA
49. Ronald H. Matson, PhD., Professor of Biology Emeritus, Kennesaw State University
50. Karen McGlathery, Professor, Director Environmental Resilience Institute, University of Virginia
51. J. Patrick Megonigal, PhD, Affiliate Faculty George Mason University
52. Ronald Mickens, Professor of Physics, Clark Atlanta University, Atlanta, GA
53. Matthew R. Milnes, PhD, Assistant Professor of Biology, Georgia College & State University
54. J. Mohan, PhD in Ecology, Associate Professor, University of Georgia, Athens, GA resident
55. Richard W. Morgan, Wetlands Biologist, Retired, US Army Corps of Engineers
56. James Morris, Distinguished Professor Emeritus of Biological and Marine Sciences
57. James Morris, PhD in Forestry and Environmental Studies, Yale University. , Research Professor and Distinguished Professor Emeritus, University of South Carolina and signing as a concerned citizen
58. James Nienow, PhD in Biology, resident of Valdosta GA
59. Michael G. Noll, PhD, Professor of Geography, Valdosta State University (VSU)
60. Carl Ohrenberg, PhD in Chemistry
61. Brian Orland, Retired Distinguished Professor of Landscape Architecture, resident of Athens, GA
62. Michael Pace, Professor in Ecology
63. Rena Ann Peck, M.S., Ecologist & Executive Director of Georgia River Network
64. Thomas Potter PhD, Principal Scientist
65. Dr. John G. Phillips
66. Indiren Pillay PhD, Professor of Microbiology, Georgia College
67. Francis Edward Putz, Distinguished Professor of Biology, University of Florida
68. JT Pynne, PhD, Wildlife Biologist, Georgia Wildlife Federation
69. David Radcliffe, Professor Emeritus
70. Todd Rasmussen, PhD, Hydrology & Water Resources, Watkinsville GA
71. James Reichard, Ph.D., Professor of Geology, Georgia Southern University

72. Randal E. Riebel, PE, F.NSPE, GSPE President
73. Dr. Stanley R. Riggs, Distinguished Research Professor, East Carolina University
74. Amy Rosemond, PhD, Distinguished Research Professor, Odum School of Ecology, University of Georgia, resident of Athens, GA
75. Kenneth S. Rumstay, Professor Emeritus of Astronomy, Valdosta State University
76. William H Schlesinger, Dean, Emeritus, the Nicholas School of the Environment, Duke University
77. Brian Silliman, , Rachel Carson Distinguished Professor of Marine Biology,
78. Megan Sims, Graduate student
79. Alan F. Smith, PhD, Professor (retired), Biology, Mercer University
80. Bruce A. Snyder, PhD in Ecology, resident of Milledgeville, GA
81. Shannon Speir, Postdoctoral Research Associate, University of Alabama
82. George E. Stanton, Ph.D., Emeritus Professor
83. Theresa Storey, Lecturer of Biology
84. Ruth Ann Tesanovich, MLS(ASCP), Medical Laboratory Scientist, UGA (retired)
85. Donald Thieme, PhD, Professor of Geology, resident of Valdosta GA
86. Merritt Turetsky, PhD, Professor, University of Colorado Boulder
87. Alan Weakley, Adjunct Associate Professor, University of North Carolina at Chapel Hill

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