

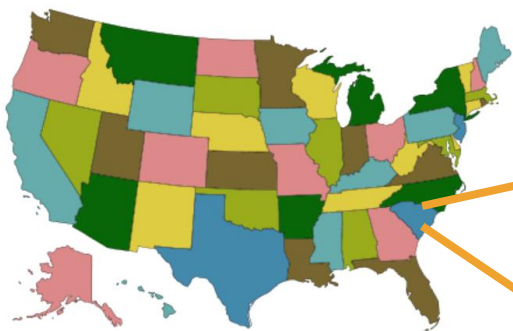
# Legacy Gold Mining in South Carolina

**Gwen Geidel<sup>1</sup>**

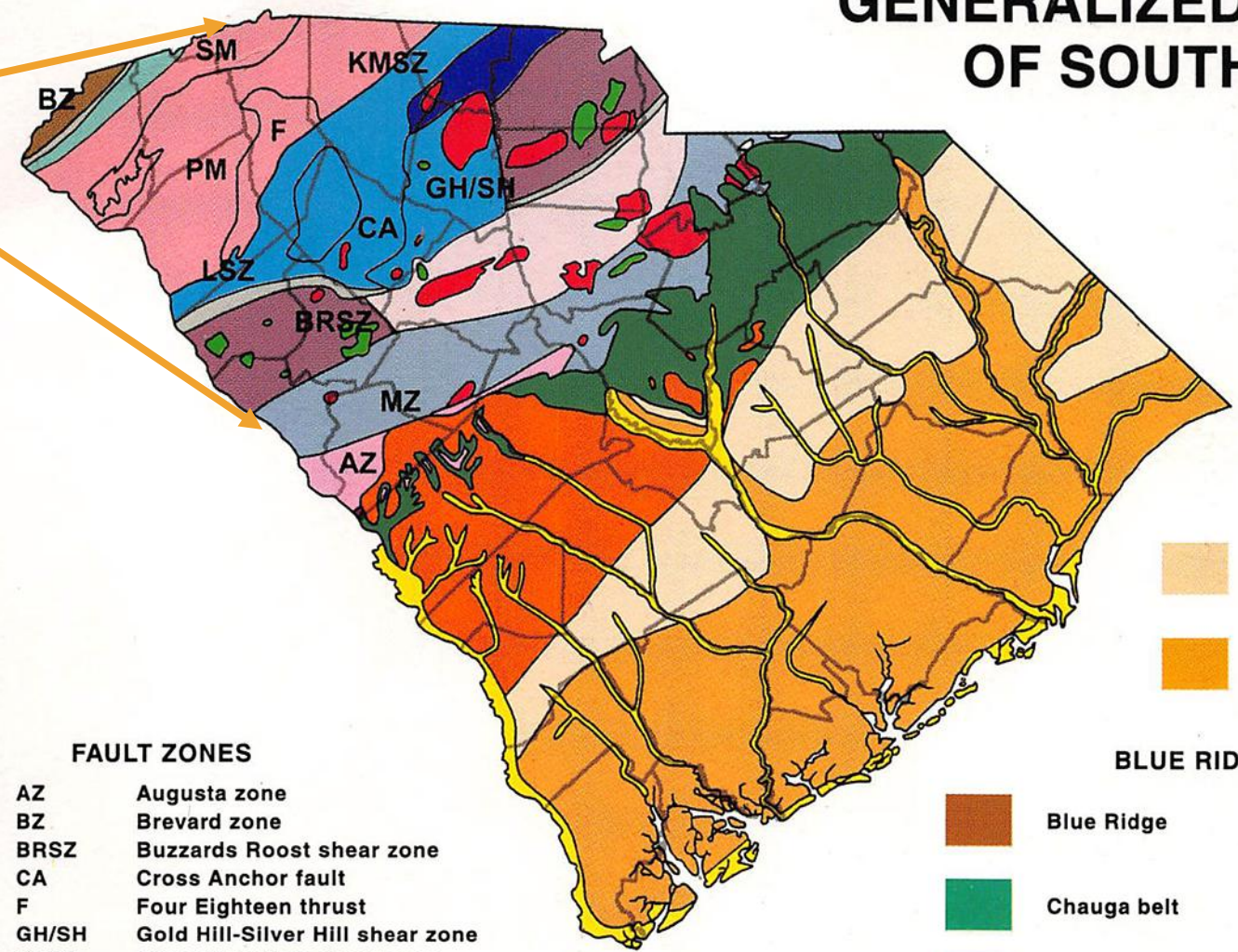
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# GENERALIZED GEOLOGIC MAP OF SOUTH CAROLINA







- FAULT ZONES**
- AZ Augusta zone
  - BZ Brevard zone
  - BRSZ Buzzards Roost shear zone
  - CA Cross Anchor fault
  - F Four Eighteen thrust
  - GH/SH Gold Hill-Silver Hill shear zone
  - KMSZ Kings Mountain shear zone
  - LSZ Lowndesville shear zone
  - MZ Modoc zone (Eastern Piedmont fault system)
  - PM Paris Mountain thrust
  - SM Six Mile thrust

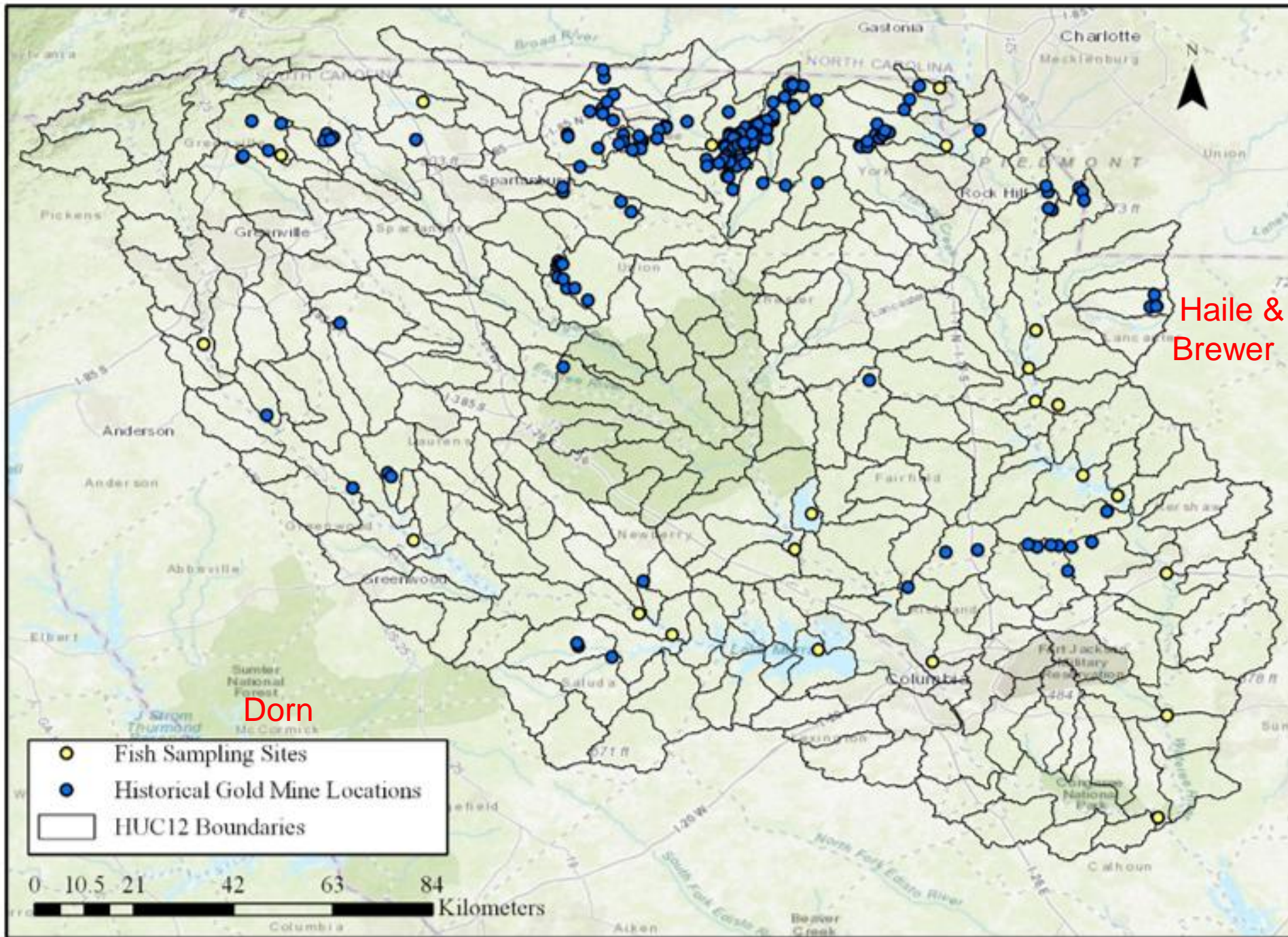
- IGNEOUS ROCKS**
- Gabbro
  - Granite

- COASTAL PLAIN**
- QUATERNARY**
- Recent
  - Pleistocene
- TERTIARY**
- Pliocene
  - Paleocene, Eocene, and Miocene
- CRETACEOUS**
- Upper Cretaceous
- TRIASSIC**
- Triassic basins

- BLUE RIDGE AND PIEDMONT**
- Blue Ridge
  - Chauga belt
  - Inner Piedmont terrane
  - Kings Mountain terrane
  - Charlotte terrane
  - Eastern Charlotte terrane
  - Carolina terrane (Slate belt)
  - Savannah River terrane
  - Augusta terrane




# The Carolina Slate Belt has hosted most of SC's gold mining activity.

-  The Early Days: Early 1800's, mostly placer mining and small scale hydraulic mines. Slate Belt, Piedmont & west
-  ~1827, Gold was discovered by Benjamin Haile, lode (vein) deposits; shaft and later first open pit mine in SC.
-  ~1828, the Brewer deposit was discovered about 17km NE of Haile.
-  1852 - 1859, the Dorn mine near McCormick, SC. Shafts and trenches.

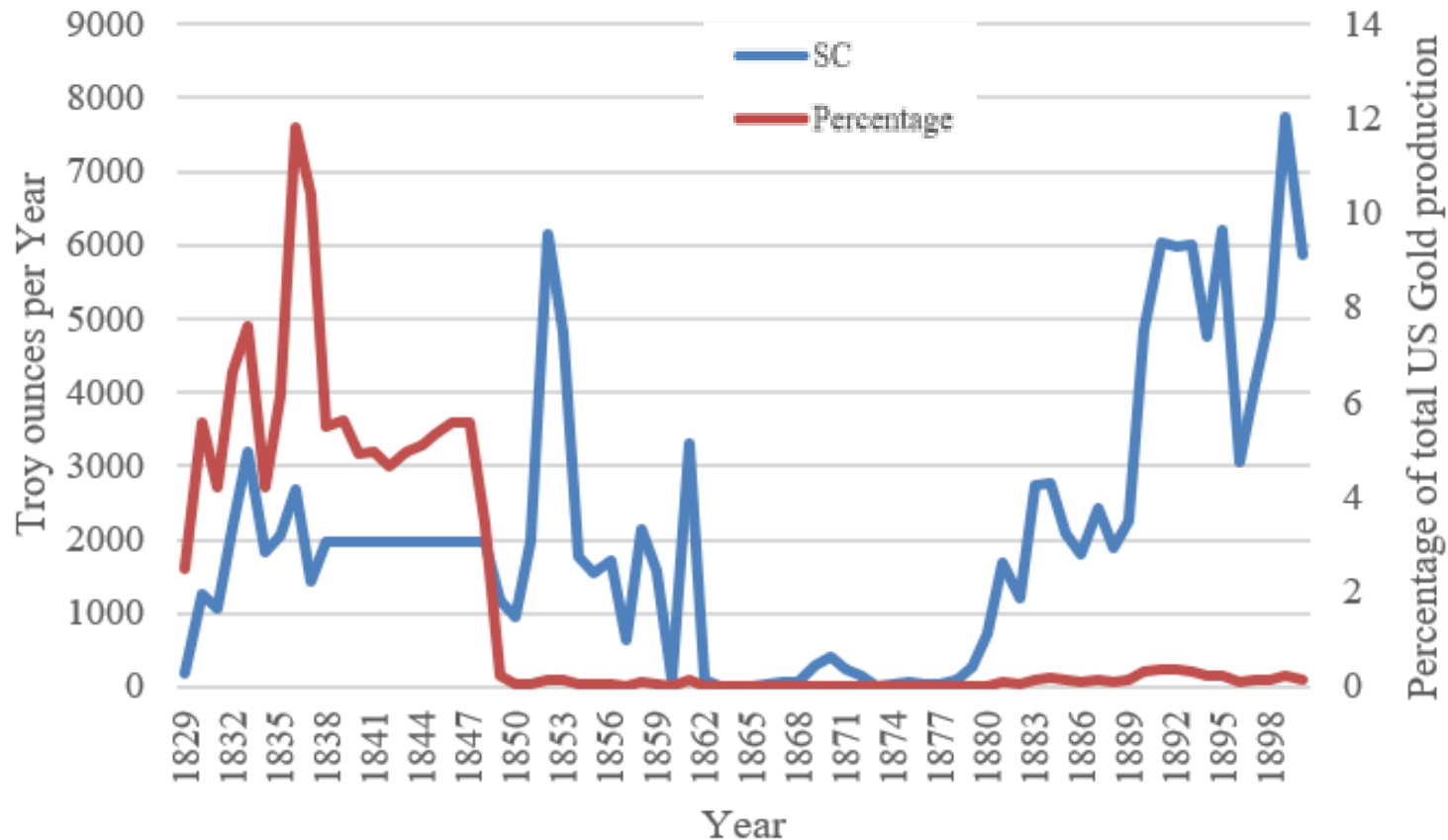


Western central  
SC showing  
historic gold  
mine sites

# SC Gold mining declining in 1850 after the discovery of gold in CA

-  CA Gold Rush (1848-1855) drew many miners to the west coast.
-  During the Civil War (1861-65) the Haile mine destroyed by General Sherman.
-  1880s – mining returned; Haile and Brewer with investments from the North.

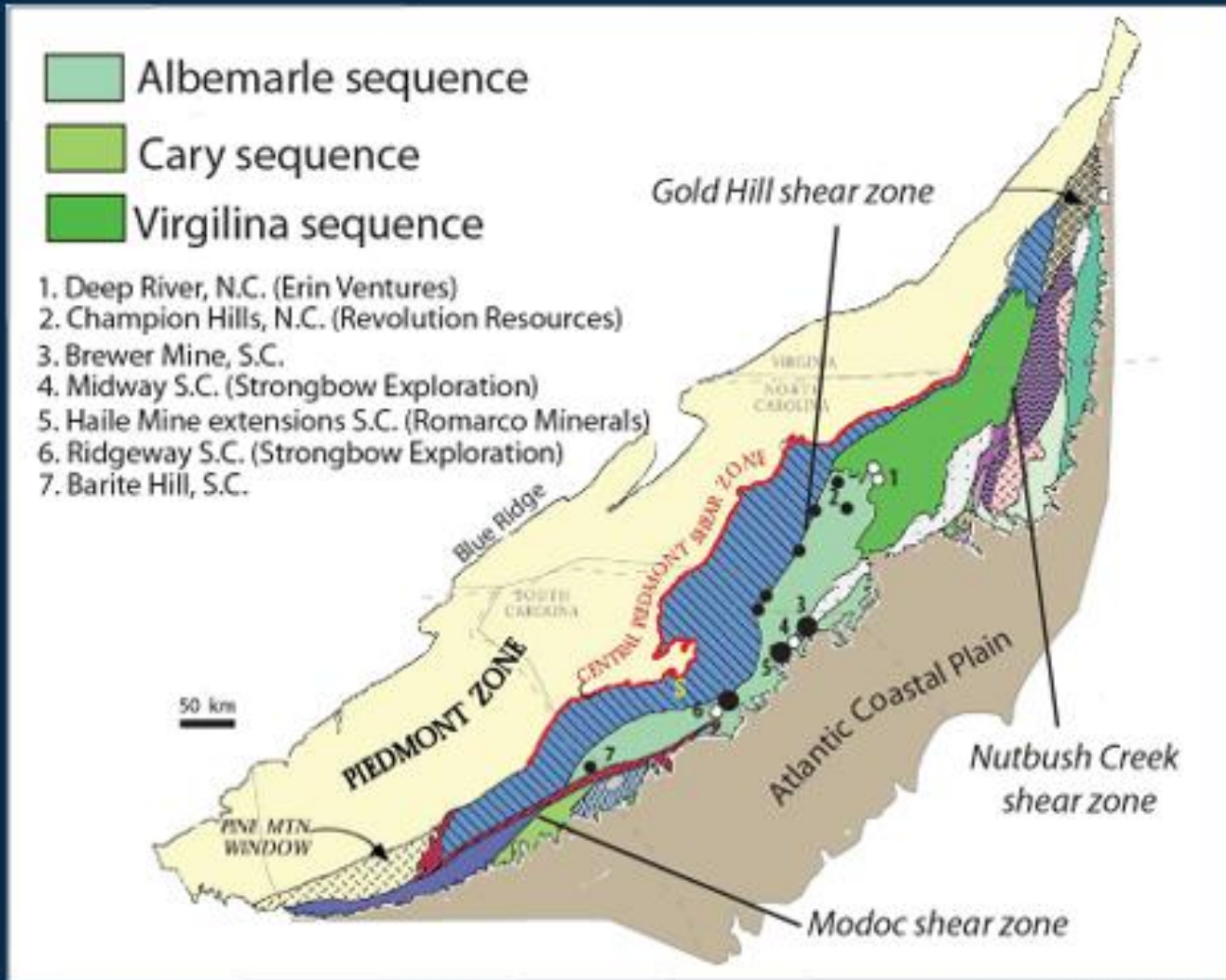
19th Century Gold Mining in South Carolina



Historical trends in SC gold mining production as both the total amount of gold produced annually and the percentage of the US total gold production from 1827 to 1900.

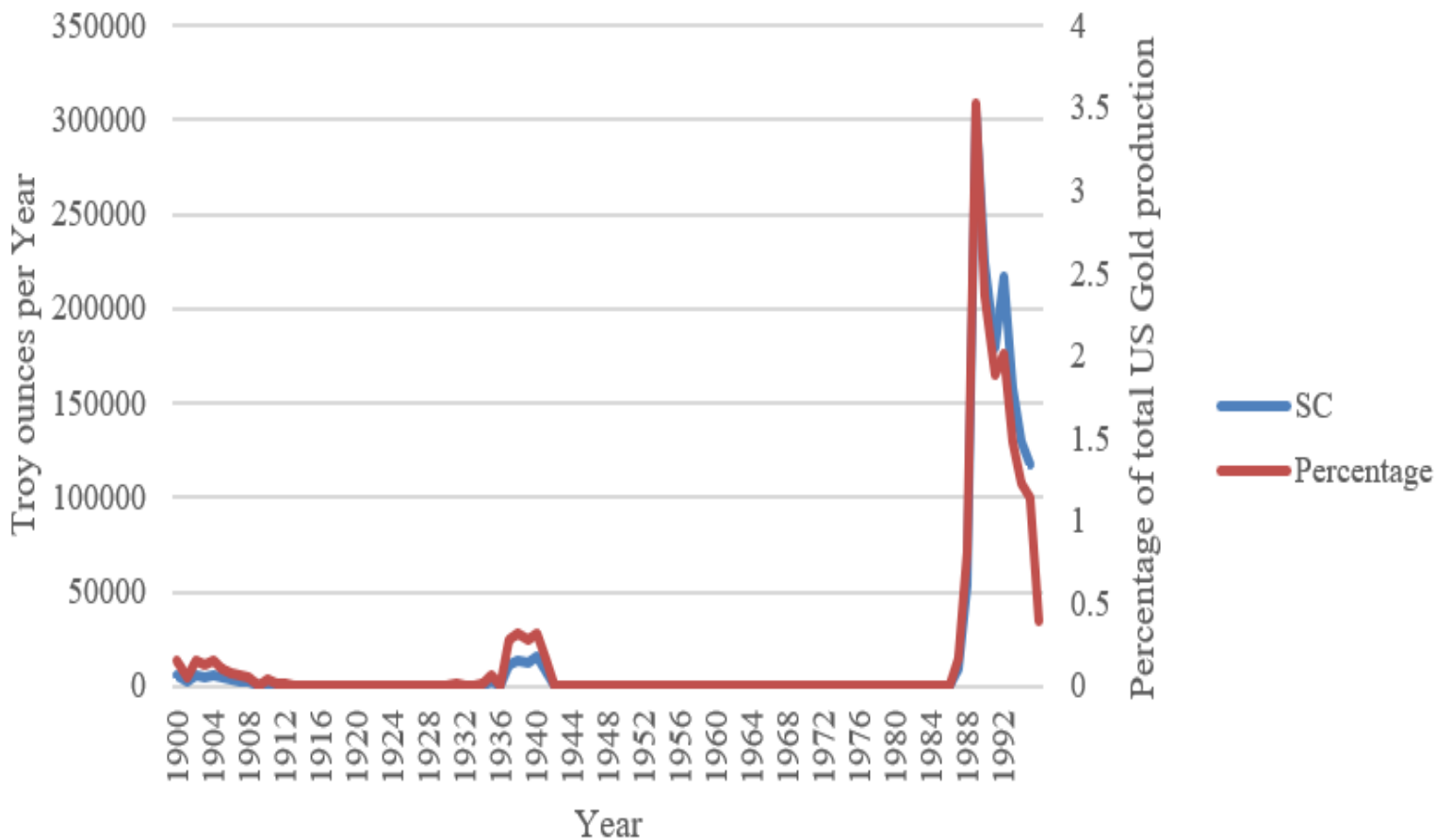
(McGuire, 2017, citing Craig and Rimstidt 1998).

# Terrane distributions in the Carolina Zone and mineral mine sites



SC Gold mining from 1900s concentrated in the Carolina Zone or Carolina Slate Belt, geologic zone of Precambrian and Cambrian (~550 Ma) volcanic rock stretching from VA to eastern AL (green).

## 20th Century Gold Mining in South Carolina



Historical trends for gold mining in South Carolina from 1900 to 1995. Both production and percentage of the US total gold production are represented.

(note change in scale)

McGuire, 2017, citing Craig and Rimstidt 1998.

# Environmental Impacts of Legacy Gold Mining in SC

Mercury (Hg) :

Amalgam (Au,Hg) created, roasting (airborne Hg) and loss to environment (water, soil, sublimation)

1800s

1900's

Metals & Acid Mine Drainage

- Reclamation issues
- CERCLA / Superfund sites

# 1800s – Mercury in Gold Mining

## Amalgamation Process:

1. Crush Gold Ore to powder
2. Add liquid Mercury (Hg) to form amalgam with Gold (Au)
3. Collect amalgam
4. Separating the Au and Hg
5. Recycling Hg – pressed through cloth or heated in retort.

# What is the impact of Hg on the current environment in SC?

“..., I have rarely examined the water, as it escapes from the riffle [of gold mines in SC], without finding both mercury and gold” (Tuomey, 1848).

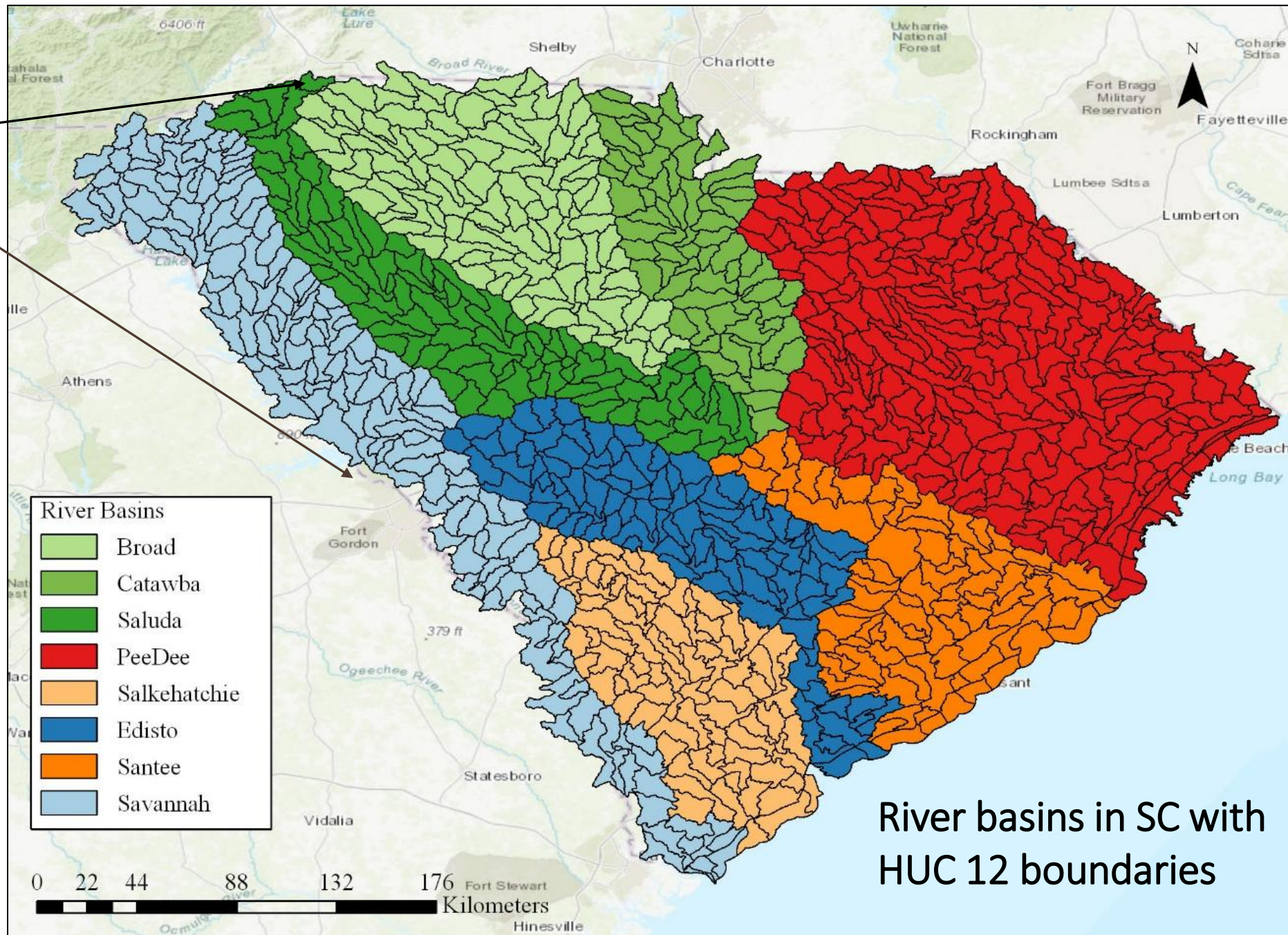
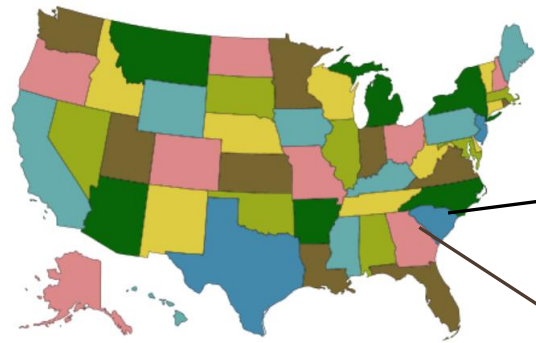
Recent studies have shown Hg in stream & floodplain sediments in SE.

Hg can be transformed into methylmercury (MeHg):

a neurotoxin which bioaccumulates up the food chain and is most associated with aquatic ecosystems.

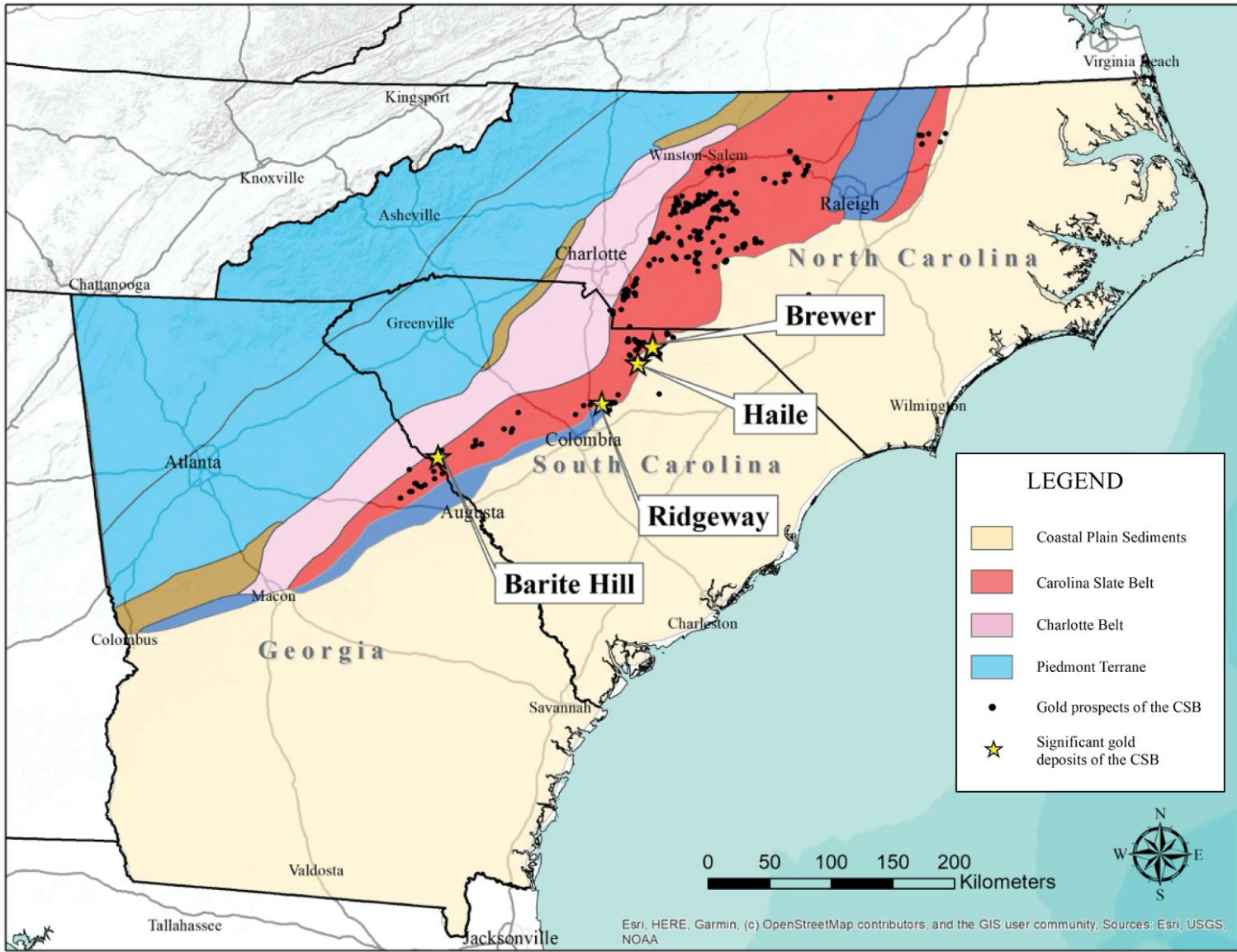
Bioaccumulation leads to increased MeHg in older fish or those species higher up the trophic level.

Iron and sulfate reducing bacteria are the primary the sources of MeHg methylation.



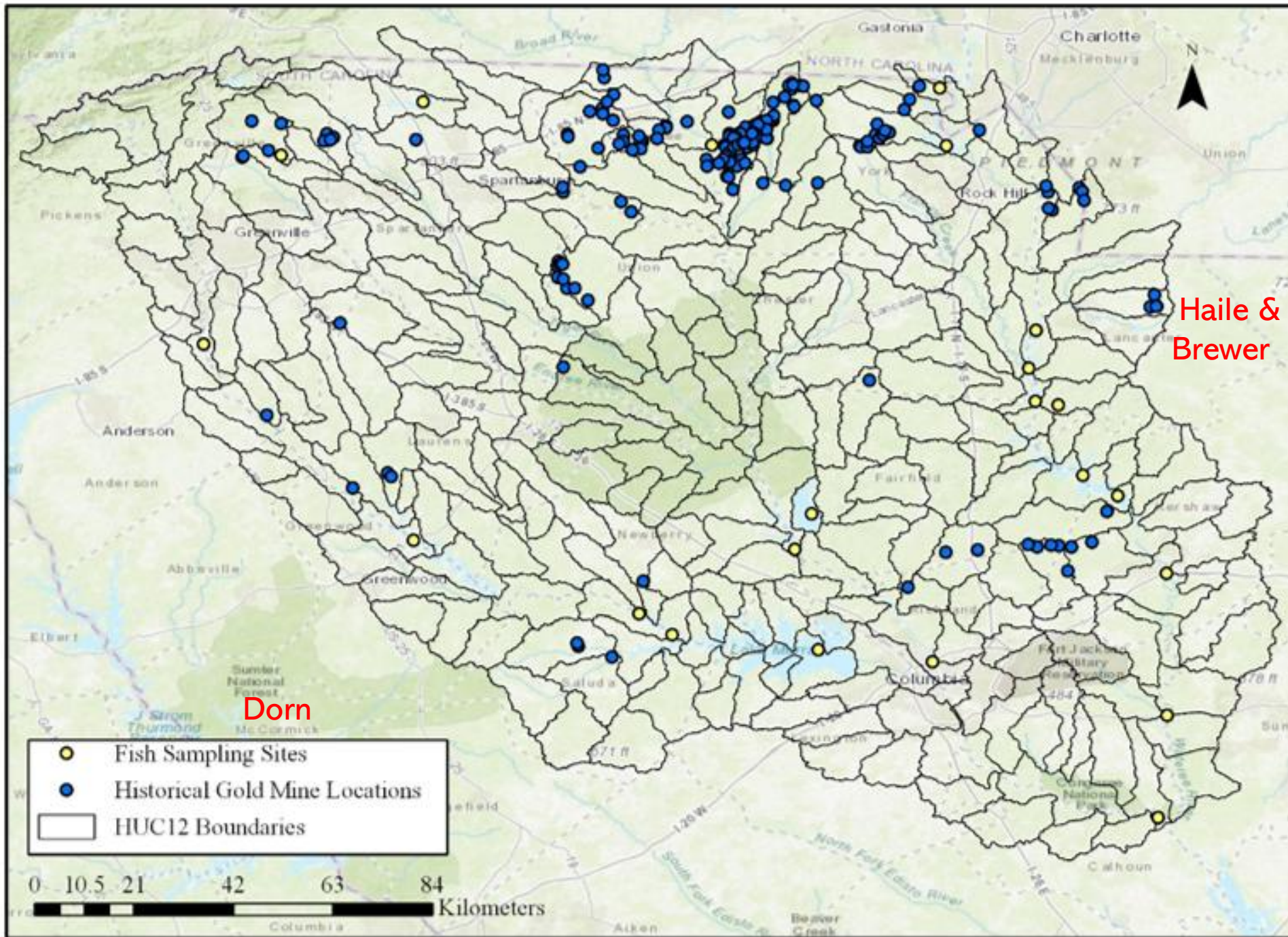
River basins in SC with HUC 12 boundaries

To assess the impact of historic Au mining on the accumulation of MeHg in fish, the watersheds in green were assessed for whether the Hg in fish could be attributed to historic Au mining.



The watersheds assessed did not study the Savannah River watershed, which would include the former Dorn and Barite Hill mines.

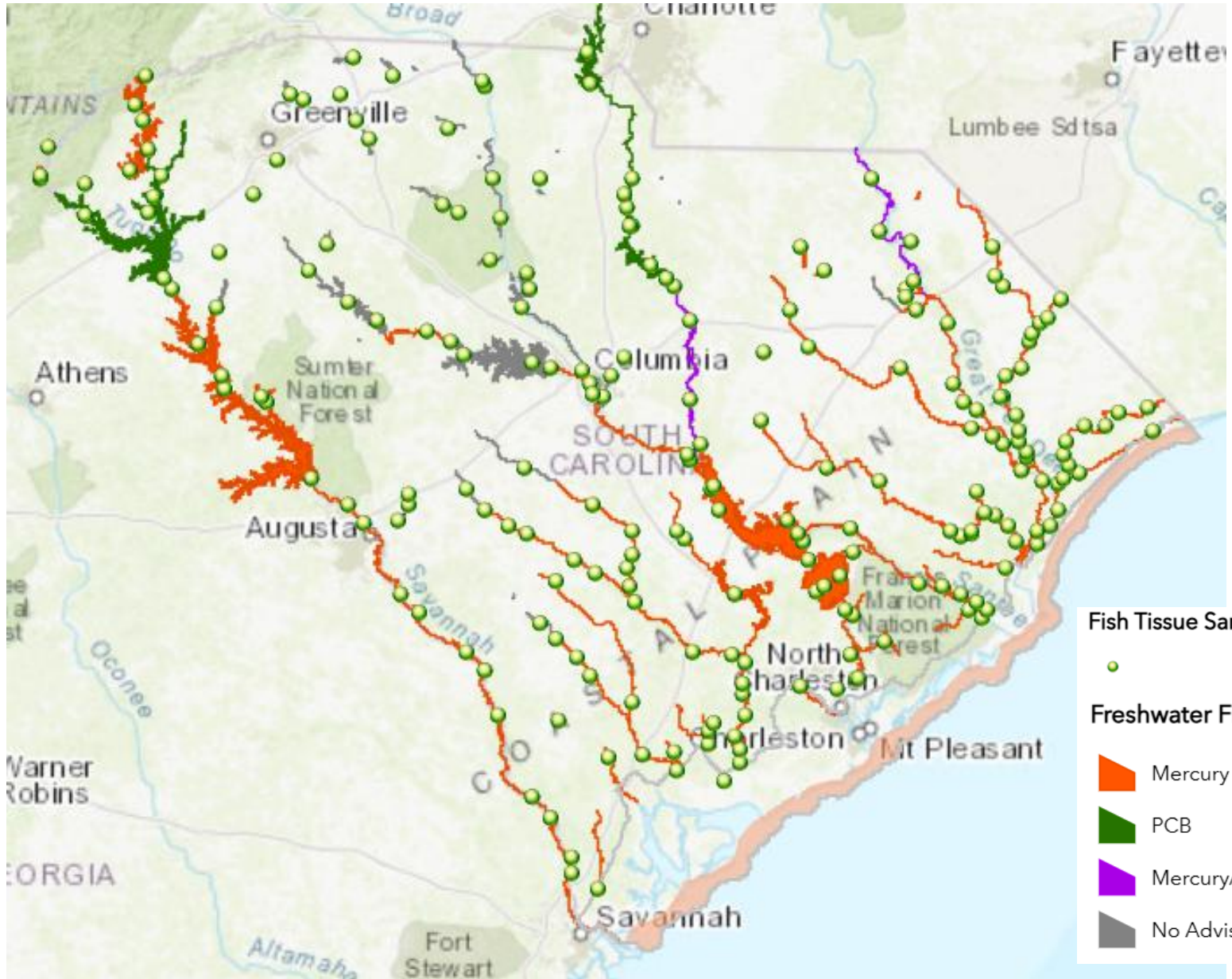
Although current gold mines are associated with the Carolina Slate Belt, historically gold has also been mined in the Charlotte Belt and Piedmont.



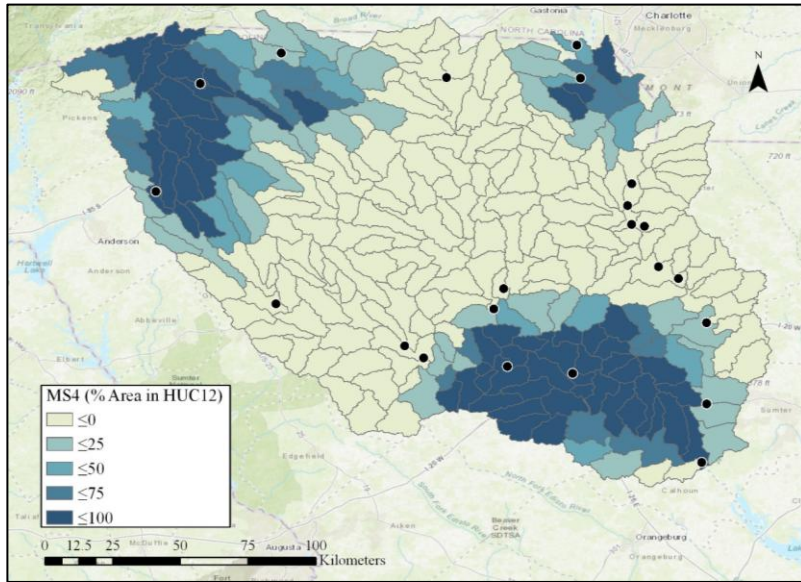
Broad, Saluda  
and  
Catawba  
watersheds  
showing historic  
gold mines and  
fish sampling  
sites

# SC Mercury Fish Consumption Advisories, 5/2025

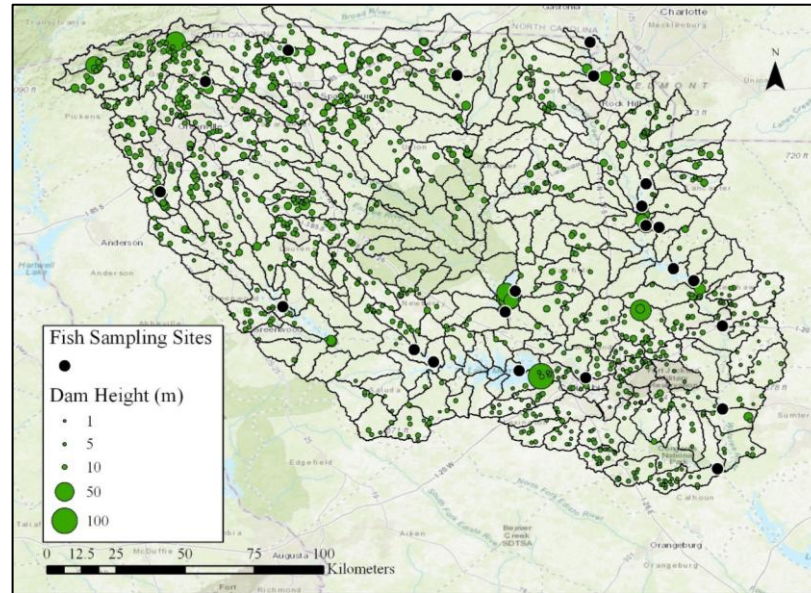
Rivers downstream from historical gold mines have Hg advisories.



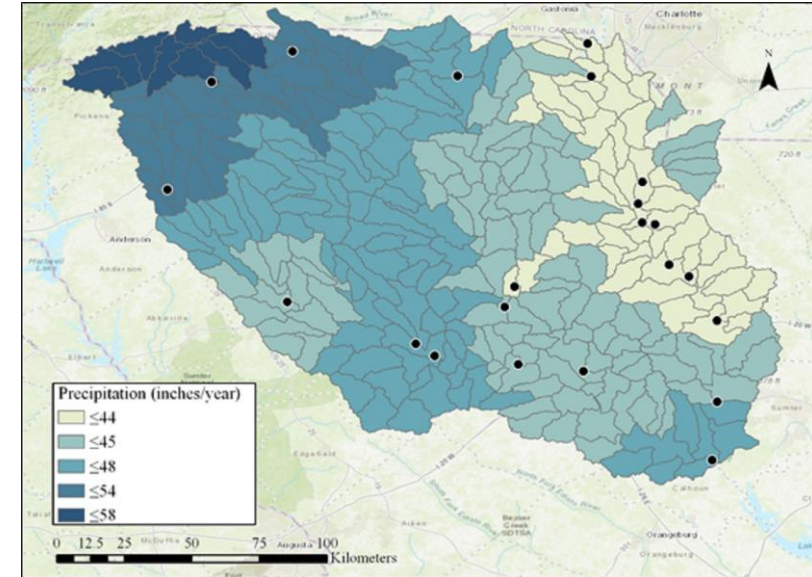
McGuire assessed factors that may also affect Hg levels in Fish including: urban land use (% MS4), dams, longitude, NEI, TKN, and precipitation.



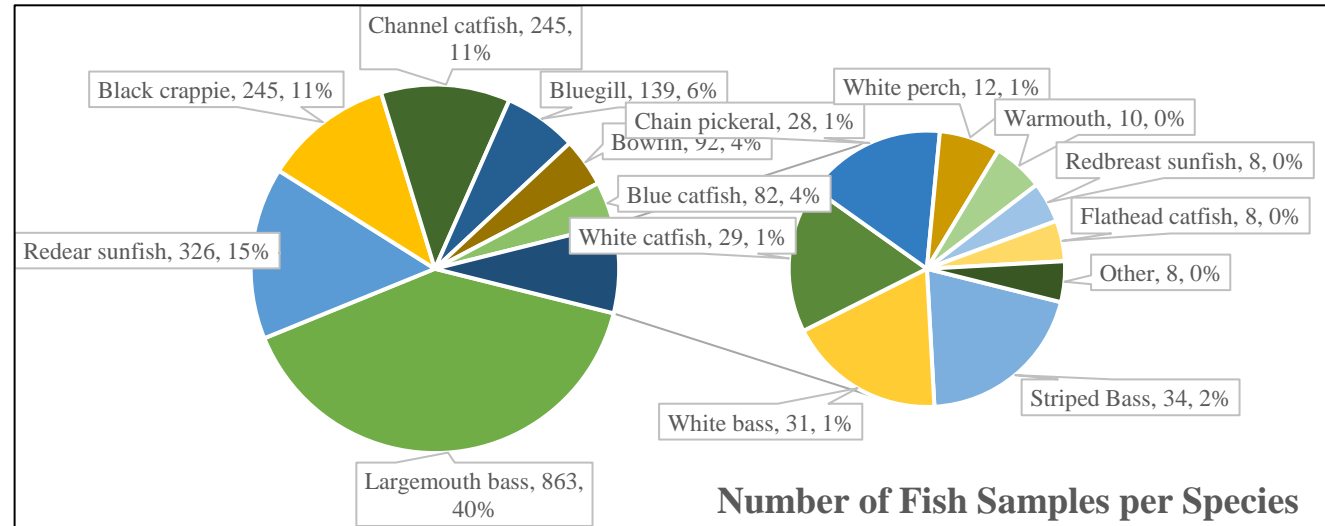
Land use as % Area in MS4



Dams in SC, 2010



Average 2005-2015  
Precipitation (in)



Number of Fish Samples per Species

Fish sampled by SC DHEC,  
2005-2015 n=2150

## Results from study suggest that Gold mining in SC may have had minor impact on level of MeHg in fish:

- 1) 2 models were constructed using over 340 variables from 6 databases, one with and one without the historical mining variables.
- 2) The model **without** the historical gold mining was a better fit to the data ( $r^2=0.84$ ) than the model with the mine data ( $r^2=0.77$ ).
- 3) Study did not find a strong correlation between Hg in fish tissue and historical gold mines and suggests that historical gold mining in SC has no immediate measurable impact on modeling mercury in fish tissue for these sample sites.
  - The reasons for this lack of significance from the historical SC gold mines could vary due to differences in mine density, climate/precipitation of the sample areas, or composition of the sediment.

Results suggest that while Gold mining in SC may have had minor impact on MeHg level in fish; other factors had greater impact including:

- 4) The model showed significant relationships between Hg in fish tissue and longitude, TKN, MS4, dam height, and precipitation.
- 5) Separate from the main model, the fish species also had an impact on mercury in fish tissue with piscivorous fish having more mercury than omnivorous ones.
- 6) Both the significant and nonsignificant correlations add to the knowledge of mercury emission into the environment and subsequent uptake into fish, resulting in an increased understanding of this concept.

However, Alpers, et al, 2016, found a correlation between historic Au mines and Hg in fish in CA related to gold mining in Sierra Nevada range. Hg mines were also present. NC study found a relationship between mines and soil .

# Environmental Impacts of Early Gold Mining in SC

Mercury (Hg) :  
Amalgam (Au, Hg) created, retort or roasting (airborne Hg) and loss to environment (water, soil, sublimation)

1800s

1900's

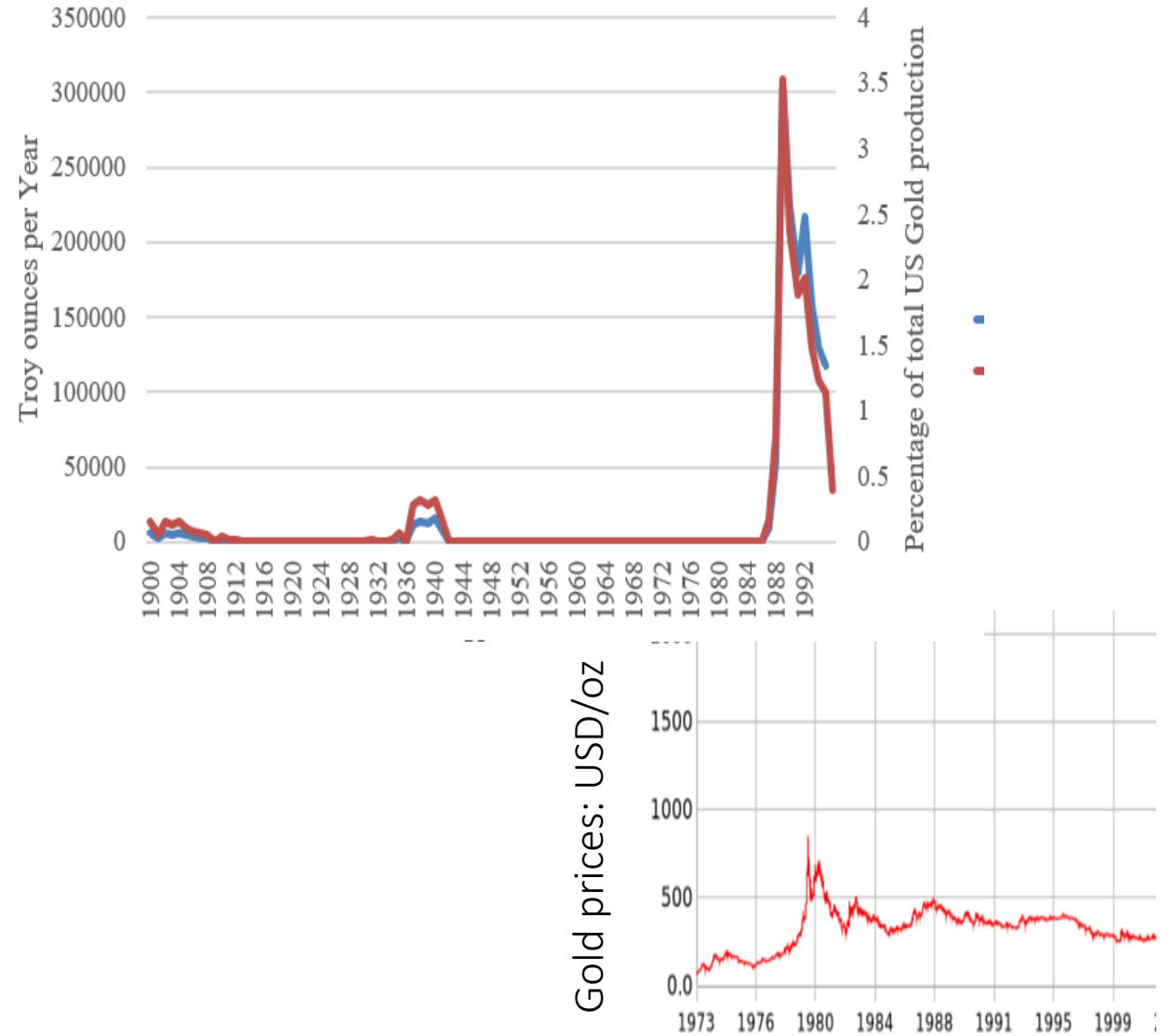
Metals in Mine Drainage

- Reclamation, WQ issues
- CERCLA / Superfund sites

# Active SC Gold Mines in late 1900s

Due to a spike in Gold Prices, 4 major gold mines opened or reopened in 1980s and 1990s:

- 1) Haile Gold Mine** – long history; reopened in 1985, discontinued by 1993 but cyanide heap leaching continued while profitable.  
FeS<sub>2</sub>, AMD and WQ issues.



Pre-1934 ~ \$26, 1935-~1972=\$35/oz,  
1979-\$700, 1985-\$400, 1999-\$300

# Active SC Gold Mines in late 1900s

2) **Brewer mine** – Brewer Gold Co., reopened in 1987, discontinued mining in 1995. Dam failure and loss of cyanide and pregnant solution in 10/1990, production resumed 6/1991. Company abandoned mine in 1999 and in 2005, Brewer was designated an EPA Superfund site per CERCLA. In 2019, State appointed receiver to lease, sell, or allow exploration.

The mine had numerous contamination problems.

- 1990 cyanide spill that killed fish along a 49-mile stretch of the Lynches River. Elevated levels of Cu, cyanide and Pb have been found in nearby Little Fork Creek, a tributary of the Lynches River.
- Cleanup efforts complicated by an old water treatment system that did not function, and contaminated water began seeping out the side of the pit about 100 yards from a creek.
- Groundwater was also contaminated with Se, cyanide and Pb.

# Active SC Gold Mines in late 1900s

3) **Ridgeway mine** –Kennecot. Ridgeway, SC – opened 1988, completed mining 1999. Open pit with cyanide Vat Leaching methods, but still large ponds with cyanide that attracted birds. Successful reclamation, although more AMD issues on site than anticipated.

Rio Tinto, owner, oversaw the cleanup and reclamation at the site as required under its permit. In 2014, 15 years after closure, acid drainage near the closed tailings pond dam was still being treated but not escaping the site.

## Barite Hill ~ 1990s

4) **Barite Hill mine-** Nevada Goldfields, Inc. McCormick, SC – opened 1990, closed in 1994, cyanide heap leach. Ore had high Cu and Fe Sulfides. Company abandoned site 1999. Became CERCLA –Superfund NPL site in ~ 2007. ROD 2020.

In 2000:

10 acre acid pit lake pH 1.5 – 2.2

Acid seeps from Leach Pad

Acid seeps from Spent Ore Landfill

Acid seeps from Waste Rock Pile

Ditches severely eroding



# SC Gold mining in the 21<sup>st</sup> Century

## 1) OceanaGold Haile mine:

Reopened in 2017 with Carbon-in-leach flotation plant. Combined open pit and underground workings. Largest gold mine in Eastern US.



Currently only active gold mine in SC and life of mine estimated to 2033.

Expect to annually mine 200 – 250,000 oz Au

# SC Gold mining in the 21<sup>st</sup> Century – Exploration

## **2) Carolina Rush- Brewer site.**

In 2020, Carolina Rush entered into a mining lease with an option to purchase with the 2019 Brewer Gold Receiver, LLC. By 2025, has drilled and completed seismic surveys for Cu-Au deposits. Company has option to purchase (with conditions) until 2030. Conditions include repayments of portions of CERCLA costs incurred by SC DES and US EPA and continual management costs. 2025: indicated ~350,000 oz Au and significant Cu

## **3) Carolina Rush- Jefferson Gold Project.**

~44 acres property leased adjacent to the Brewer site for gold exploration; leased until Sept 2025 from a private landowner. Company also has option to lease another 52 acres.

## **4) Lexington Gold Ltd - Jennings-Pioneer site. (near Barite Hill)**

Drilling and exploration of areas near the Barite Hill mine. In May 2025, drilling along the Barite Hill Trend focused on historic Barite Hill open pit gold-silver mine. The Jennings Trend parallels the Barite Hill Trend, and is offset by approximately 500 m.

# Conclusions

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1) Numerous small scale gold mines in 1800s used mercury in amalgamation process. Study indicates that Hg from gold mines, while it may be present in sediments and soil, is not the source of MeHg in fish in 3 major SC watersheds.

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2) In the 1980s-1990s, 4 large scale mines opened in SC when the price of gold increased. All closed by 1999. 2 of the 4 mines had severe AMD and reclamation issues & became Superfund sites (Brewer and Barite Hill mines). 1 closed successfully (Ridgeway). Exploration continued at the 4<sup>th</sup> (Haile).

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3) 21<sup>st</sup> Century gold mines: Haile has been operating since 2017 and is largest gold mine on east coast. 3 other sites near former mines (Brewer & Barite Hill) are being explored and drilled to evaluate reserves.

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With more stringent environmental permitting and new technologies, it is anticipated that mining in the 21<sup>st</sup> century will not leave the same legacy as the past 2 centuries of mining.

# Questions ?

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All Data Gold Price in USD/oz

High: 3415.57 Low: 64.95 ▲ 3232.42 4976.79%

Last Close: 3297.37



Pre-1934, \$26, 1935-~1972=\$35/oz,  
1979-\$700, 1985-\$400, 2000-\$300

