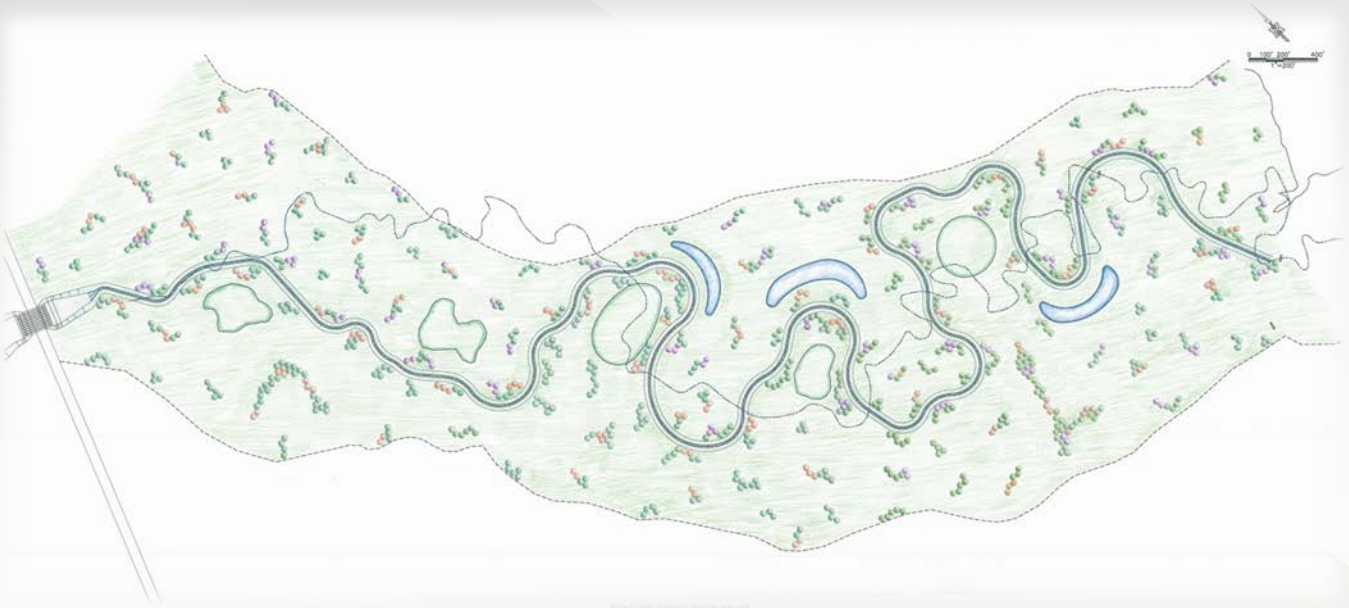
Stream restoration initiative

at the Jewett Lignite Mine



what is stream channel restoration?

- the **re-establishment** of the stream system that **existed prior** to disturbance…
- an understanding of **the physical and biological components** of a stream system and its watershed…
- includes a **broad range of measures** to **protect stream banks** from erosion and **provide wildlife habitat**…

secrets to success

Questions to consider:

1. Does the stream's water flow quantity and velocity **meet engineering standards**?
2. Does the water quality **improve** as it moves through the system?
3. Does the stream and vegetation **look natural**?
4. Does it demonstrate **biodiversity**?
5. Does pre-disturbed wildlife **voluntarily relocate** to the restored stream?
6. Are there any **erosion** problems along the stream channel?

challenging and unique

Streams are **dynamic ecosystems**. They are **constantly being affected** by other manmade and natural sources within its given watershed.

- **Drought**
- **Large rain event**
- **Harmful wildlife**
- **Access**

the way we do it...

3 phases of planning

1. Pre-mine

2. Trans-mine

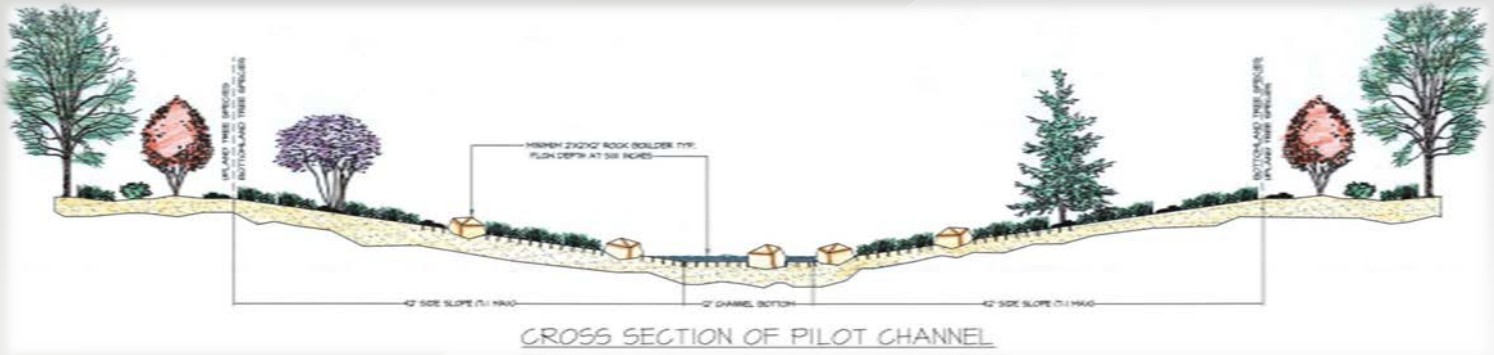
3. Post-mine

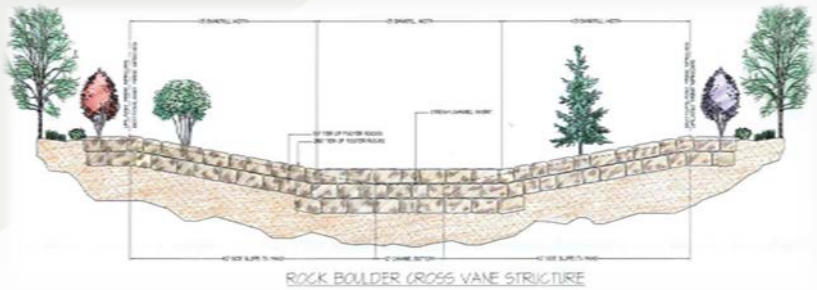
pre-mine

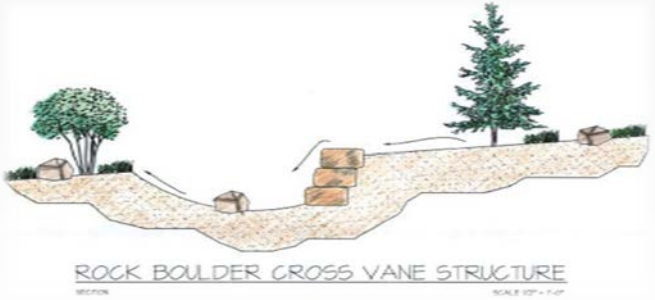
pre-mine

engineering design

Preplanning provides **more flexibility** and **design options** with regards to stream channel location and configuration.



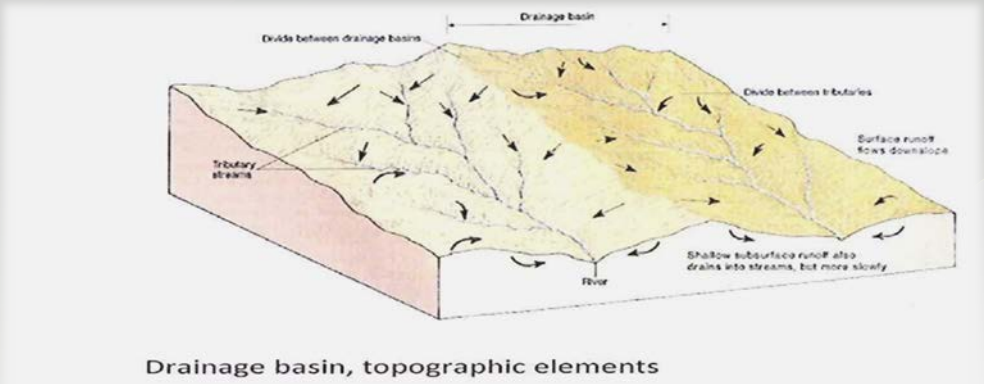




pre-mine

engineering design

- ***Geo-fluvial design***



Drainage basin, topographic elements

- ***Sinuosity***

pre-mine

vegetation

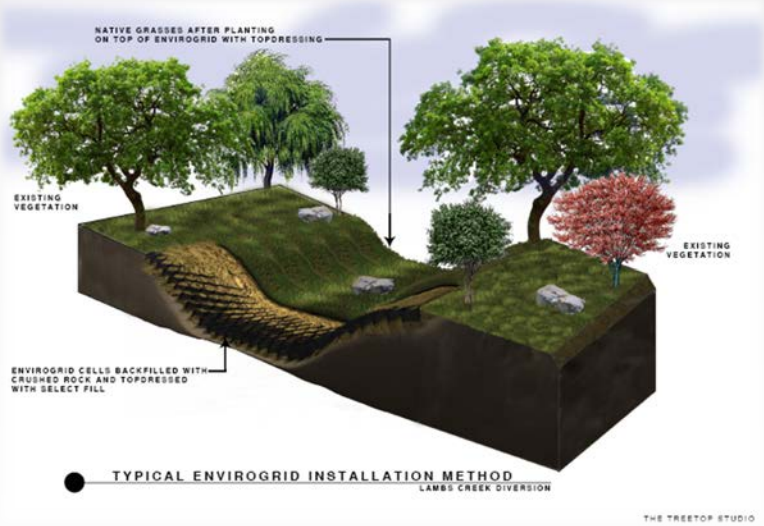
Vegetation plans for stream restoration projects are **essential** to the **long-term success** of the project.

- **Aesthetics**
- **Wildlife benefits**
- **Erosion protection**
- **Long-term maintenance**
- **Biodiversity**
- **Natives vs. nonnatives**

pre-mine

vegetation: aesthetics

How a stream restoration project **looks in the field** means something. It's like a **first impression**, **you get just one**. It requires **carefully designed** vegetation plans to ensure a stream channel **looks natural** fifteen to twenty-five years down the road.



pre-mine

vegetation: wildlife benefit

Stream channels are a great opportunity to provide **wildlife habitat** corridors. **Selecting the right species** of vegetation can provide animals with the food and shelter **they need to survive**.

pre-mine

vegetation: erosion protection

- Erosion is caused by two primary means:
  - Impact of rain droplets hitting the ground
  - Sheet flow of water across the ground
- What you can't see is just as important as what you can.
- Not all plants are created equal

pre-mine

vegetation: biodiversity

It is a good idea to mix many different species of woody and herbaceous plant material within the various stream channel ecosystems. Spreading out the different species throughout the entire stream restoration project increases the natural appearance and provides a higher quality ecosystem for wildlife. Also consider planting different size trees along the stream channel.

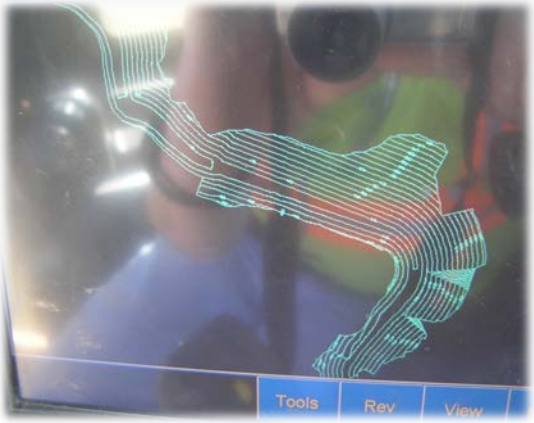
trans-mine

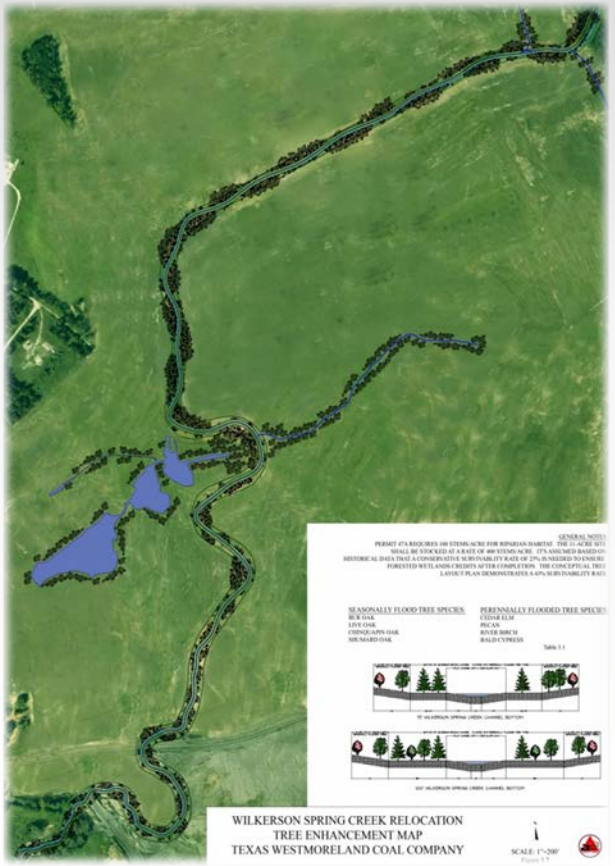
trans-mine

digital terrain modeling

The use of Digital Terrain Modeling (DTM) in the stream restoration process as has proven advantages

- Accuracy
- Speed





trans-mine

selective handling

Traditional selective handling processes addressed **the need to reuse the pre-mine existing topsoil** for more productive post-mine vegetation. The same ideology proves true for stream channel restoration projects.

trans-mine

selective handling

Environmental benefits of selective handling while restoring a stream channel:

- Riparian and wetland soils have very unique characteristics that could take many decades to form
  - Higher oxidation levels
  - Correct soil composition (sand vs. silt vs. loam)
  - Correct pH levels
  - Unique biomass structure
- Seed and root systems of native riparian and wetland species can germinate from pre-mined soils when selective handling processes are implemented.

Selective handling of existing hydric soil will increase the probability and decrease the timeline to achieve stream channel restoration success.

post-mine

post-mine

vegetation establishment

Long-term stream channel restoration success is a function of having the right quantities and species of vegetation along the project site. Planting methods can be unique and challenging.

post-mine

vegetation establishment

Woody

- TWCC utilizing a broad range of tree and shrub container sizes
- Wet conditions limit planting methods to hand planting with shovels for liners and plug material, and skid steers equipped with tracks and augers for to dig holes for larger material while minimizing negative environmental impact

Herbaceous

- TWCC utilizes hydromulch techniques to apply herbaceous plant seed mixes to stream channel bottoms and slopes while.

post-mine

hydromulch

Benefits of hydromulch:

- **Economical**
- **Less environmental Impact**
- **Efficient**

post-mine

irrigation

Irrigation is critical to increasing survivability rates of plant material, both herbaceous and woody. At TWCC, we provide bubblers to all of our larger woody stock and can water herbaceous vegetation with cannons, impact heads, and mobile tanks.

end