

From Rip Rap to Riffles: The Evolution of Stream Reclamation in the Indiana Coal Fields



Indiana Department of Natural Resources

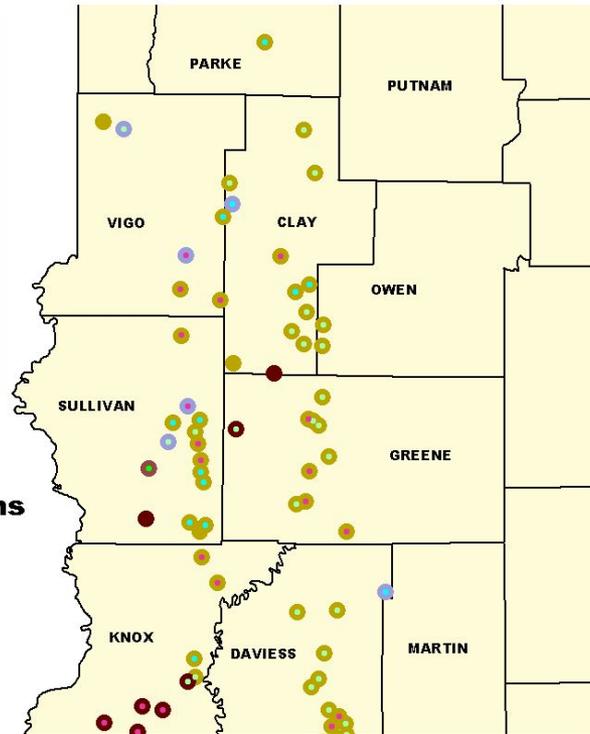
Illinois Coal Basin



LOCATION OF COAL MINES IN INDIANA



Extent of current and historical coal mining for Indiana.



Key to Operations

- Active Mining
 - in Reclamation
 - Inactive
- Permit Type**
- Processing Area
 - Surface Mine
 - Underground Mine

INDIANA COAL MINING FACTS



- **32-35 million tons/year**
- **68% Surface Production**
- **32% Underground Production**
- **10,000 Acres/Year affected and reclaimed.**
- **97% of Indiana's electricity from coal**
- **Generally surface coal reserves are <200 feet**

INDIANA COAL MINING FACTS

- **Truck/shovel operations dominate, 2 draglines operating**
- **No steep slope mining**
- **No mountaintop mining**
- **Little topographic relief**
- **USGS Area 32 Report- 62% of land use is agriculture**



INDIANA COAL MINING FACTS



➤ Underground depths range from 200' to 1000'

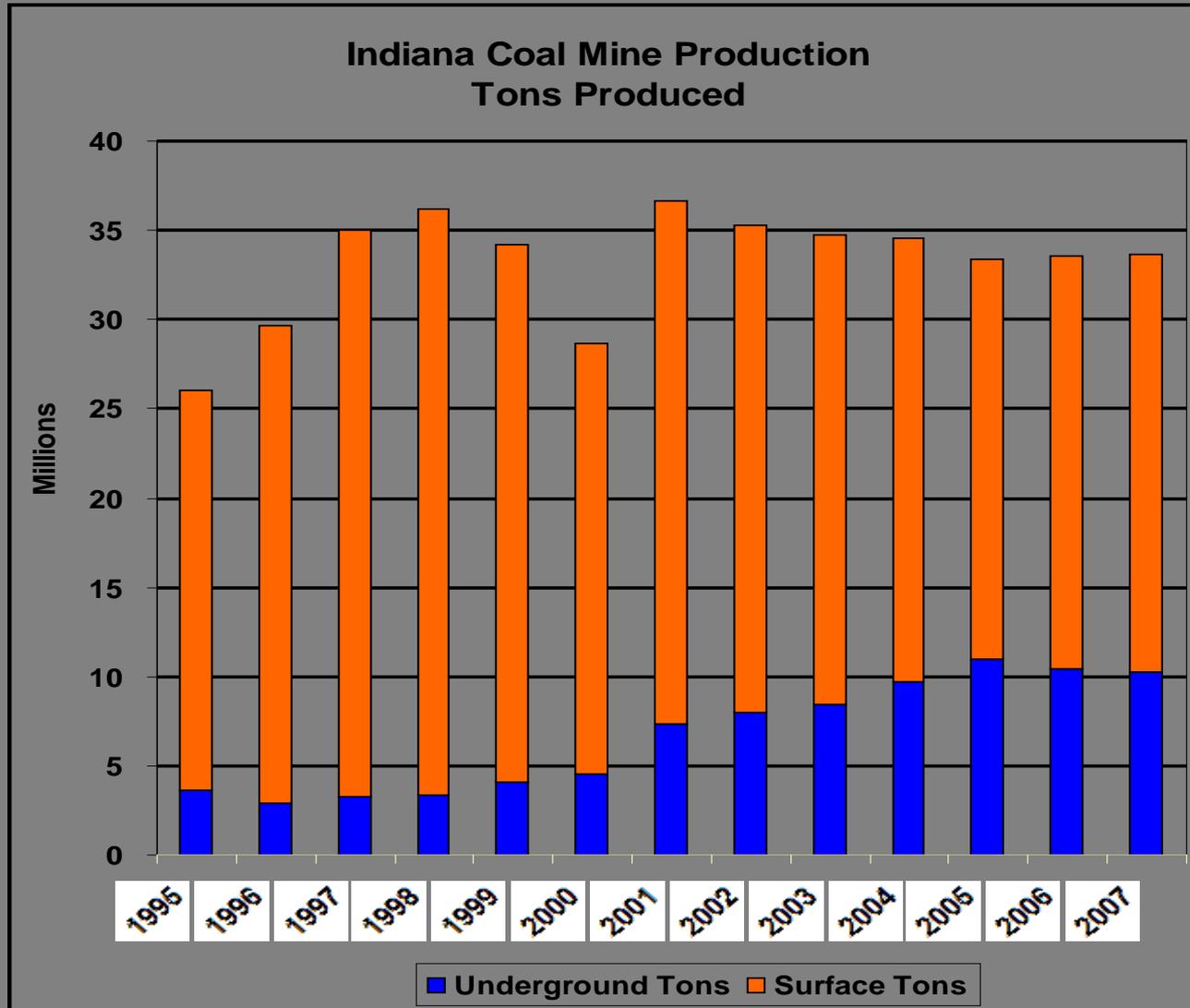
➤ Underground access to coal via slopes or shafts

➤ Room & Pillar

➤ No Longwall operations to date

➤ Coal Refuse Disposal

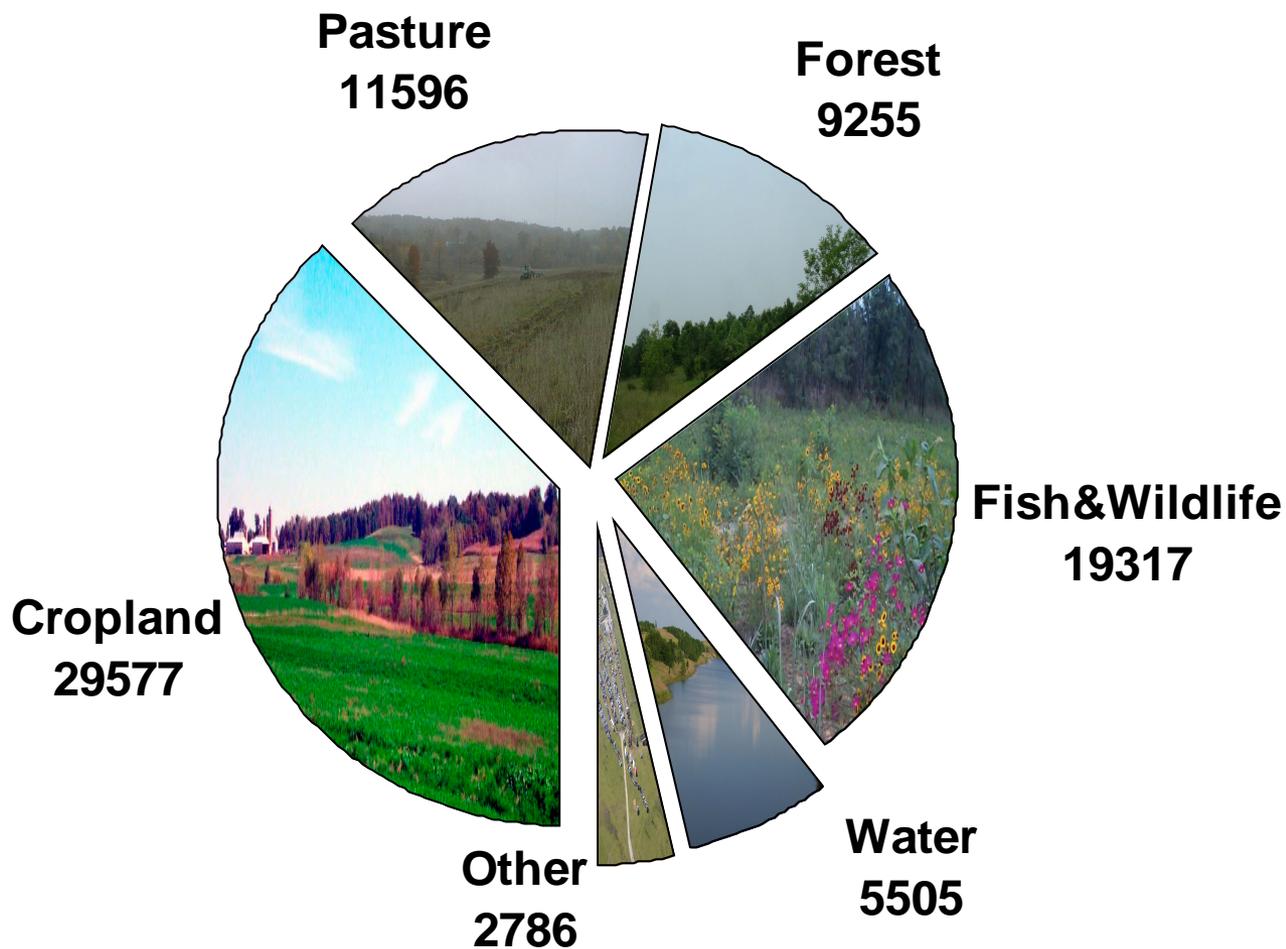
Indiana Production



SURFACE WATER AVAILABILITY

- **Annual Precipitation Ranges from 40-45 Inches**
- **10yr/24hr Storm Ranges from 4.3 to 4.6 Inches**
- **100yr/24hr Storm Ranges from 6.0 to 6.5 Inches**
- **“7day/10yr low flow values for the (Wabash) lowland are minimal, owing to the absence of surficial aquifers.”**

Landuse Acres Returned to Landowners Between 1996-2007



AGRICULTURE



TYPICAL DRAINAGE PATTERNS



UNAFFECTED AREA STREAMS



PAST PRACTICES

- Focus: soil stability
water transport, water
quality
- Rip rap
- Terraces
- Heavy vegetation
- Straight channelized
drainages



CURRENT PRACTICES

- Focus: soil stability, water transport, water quality AND wildlife values
- Natural stream channel design
- Native vegetation
- Establishment of wooded riparian corridors



BENEFITS



- Wildlife habitat diversity
- Less maintenance
- Aesthetics



- Better flood control
- Water quality

CHALLENGES

- Land use restrictions
- Landowner concerns
- Multi agency jurisdiction
- Conflicting regulations
- Learning curve
- Review complexity
- Swell factor
- Personal values

STRIKING A BALANCE

- Environmental protection
- Maximizing coal recovery
- Landowner concerns
- Environmental laws and regulations
- I-SMCRA Law "Assure that the coal supply essential to the nation's energy requirements and economic and social well-being is provided and strike a balance between protection of the environment and agricultural productivity and the nation's need for coal as an essential source of energy."

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