



Deborah Lanius - Antarctica















But fractures if stress is sudden

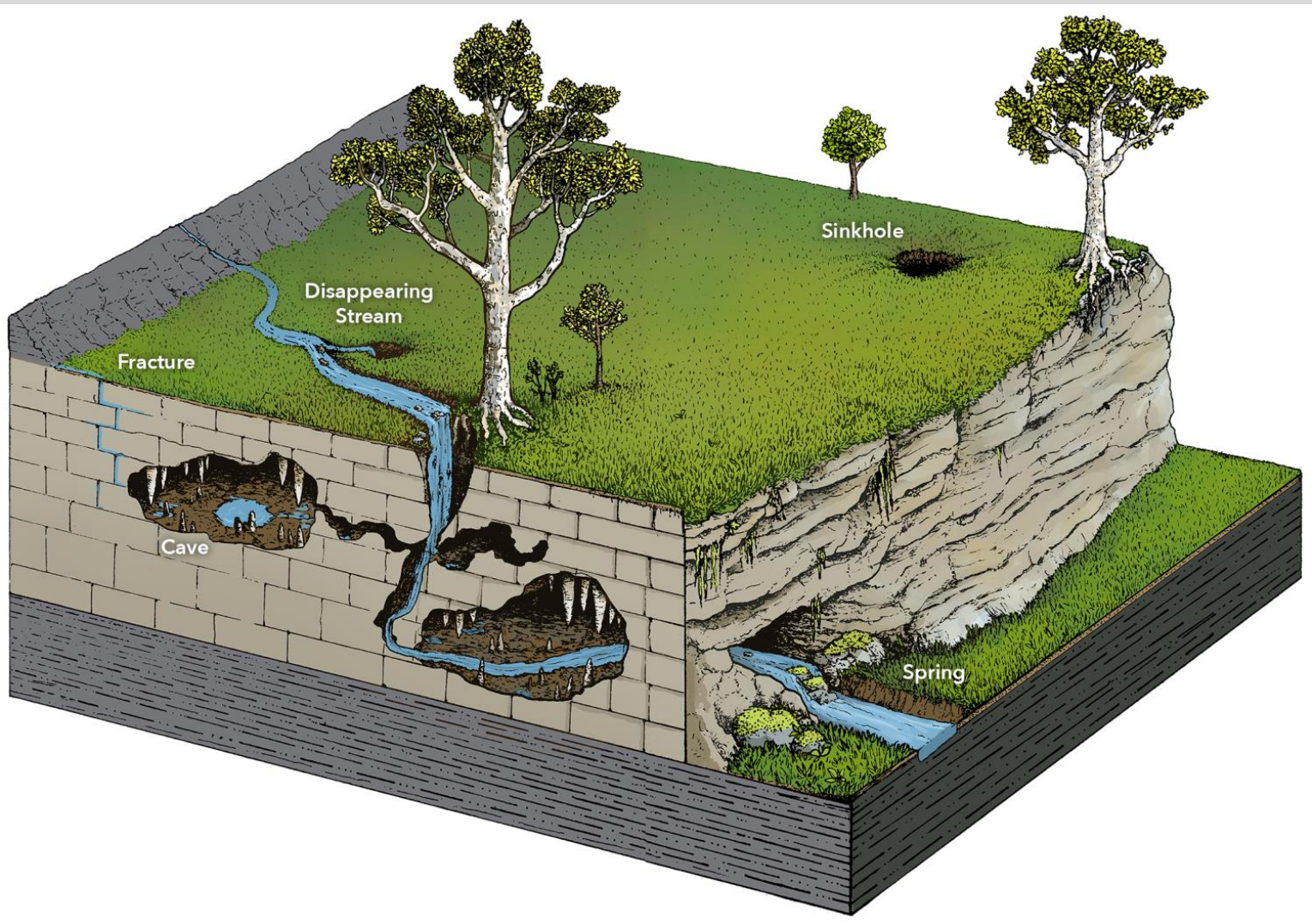
Silly putty flows if stress is applied slowly

Susan Green, photographer

**Limestone's Influence on Modern Environmental Challenges  
Or  
How Conditions & Life 470-370 Million Years Ago Affects Us Now**

**Topics**

1. Development patterns – lot size, house type  
Changes from 1960's
2. Solid waste removal
3. Flooding





# 1. Development pattern







What do these properties have in common?







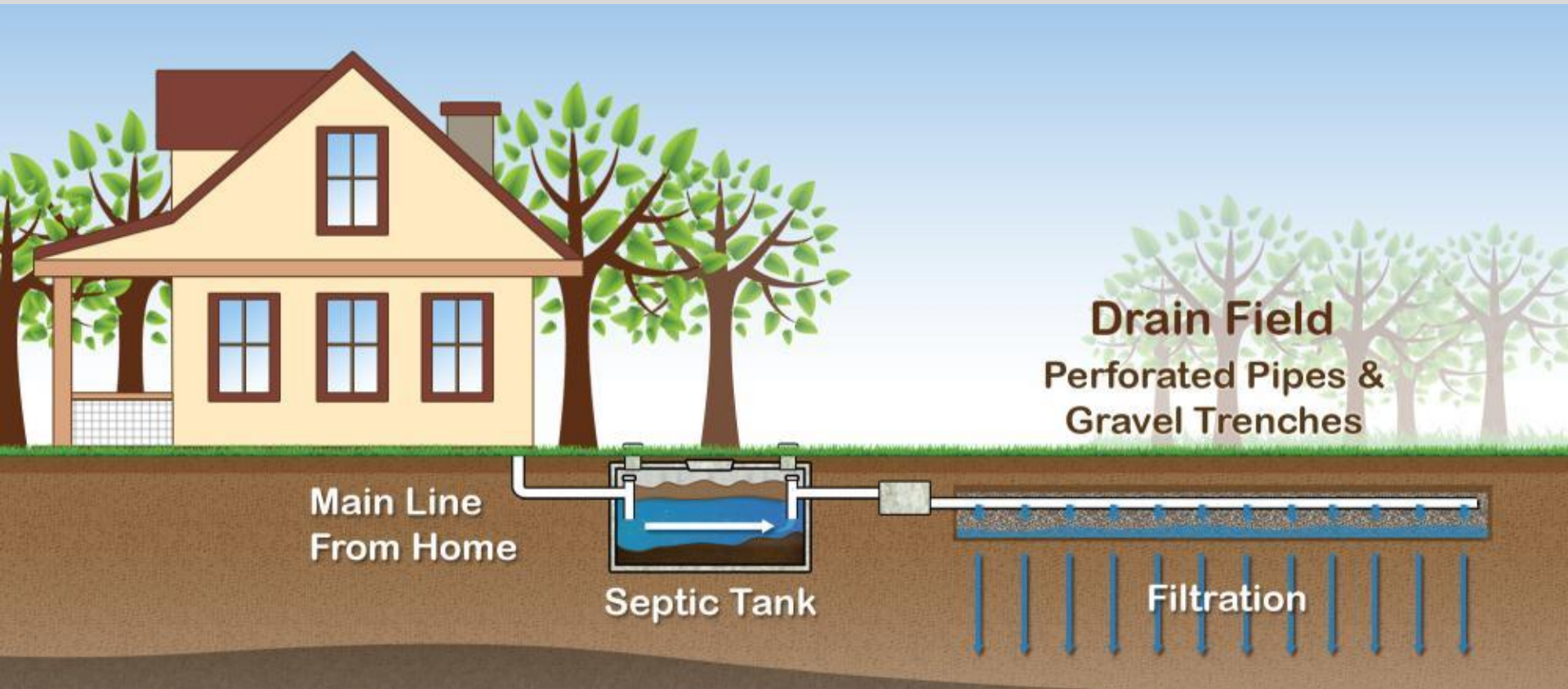






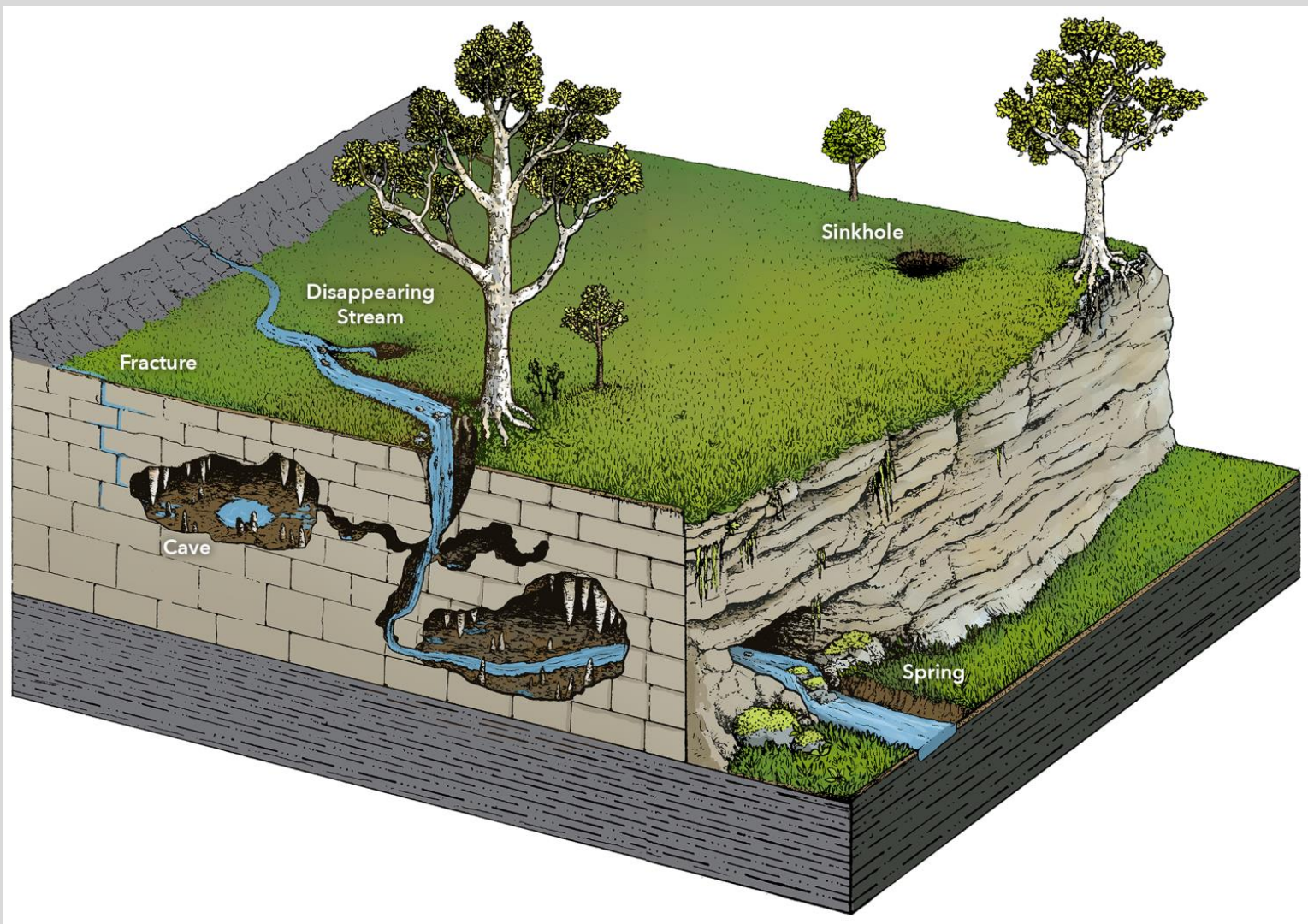
All built before sewers system expanded to after Metro formed. In 1972

Needed septic systems



<https://www.pca.state.mn.us/news-and-stories/keep-your-septic-system-healthy>





Soil needed for septic system to filter out bacteria – need lot of soil

To needed volume of soil (very thin soil) also required huge area = big lot.  
Also dangerous because unclean water could travel rapidly through cracks





Built in 1963 ~2,000. sq ft. Asking price 2023 = \$575,000 lot size = 1 acre





Built in 2022. ~ 6100 sq ft. Asking price = \$3,199,000 lot size = 1.74 acres







Where does tear down material go?







Image: Albany Business Review

Housing density in Schenectady, New York -- neighborhood from 1600's inside of stockade  
No concern regarding sewage system – so houses packed together from beginning



**A PLAN**  
of  
**SCHENECTADY**

About 1750 - *From the Indian Wars*  
Situat'd Lat. 43. Long. 74. 30.



*Photo. Eng. for*  
*J. W. Macfarlane*

*M. Degrave*



- A. Schenectady -
  - B. Wooden fort with five Block houses for flankers.
  - C. Block houses to defend the Stockades.
  - D. Stockades planted round the Town.
  - E. The Nearest high Ground to the Town which is about 800 Y<sup>ds</sup> from the Stock.
  - F. Part of a line of an Encampment thrown up and a fine Battery to show how such works are Constructed.
  - G. Barracks or Sheds where part of the Reg<sup>t</sup> were lodged last Winter.
- The Boundary on each side of the River is pecky nearly on a Level -  
Except where its mark'd otherwise on the Draught.
- [The date of this map is unknown, probably about 1750-60.]

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Changes from 1960's
2. **Solid waste** -
  - A. General: Whirlwind history of solid waste in US
  - B. Nashville:
    1. 1800's growth: river, effects of cotton gin
    2. early 1900's: reports of "Scavenging Department"
    3. late 1900's – now
3. Flooding

## 1800's in US.

Population: 1800 = 5.3 million vs. 1900 = 106 million

### Population Distribution

	1800	1920
Rural	93.9%	48.8%
Urban	6.1%	51.2%

*Average American woman had*

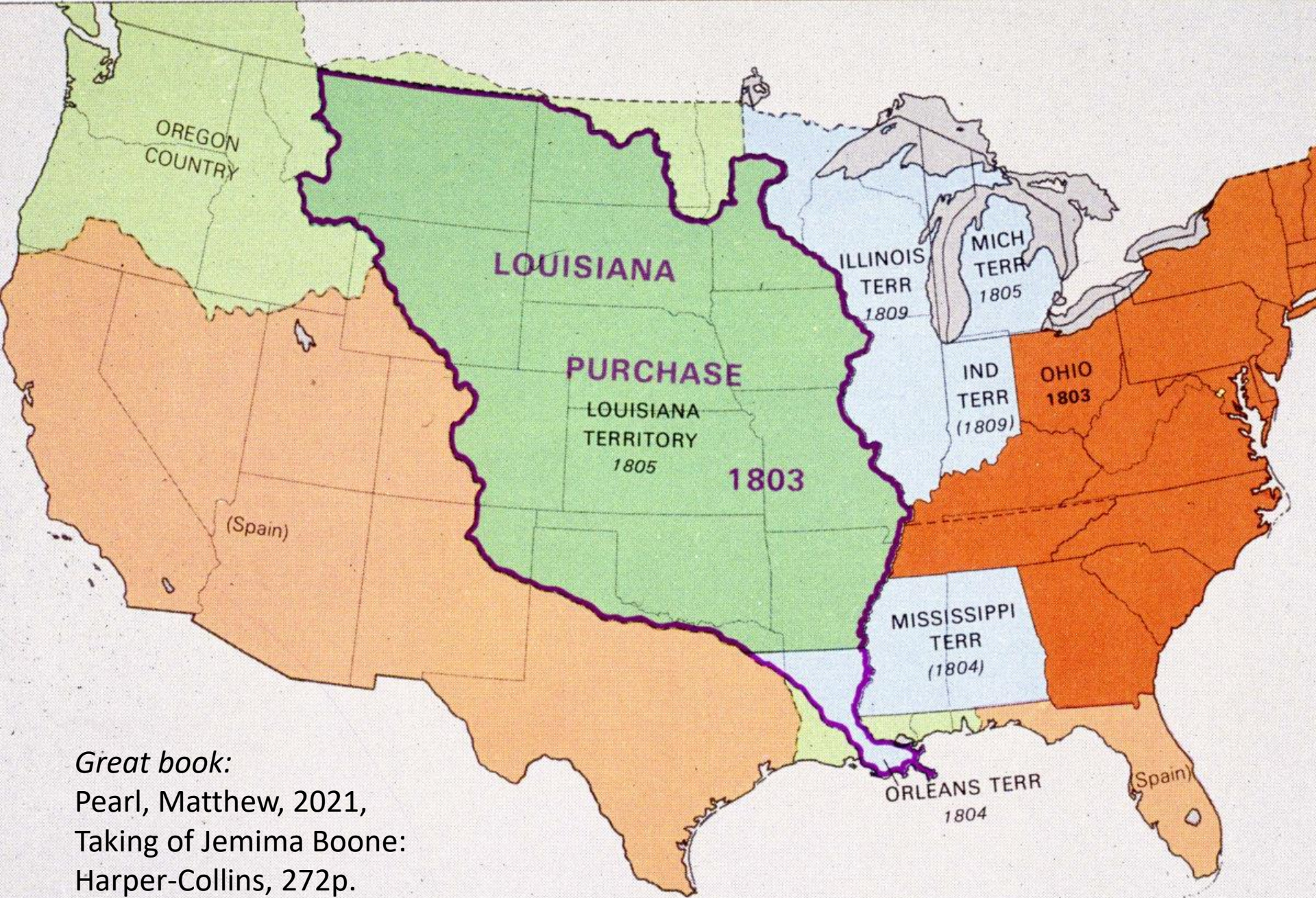
*7 children in 1800*

Population grew over 30% every 10 years (except one) 1800 – 1880

Big changes:

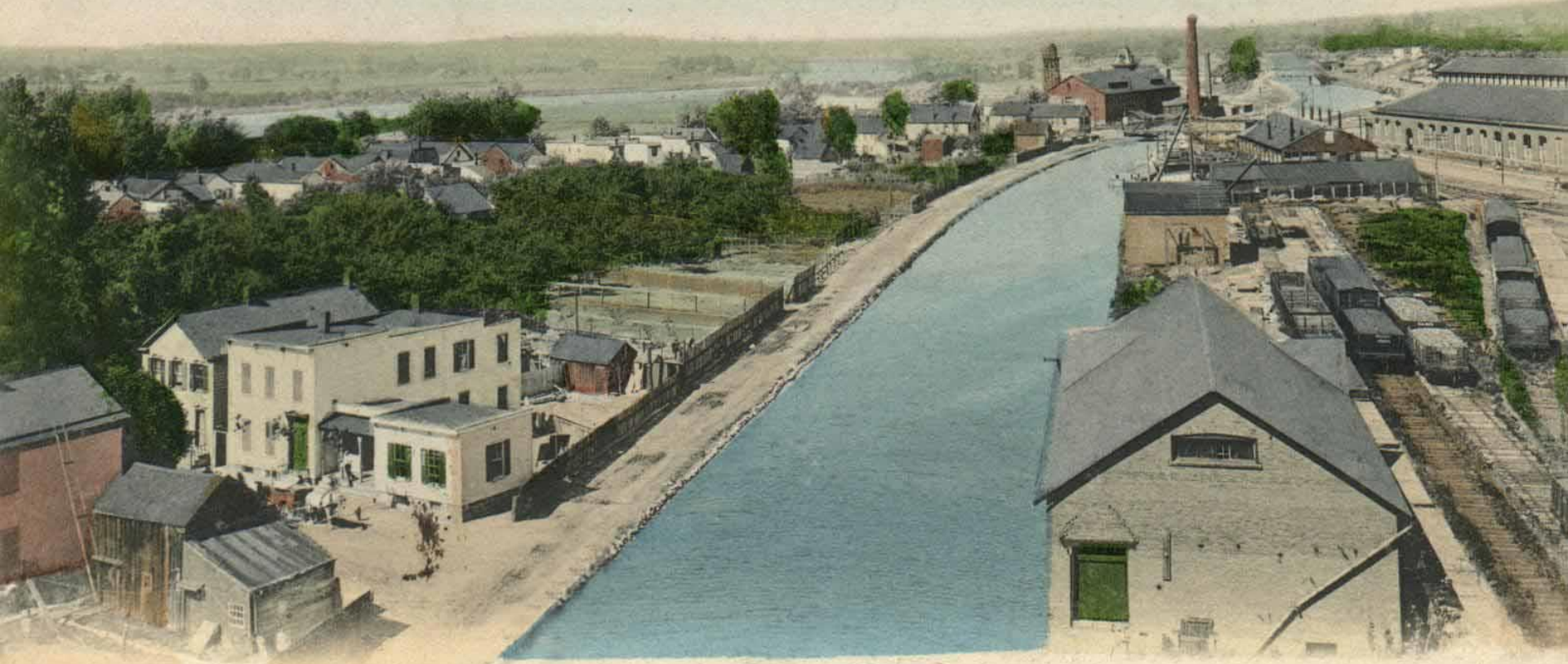
- 1) Rapid acquisition of land – next slide from France, land occupants
- 2) Transportation – railroads. - started in 1830's – current RR by 1900
- 3) Industrial revolution – materials to & from cities in NE and Midwest
- 4) Cities struggled to handle influx of people. (1,000 per acre, NYC)  
41% of urban residents = immigrants in 1880 (factory workers)





*Great book:*  
Pearl, Matthew, 2021,  
Taking of Jemima Boone:  
Harper-Collins, 272p.





9301. Erie Canal, Mohawk River in the distance. Schenectady, N. Y.

Handcolored.

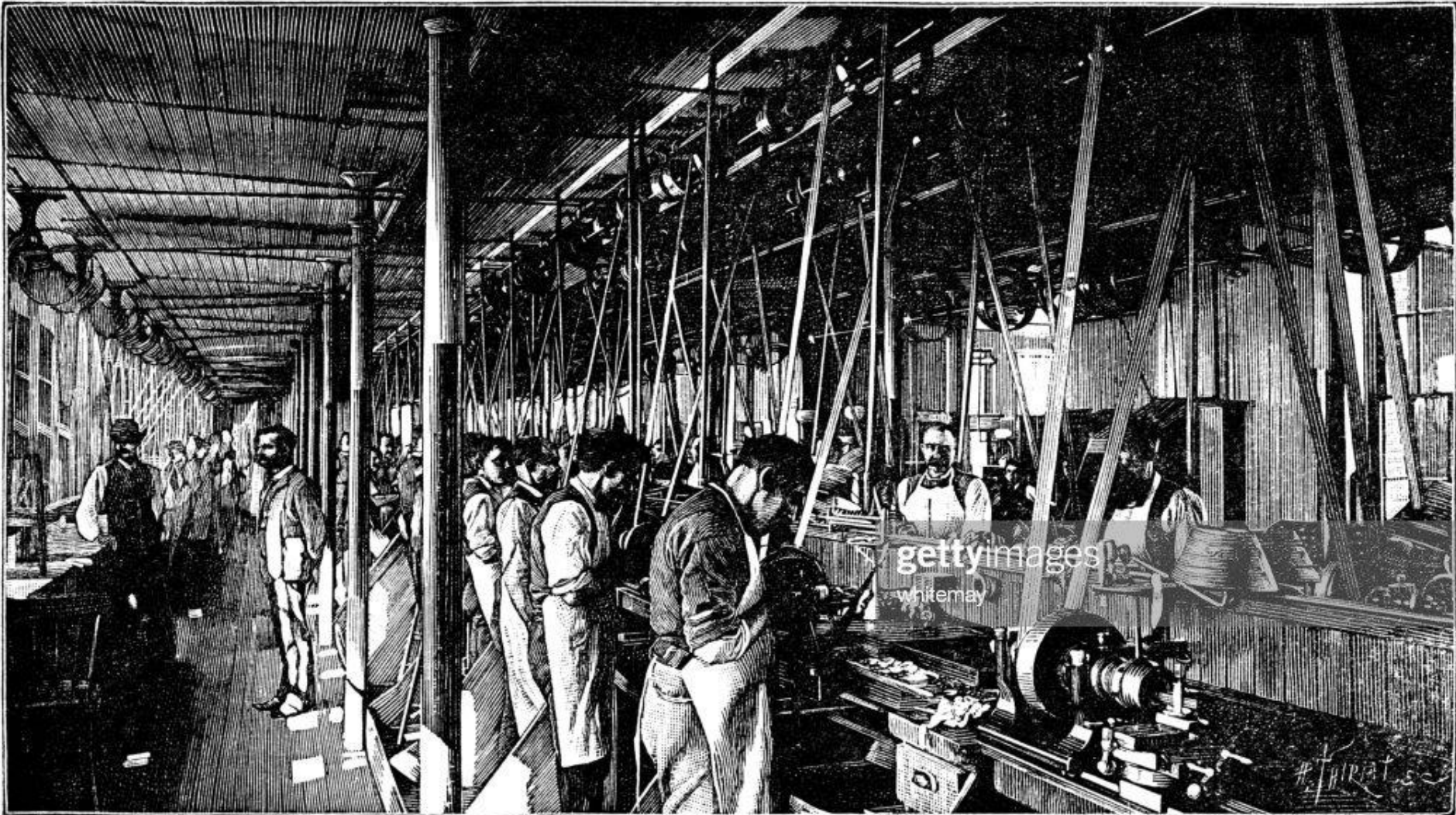
1800's Erie Canal - with railroad t











1300341705

The Waltham Watch Factory—Box Making.









People just threw trash in the street



## **Efforts to reduce amount of trash in NYC**

- charge people for right to scavenge through trash**
- dump in poorer areas of city**
- dump in rivers, ocean, wetlands**
- incineration – in late 1800's; given up by ~1900**

**Brooklyn ~1901 had 26,000 horses,**

**Produced 200 tons of manure a day**

**Average lifespan of a horse = 2 years**





# Nashville

Growth – river access

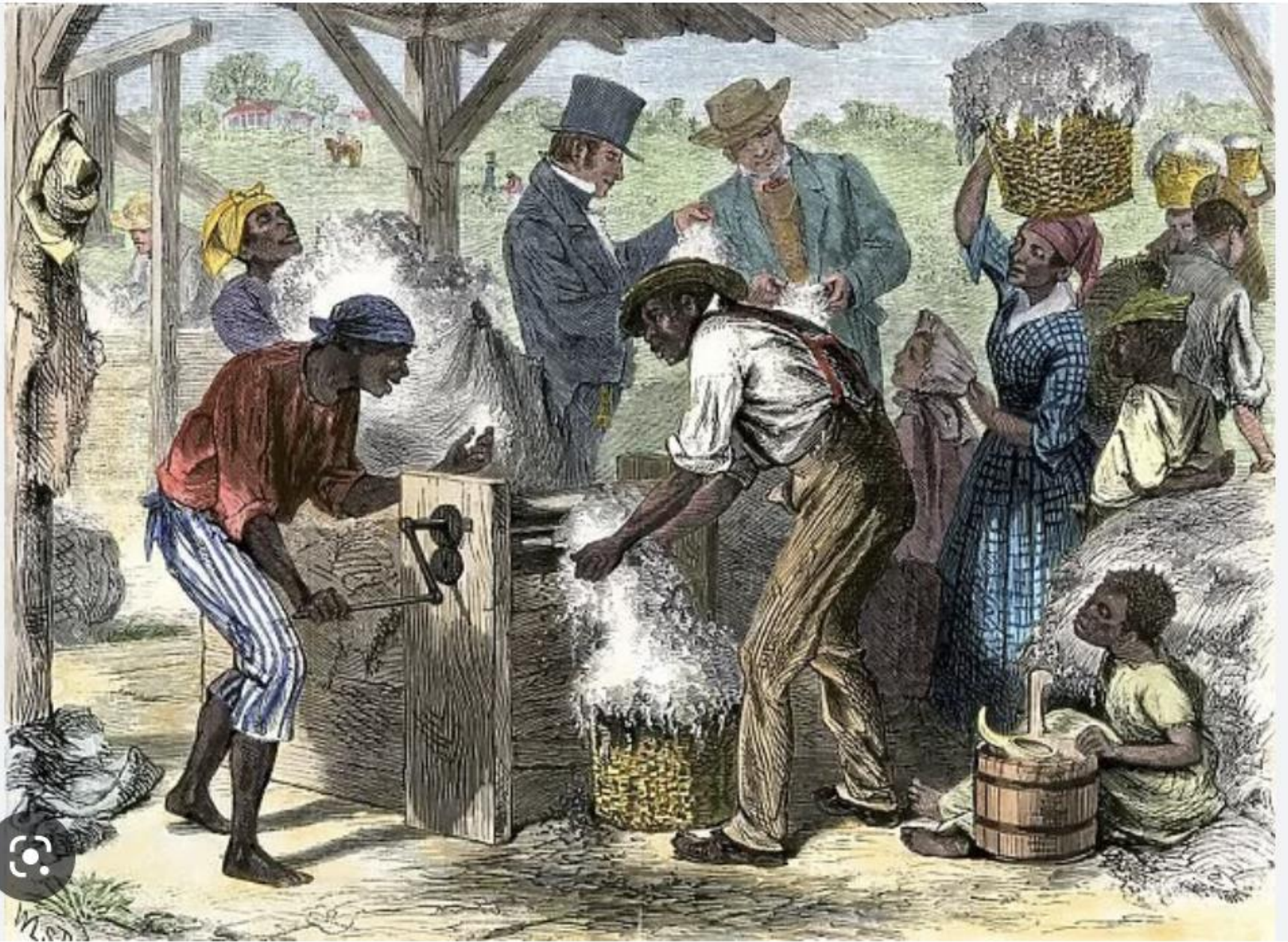
Effects of industrial revolution – especially cotton gin

- Removed seeds from cotton – much easier to process

- Created huge need for more cotton to be grown (in South)

- Agricultural workforce = slaves. (on rural plantations)

- Nashville became slave trading center



Cotton gin in use by African-American slaves in the ...

[Visit](#)



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## THE NASHVILLE SLAVE MARKET

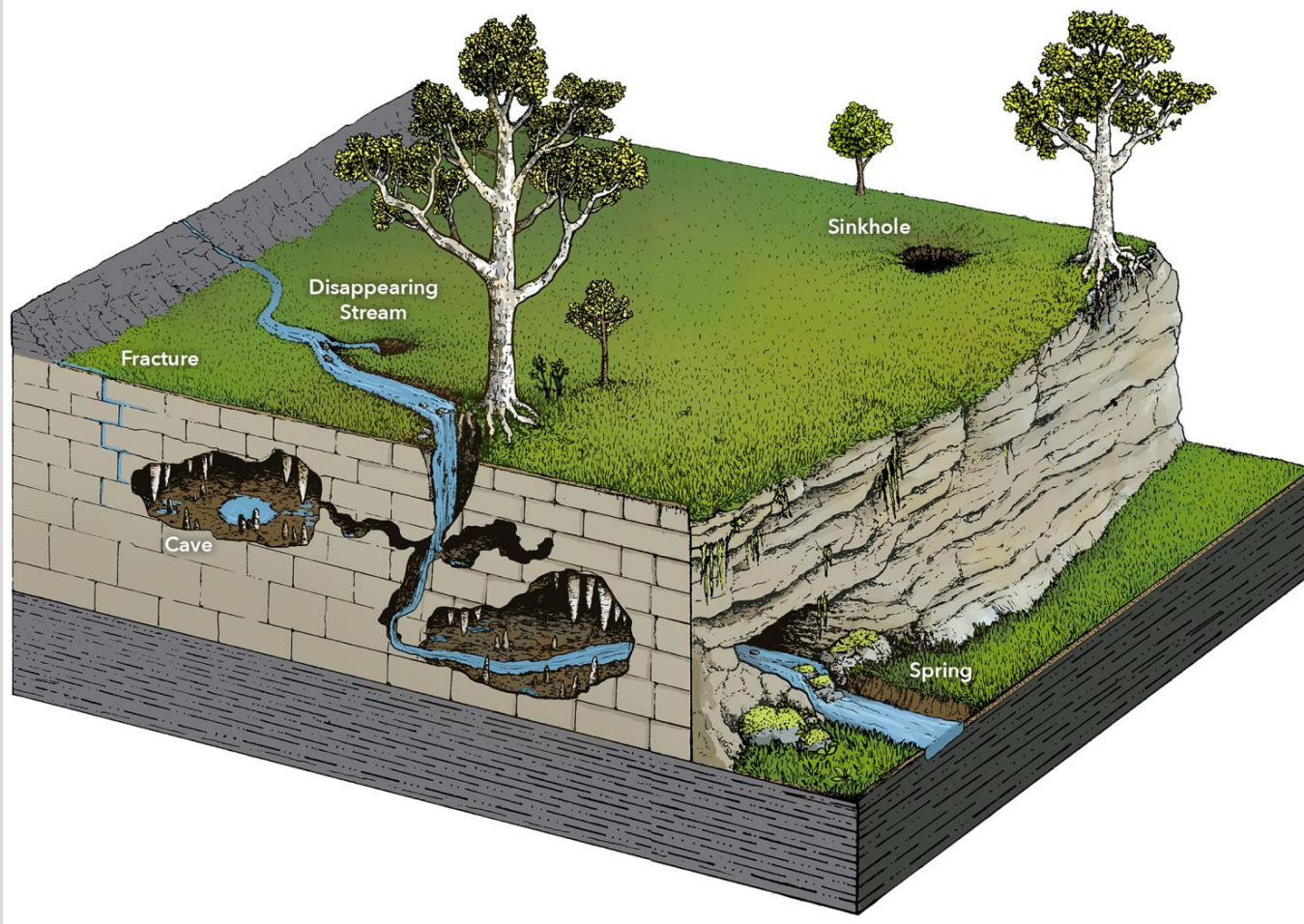
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This area was home to institutions that were an integral part of enslavement in Tennessee: banks that loaned planters money needed to buy the enslaved; hardware stores that provided farming tools, clothing, and firms that protected the planters' investments in their enslaved human chattel. The slave trade played a vital role in the city's economic development during the 19th century. This growth came as the result of daily, weekly, and constant emotional trauma for the families who endured the slave trade.



2600 people lived in area in red circle – between science museum and 8<sup>th</sup> ave S  
Greer Stadium (minor league baseball) in red; Fort Negley is between Greer and circle





2700 workers - between science museum and 8<sup>th</sup> Ave

Water source? **Well or spring?** Sewer system? **Outhouse** Garbage?

No shelter, insufficient food, little pay

**600-800 people died**

## Early 1900's in Nashville

### Department of Scavenging Annual Reports to Mayor

Removed trash by “cartloads”. - record for 1901

56,351 cartloads of ashes and trash

39,315 cartloads of street scrapings

6,562 cartloads of slops

2,977 cartloads of street sweepings

### What is missing....

What was this stuff?

Where did they take it?

What part(s) received scavenging attention?



## Early 1900's in Nashville

### Department of Scavenging Annual Report to Mayo

The report for fiscal year 1903 includes this request to Mayor A.S. Williams regarding the “Dump Boat”.

***“The dump boat at its present location has become an intolerable nuisance. I suggest that your Honorable Board take immediate steps to have it removed to a less objectionable place on the Cumberland River.”***

***Note: The next year a garbage chute was built was built next to the river to provide easy transport of solid waste into the river***

## Mid 1900's in Nashville and Throughout the US

Second Industrial Revolution – I

Increase in plastics, chemicals

Increase in wealth (post war)

Increase in waste (correlated with wealth)

Examples of lack of thought about waste, air quality, etc/





Why are they burning that car?





Dead fish in polluted lake -







Attitudes have  
Changed at  
Yellowstone and  
elsewhere!





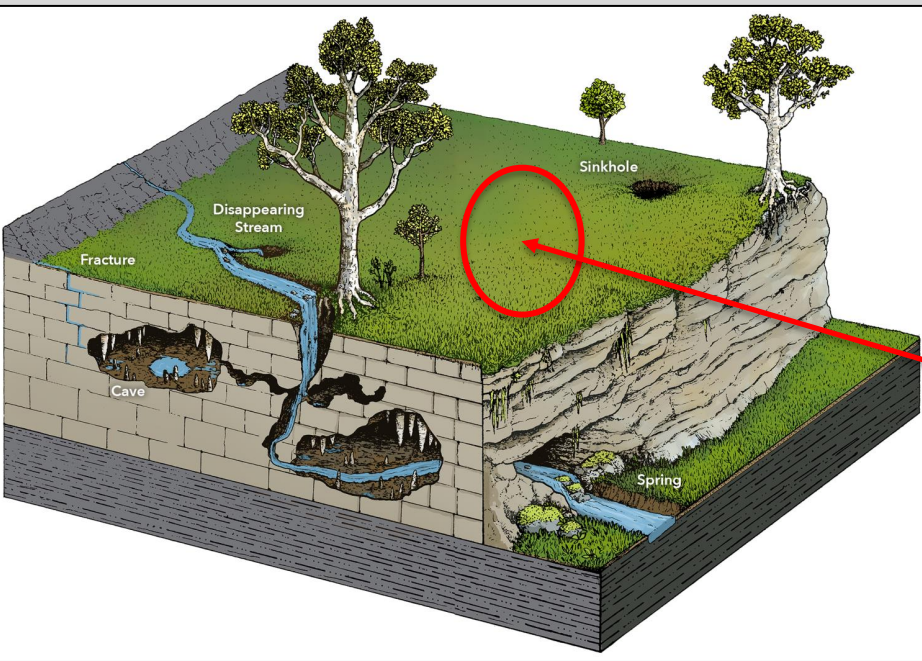
## 1965 – Solid Waste Disposal Act

- First assessment of where trash was going
- Provided grants to states to study and change
- Provided guidelines and funds to attain goals

Found 270 certified dumps in TN

Nashville early to get funds, recognized need for sanitary land fill

1972 – had 5 dumps, one closed immediately, 2 limited time left,  
2 under study

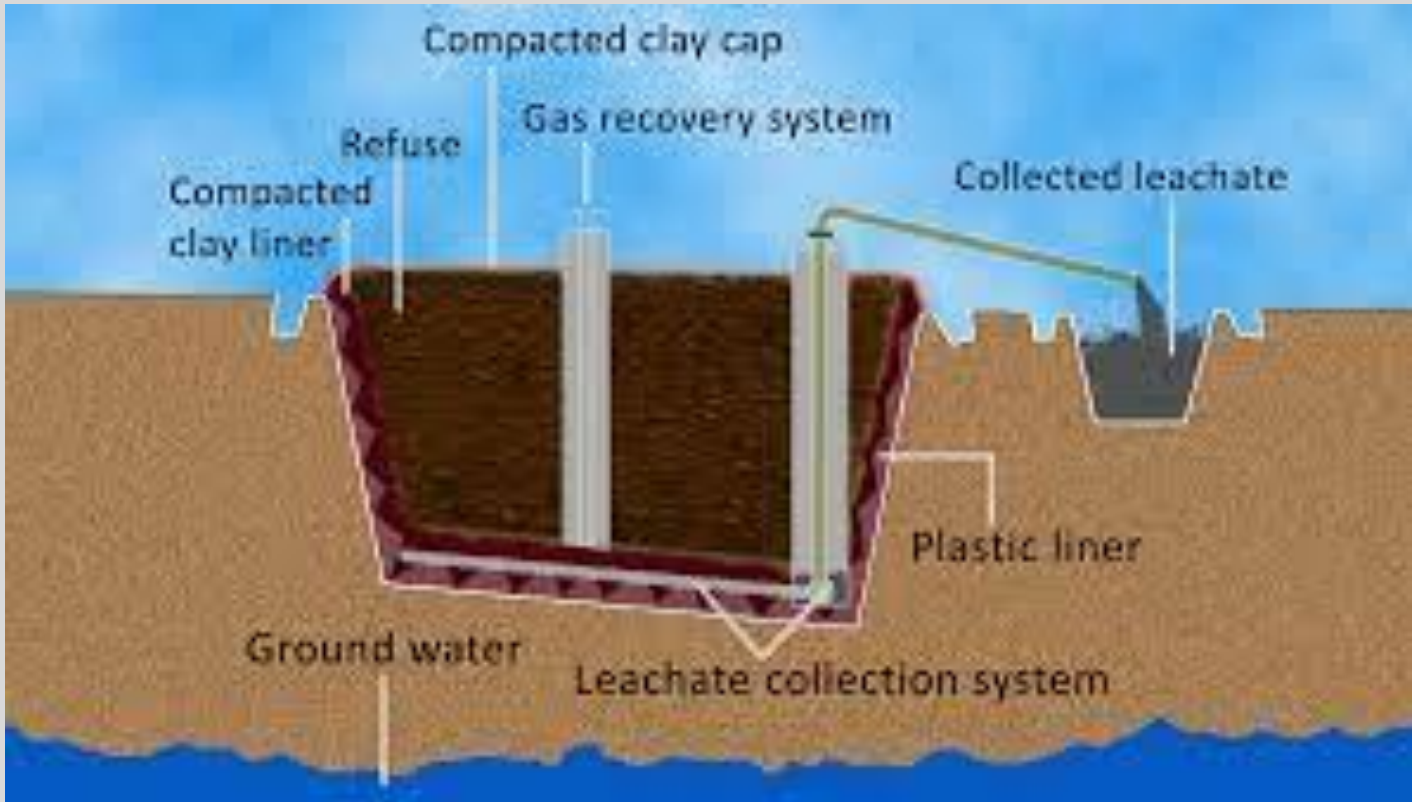


How much baby waste might go into dump or landfill each year instead of sewage treatment?

~13,000 babies under 2 in Davidson County, most wearing disposable diapers

+ plastic bags of dog poop from greenways and parks





Clay, plastic liners - to contain trash, leachate  
Trash covered daily by 6" of soil or approved substitute  
Above groundwater table  
Leachate and gas collect recovery systems

Final capping by 36" of soil



What little undissolvable  
silt and clay in limestone

Deposited on inside of  
bends in rivers – Cumberland

Water flows faster on outside  
of bends – causes erosion

Plenty of soil to cover trash on inside of bend, but usually ground water table is too close  
To trash or floods too likely to erode the trash and contaminate river.



**Landfill fo household garbage**





Nashville Thermal Transfer Plant - vision of future when built





Nightmare – air pollution, ash downtown, over budget, air quality issue never resolved.

Closed in ~2003 – now Ascend venue

# Solid Waste Master Plan Priorities (2019)

- Reach Zero Waste in 30 Years – defined as 90% diversion from landfill disposal
- Increase recycling, food waste reduction and recovery, and composting programs
- Adopt recycling and recovery programs targeted toward Nashville's growing construction and demolition waste stream
- Strengthen public education and outreach programs

<https://www.nashville.gov/departments/water/zero-waste-nashville/zero-waste-master-plan>



# How Well is Nashville Moving toward Achieving Zero Waste?

Appendix B · Existing Solid Waste System

## B.2.2 Construction and Demolition (C&D) Waste

In 2016, C&D waste was 23% of the total waste stream. Since 2008, C&D waste generation in Nashville has nearly doubled while C&D waste recycling has decreased to minimal levels, as shown in **Figure B-5**.



As of 2016 –

Had a long way to go!

## Where does trash go in Davidson County?

Type #1 = Construction and Debris Landfill

Southern Services Landfill owned by Waste Management







Briley Pkwy

Ashland City Hwy

WM - Southern Services  
C&D Landfill &...

Nashville

2. Where does trash go in Davidson County?

Type #2 = Household garbage – Middle Point Landfill, Murfreesboro





## Many problems Middle Point Landfill – Where to start

Limestone – swiss cheese, needs full containment

- up stream of East Fork of Stones River water supply
- takes garbage from 34 counties, mostly Davidson
- ech-- nearly full; no enlargement allowed
- stopped taking Davidson Co trash as of 12/22
- pervasive bad smell
- leakage of leachate
- fire in July, 2022 from a “hot load”
- legal battles; is it leaking leachate??

Possible solution – Mufreesboro is considering & funding

- Wastaway – hi tech incineration, does not release carbon dioxide into atmosphere -- Will it really work?

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3. **Flooding** - Too little soil to sponge up atmospheric river deluges





Enhanced runoff during large rain events