



# The Employment Impact of Rig Count in the Piceance Basin

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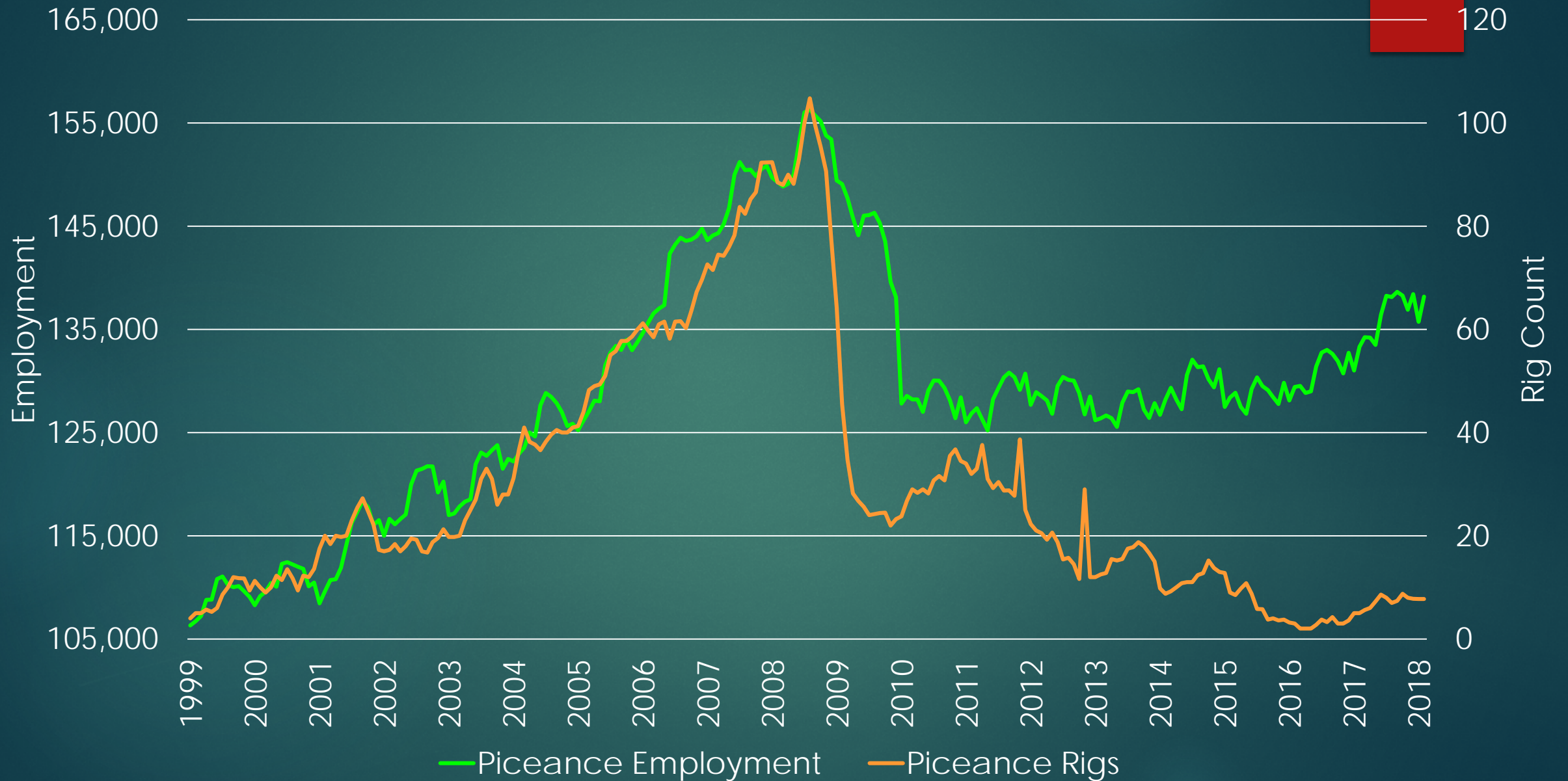
# Economic Impact of Natural Gas in the Piceance

- ▶ There are two ways to determine the economic impact of oil/gas production:
  - ▶ Part 1) Conduct an econometric study relating the changes in employment to changes in rig counts, gas prices, well counts, etc.
    - ▶ This is what I am presenting on today.
  - ▶ Part 2) Comprehensive economic impact that accounts for spending in the industry, adjusts for multiplier effects, supply chain effects, and leakages from the system.
    - ▶ This is usually conducted with BLS, BEA, or survey data using economic impact software.
    - ▶ This part of the study will be completed over the fall (more on the last slide)

# Study Part 1: Previous Studies

- ▶ Brown (2015) studies this at the state level.
  - ▶ Studies the relationship between rig count and employment in the top 12 oil/gas producing states.
  - ▶ Findings:
    - ▶ 1<sup>st</sup> month: 28
    - ▶ 2<sup>nd</sup> month: 41
    - ▶ 3<sup>rd</sup> month: 49
    - ▶ 4<sup>th</sup> month: 76
    - ▶ 5<sup>th</sup> month: 80
    - ▶ 6<sup>th</sup> month: 94 (cumulative)
    - ▶ Long Run: 171 jobs
    - ▶ Multiplier associated with this: 1.8
      - ▶ Suggests 0.8 jobs added outside the oil and gas sector for every job in the sector (Brown, 2015)
- ▶ Agerton et. al. (2015)
  - ▶ 37 jobs for first rig
  - ▶ 224 jobs created per rig over the long run

# Rig Count and Employment



# Method

- ▶ Mesa, Rio Blanco, Garfield, Gunnison, Delta, and Moffat Counties are used in this study. Data from 1999 to 2018 in monthly format.
- ▶ Used an Autoregressive Distributed Lag Model (ARDL)
- ▶ This is a common model to capture the effect over lagged periods of time
- ▶ Controlled for seasonal factors in employment
  - ▶ Since there is not seasonally adjusted employment available at the county level
- ▶ Looked at both rig count and gas prices
- ▶ Regression equation:
$$\Delta EMP_{it} = \Sigma \alpha_m \Delta EMP_{it-m} + \Sigma \beta_k \Delta RIGS_{it-k} + \gamma_t + \varepsilon_{it}$$
- ▶ The general model follows Brown (2015)
  - ▶ Brown (2015) uses panel data
  - ▶ This study combines data into a singular time series
  - ▶ The final report will have a panel model similar to Brown's approach

# The Effect of Rig Count on Employment in the Piceance

- ▶ Following Brown's 6 month lag for comparison purposes:
  - ▶ 6 month effect of jobs: 138
  - ▶ Long run impact of rig on jobs: 394
  - ▶ Implicit employment Multiplier: 2.78
- ▶ Using 3 month lag which AIC criterion (statistical test) says is the optimal lag length for this study:
  - ▶ 3 month effect on employment: 105
  - ▶ Long run impact of rig on jobs: 343
  - ▶ Implicit employment multiplier: 3.24

# What does this employment consist of?

- ▶ Direct jobs for managing the rig (40-50)
- ▶ Jobs associated with managing the well
- ▶ Contractors
  - ▶ Water support
  - ▶ Welders
  - ▶ Pipeline
  - ▶ Infrastructure
- ▶ Multiplier effects
  - ▶ Car dealerships
  - ▶ Real estate
  - ▶ Restaurants/bars
  - ▶ Car Rentals

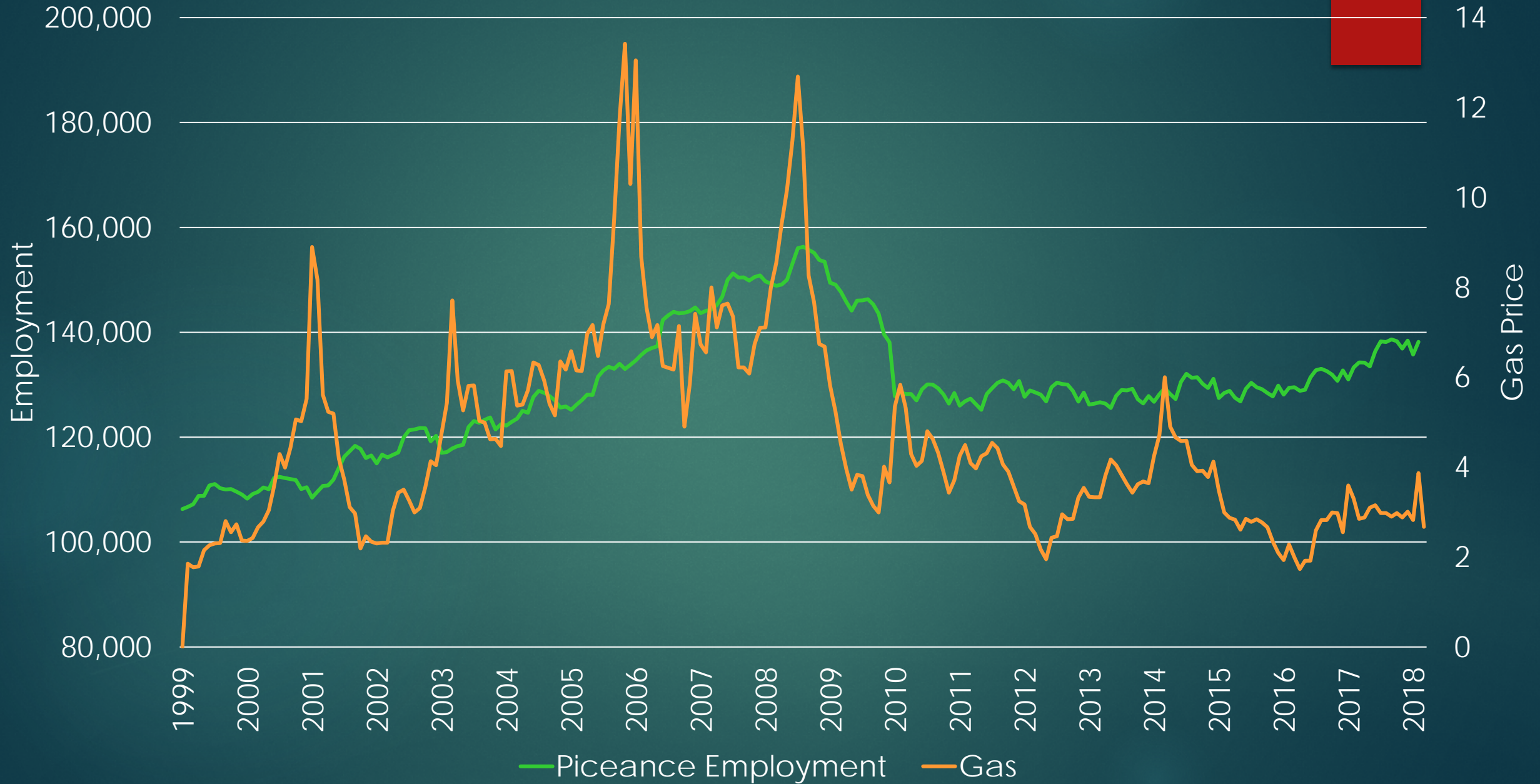
# Employment Forecast Fit

- ▶ From August 2008 to May of 2016, rigs went from 80 to 2.
- ▶ Employment in the same time period went from 156,307 to 128,834, for a loss of 27,473 jobs.
- ▶ 2008 strong national economy
- ▶ 2009-2013 weak economy
- ▶ 2016 strong national economy
- ▶ Using the model results above: 343 jobs per rig multiplied by 78 rigs is 26,754 jobs
  - ▶ This model predicts that almost all of those employment losses were a result of lower rig counts .

# Why are the results for the Piceance larger than previous studies?

- ▶ Percentage of total wages that oil/gas/mining contribute per county (2013 data)
  - ▶ Mesa: 11%
  - ▶ Garfield: 19%
  - ▶ Rio Blanco: 50%
  - ▶ Gunnison: 28%
  - ▶ Moffat: 34%
  - ▶ Texas: 7%
  - ▶ United States: 1%
- ▶ Simple: Western Colorado is simply more economically dependent on the oil/gas industry than other areas studied.

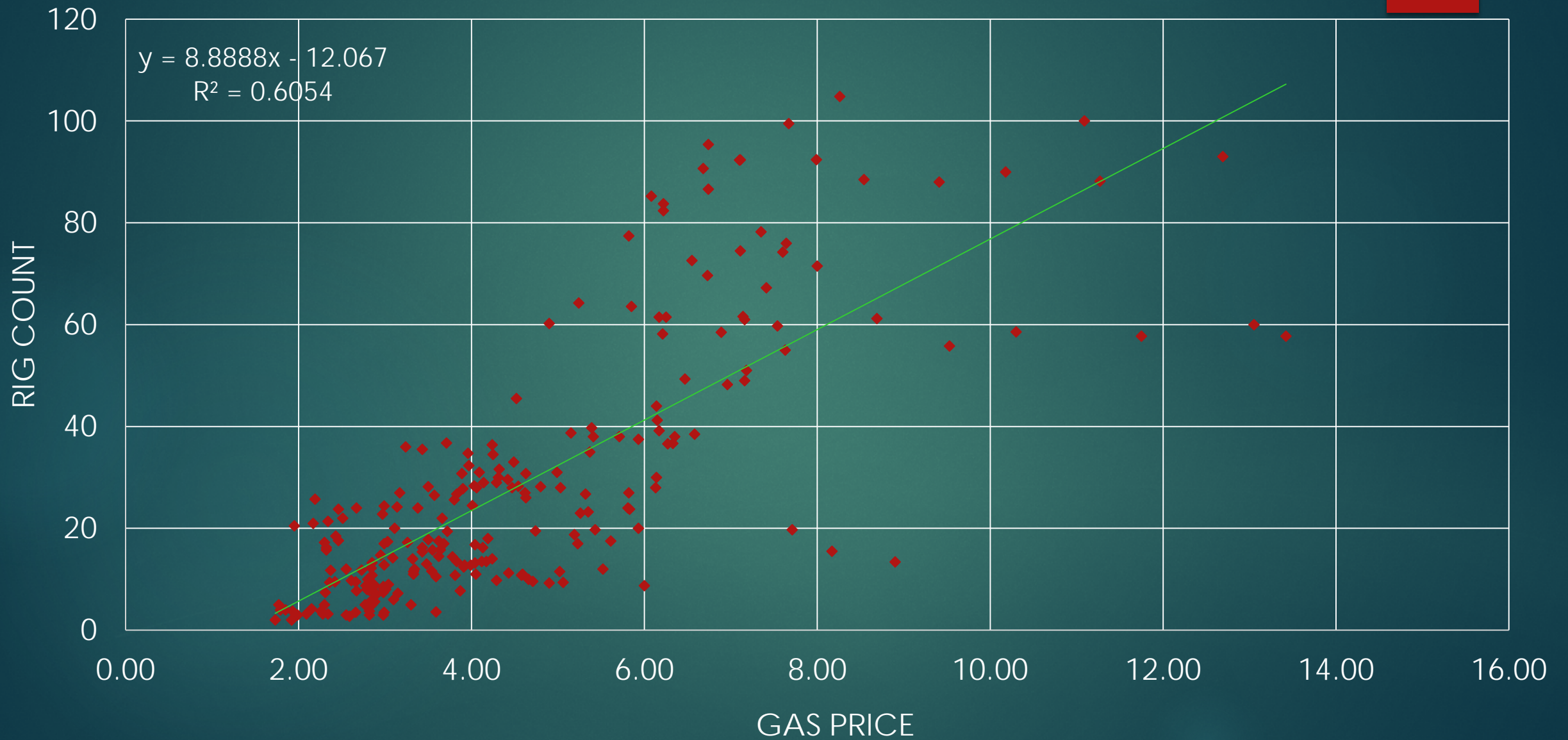
# Employment and Gas Prices



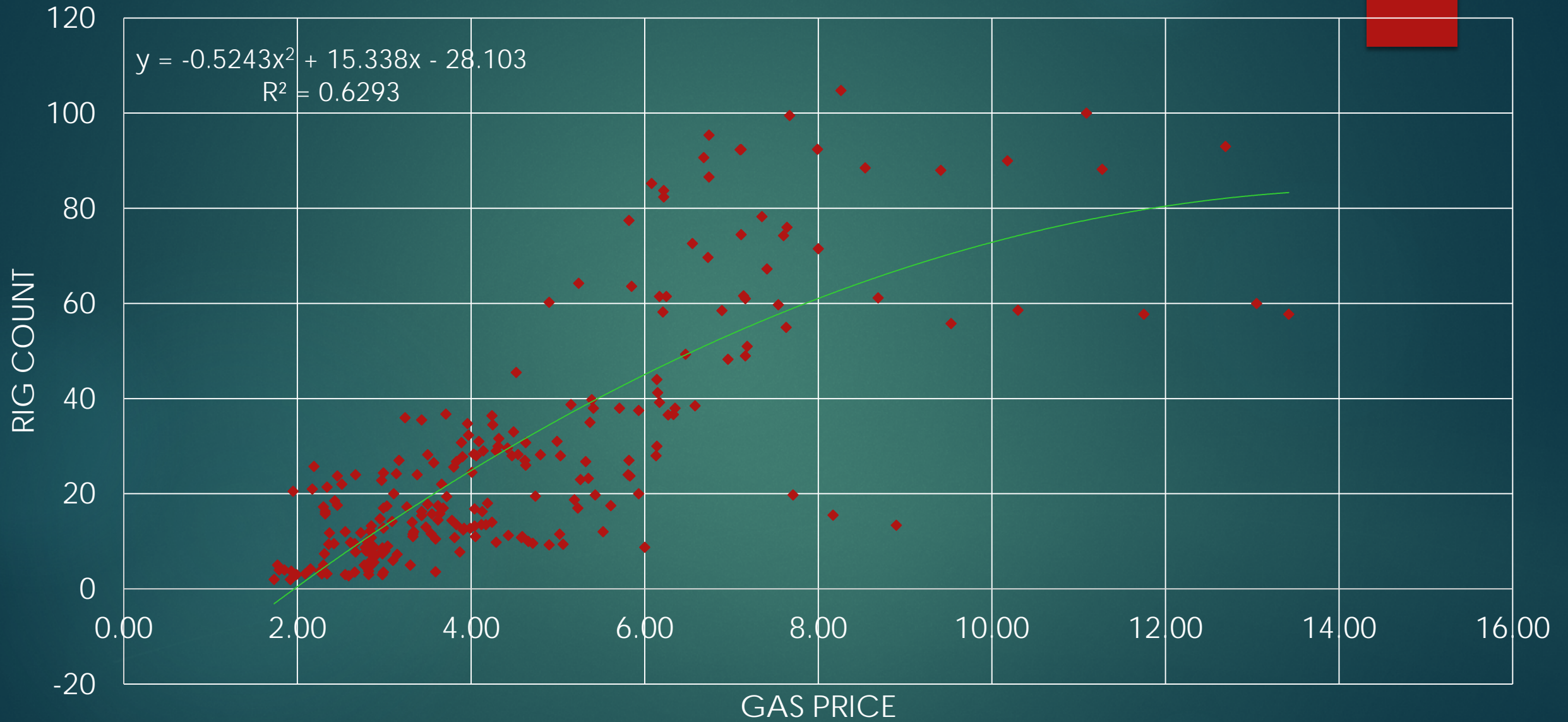
# Impact of Gas Prices on Employment

- ▶ Most previous literature agrees that rigs model employment better than gas/oil prices.
- ▶ For every dollar increase in gas prices:
  - ▶ 6 month employment: 394 jobs
  - ▶ Long Run Employment: 1,518
  - ▶ Using the same time period as before: Gas prices peaked summer of 2008 at 12, bottomed March 2016 at 1.73.
  - ▶ That's a \$10 difference in gas prices
  - ▶  $\$10 \times 1,518 = 15,180$  jobs
- ▶ Close to rig estimate of 26,754 jobs

# RIG COUNTS AND GAS PRICES



# RIG COUNTS AND GAS PRICES



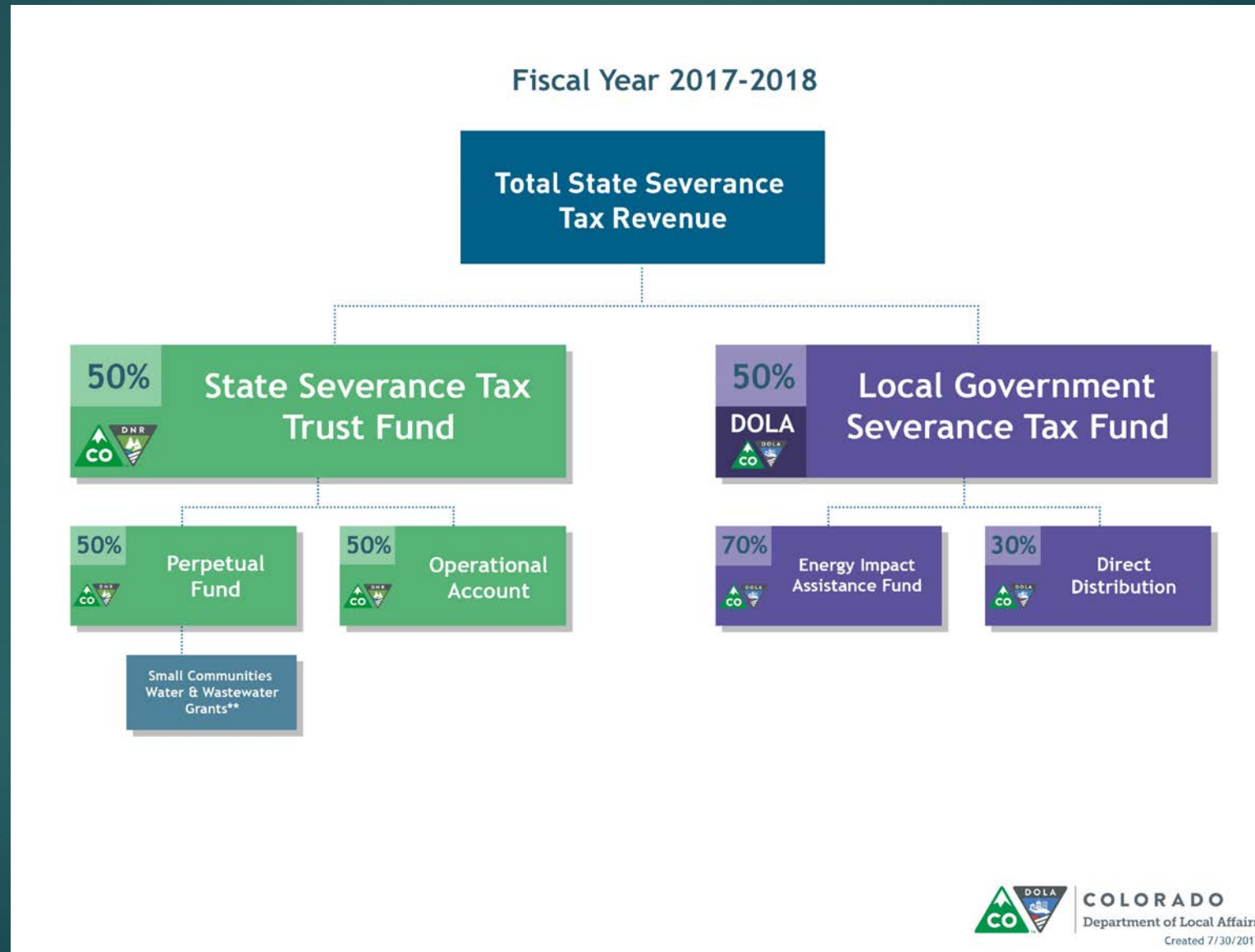
# Graphical Interpretation

- ▶ For every dollar increase in gas prices rig counts rise by approximately \$9
- ▶ This levels off around a price of \$8
- ▶ Max gas price of approximately \$12 in the summer of 2008, but only for a few months. Lets call max price \$10.
- ▶ Gas price low of \$1.73 in March of 2016
- ▶  $\$8 \times 9 = 72$  rigs
- ▶ Rig count went from 80 to 2, a change of 78 rigs. This model predicts rig count based on gas price well.

# A few details on study part 2...

- ▶ The Economic Impact study is unique to the area and is unique to the literature.
  - ▶ Many studies have been conducted on the state level or the national level, not on the county level.
- ▶ Other studies just look at the direct expenditures for the gas/oil industry, but do not look at the precise impact that various taxes imposed on the industry have on the county where the production takes place.
- ▶ This part of the study, when completed, will include the following:
  - ▶ a) Capital expenditures
  - ▶ b) Operational costs (wages, expenditures)
  - ▶ c) Severance tax effects
    - ▶ We are tracking severance taxes from the county, to the state, and back to the county, and counting in the economic impact report the severance tax money that returns in the form of grants, spending, etc.
  - ▶ d) Federal Mineral Royalty effects (both state and federal split analysis)
  - ▶ e) Royalties from private landowners and the spending attached to those royalties
- ▶ This part of the study will be completed at the end of the year 2018

# Severance Tax Flow Chart



# Federal Mineral Lease Flow Chart

