

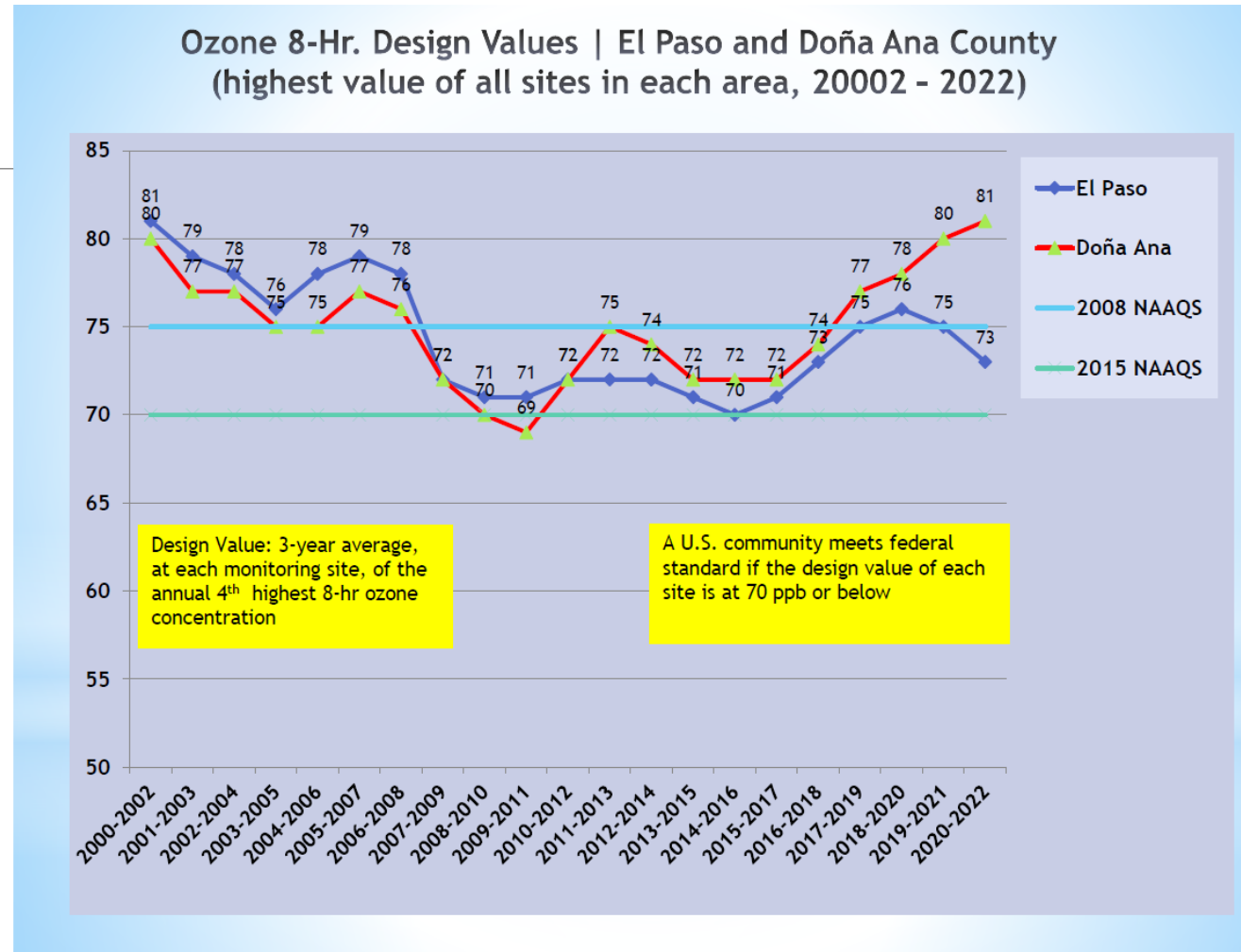
Ozone Transport from the Permian Basin to the Paso del Norte Region

DAVID BAAKE

DAVID@BAAKELAW.COM



Ozone in the PdN is at Highest Level in 20 Years

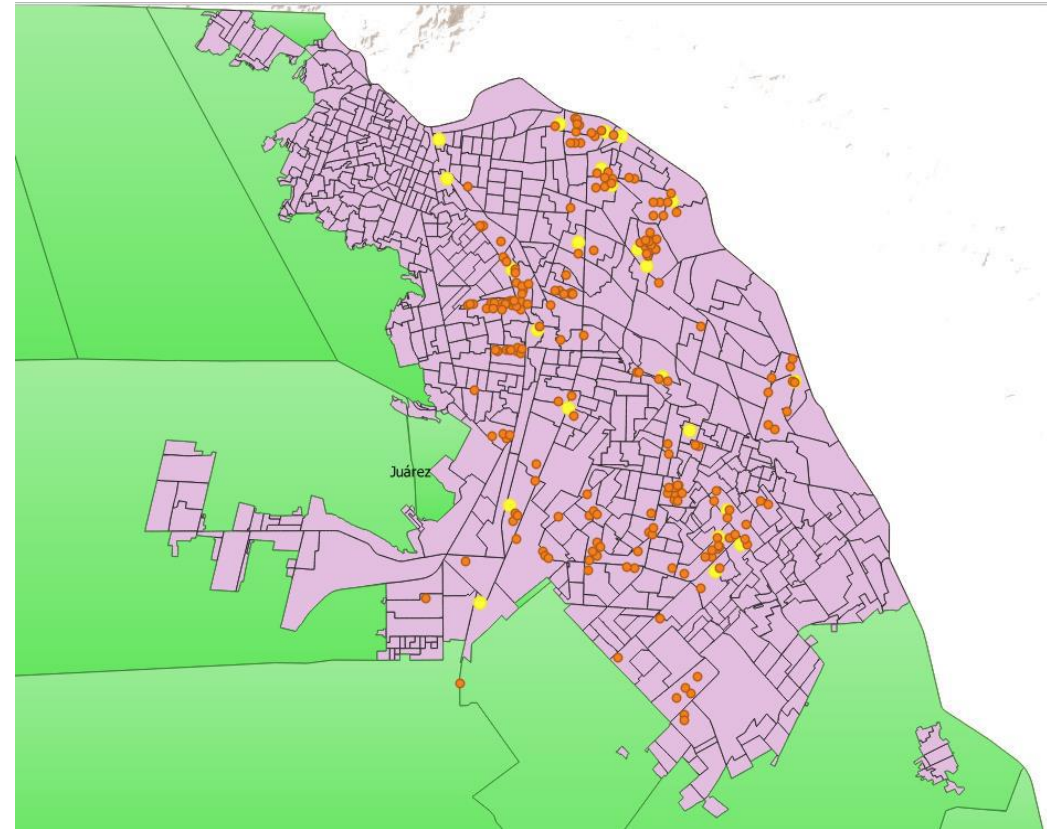


https://www.cccjac.org/uploads/9/1/9/2/91924192/jac_85_aq_report_2023-02-16_final_epa.pdf

Dr. Carlos Rincon Presentation (Feb. 16, 2023)

Cd. Juarez Emissions Are Stagnant or Declining

Year	NOx	VOC
2016 (EPA 2016v2 Emission Inventory)	39,744	33,363
2018 (Inventario Nacional de Emisiones de Contaminantes Critero)*	32,228	32,348
Change Since 2016	-18.9%	-3%



* https://www.cccjac.org/uploads/9/1/9/2/91924192/inventario_de_emisiones_cd_juarez_hugo_landa.pdf
(2018)

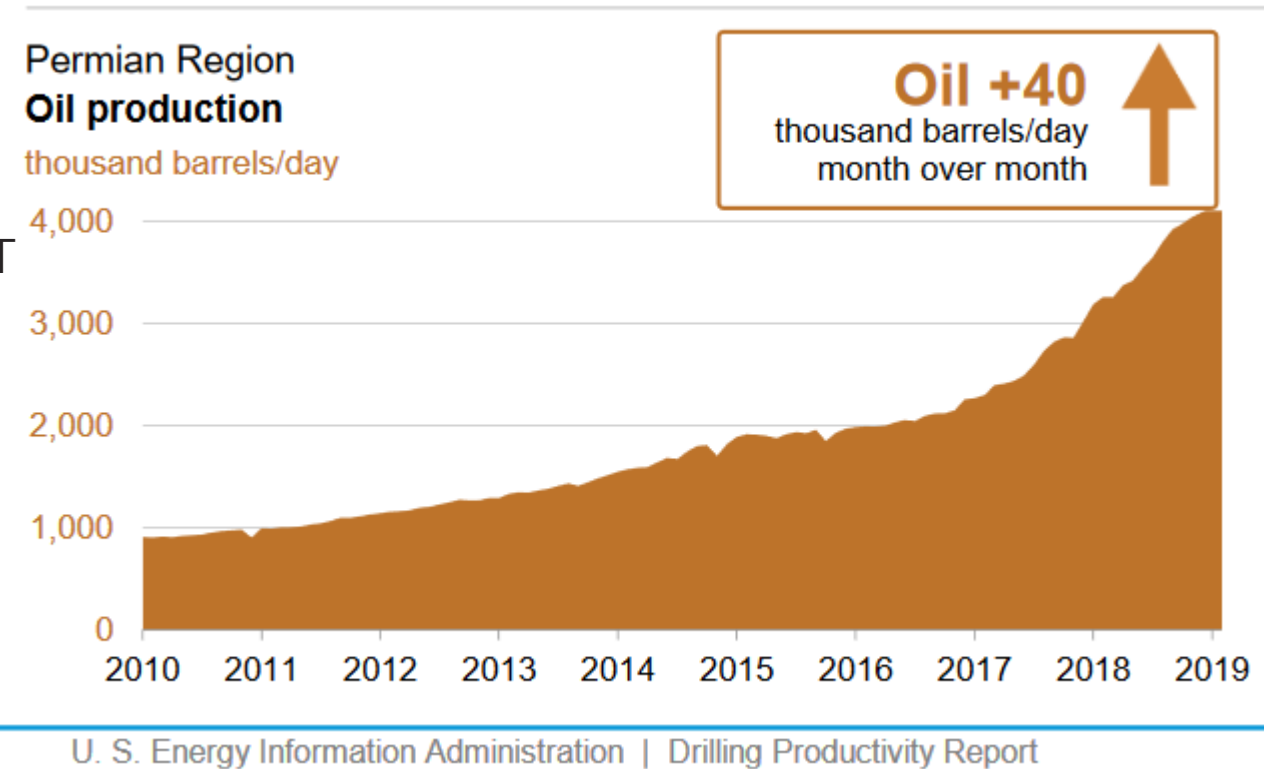
In the Last Decade, the Permian Has Become the World's Most Productive Oilfield



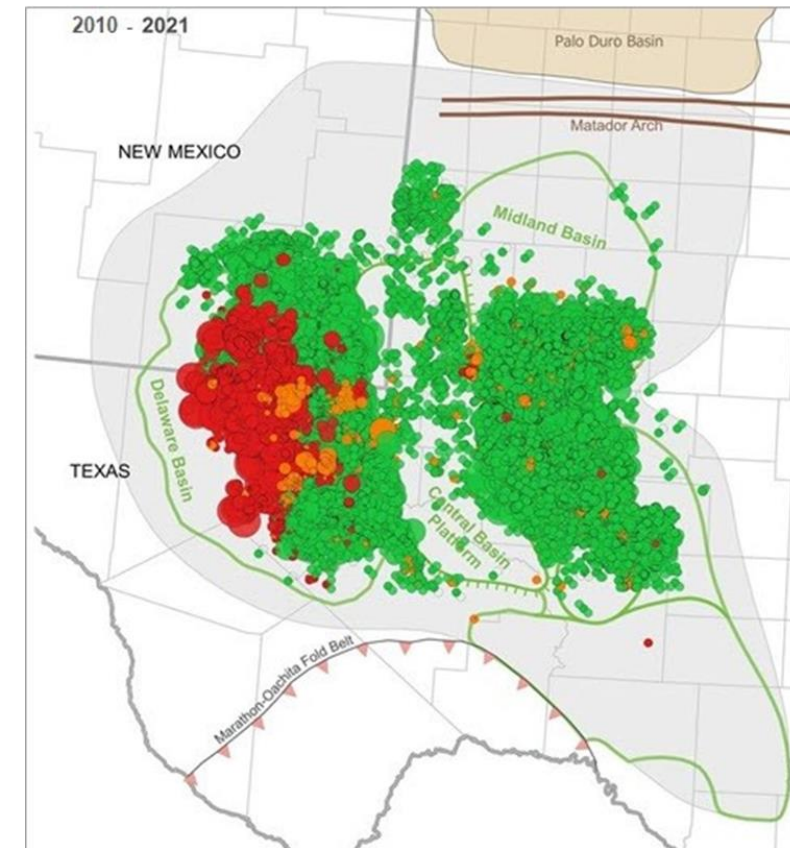
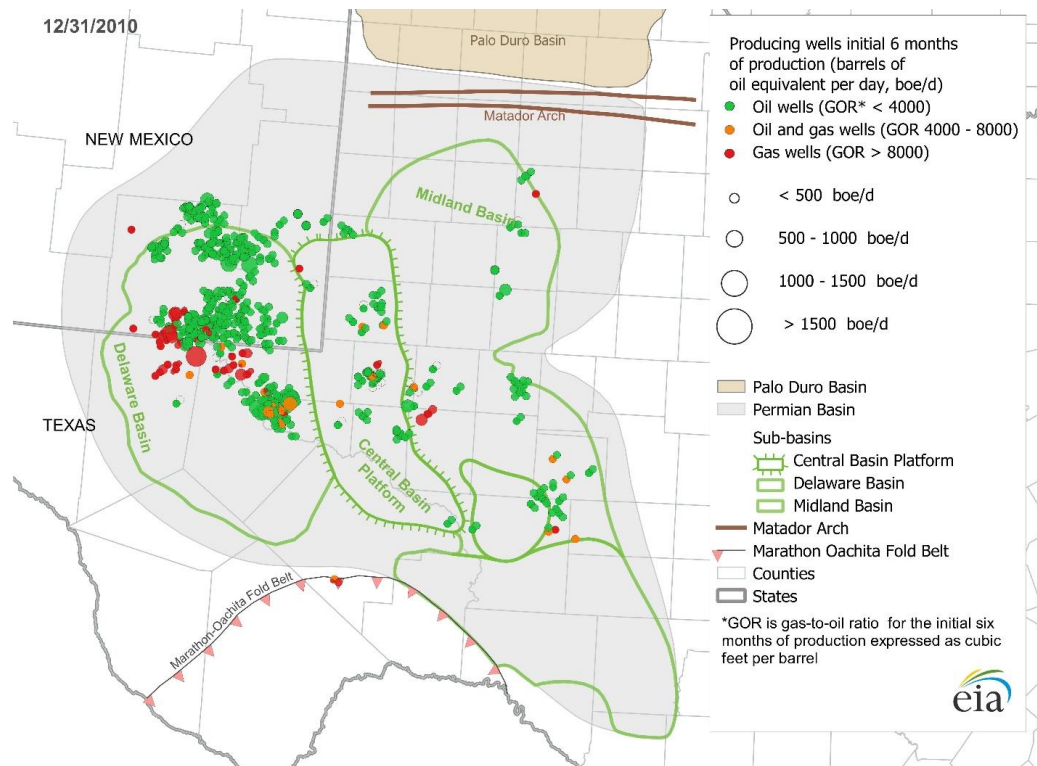
THE PERMIAN BASIN IS NOW THE HIGHEST PRODUCING OILFIELD IN THE WORLD

BY ELIZABETH CALDWELL APR. 02, 2019

<https://www.energyindepth.org/the-permian-basin-is-now-the-highest-producing-oilfield-in-the-world/>



In the Last Decade, the Permian Has Become the World's Most Productive Oilfield

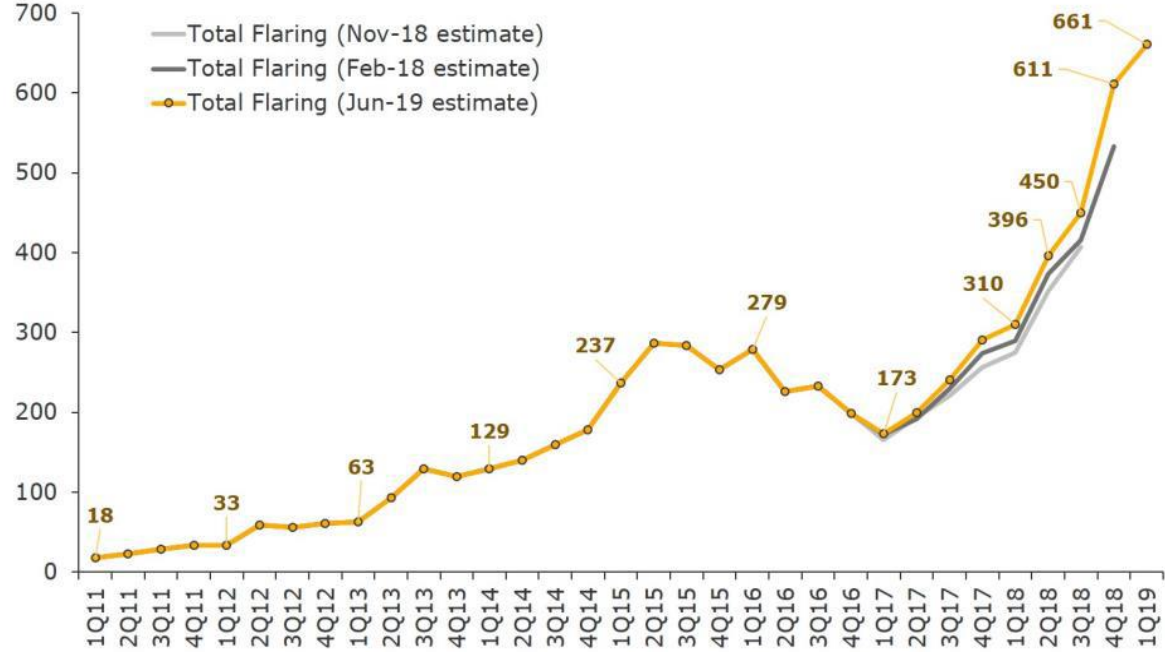


<https://www.eia.gov/todayinenergy/detail.php?id=54079>

Permian Emissions Have Skyrocketed



Natural gas flaring and venting in the Permian Basin by quarter
Million cubic feet per day



Source: Rystad Energy research and analysis, Rystad Energy ShaleWellCube



Emissions from the Permian Basin Dwarf Emissions from Cd. Juarez

Year	NOx	VOC
Cd. Juarez (2018 Inventario Nacional)	32,228	32,348
TCEQ Region 7 (Midland- Odessa)*	85,550	362,139

*<https://www.tceq.texas.gov/downloads/air-quality/air-monitoring/network/historical/tceq-2020-5yr-assessment.pdf>
at Table 10



Permian Emissions Are a Key Factor in Declining Air Quality in the PdN

- * Regional Trends
- * Meteorological Evidence
- * Source Apportionment Modeling

Regional Trends: Ozone Levels Increasing from Carlsbad Caverns to Chapparal, NM

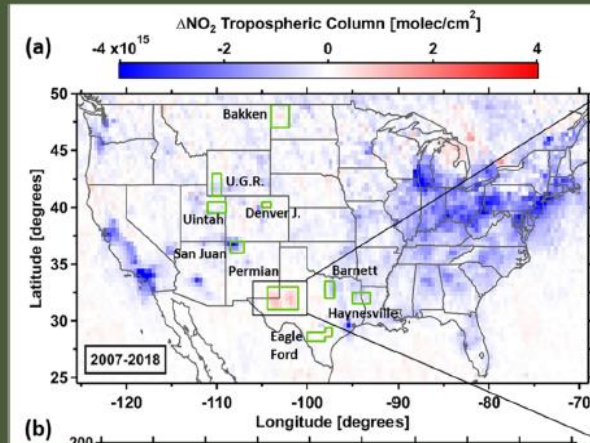
Increases in NO_x^* and Ozone at Carlsbad Caverns National Park

* $\text{NO}_x = \text{NO} + \text{NO}_2$

Carlsbad Caverns Ozone

70 ppb is the national standard

Year	# Exceedance Days	Years	8-hr 4 th high O_3
2016	None	2014-2016	67
2017	None	2015-2017	66
2018	10	2016-2018	71
2019	6	2017-2019	74
2020	9	2018-2020	73



Trends in NO_x from satellite data
(Dix et al., 2020)



<https://www.env.nm.gov/environmental-improvement/wp-content/uploads/sites/8/2021/05/2021-07-28-EIB-21-27-NPSTechnical-Comments-pj.pdf>

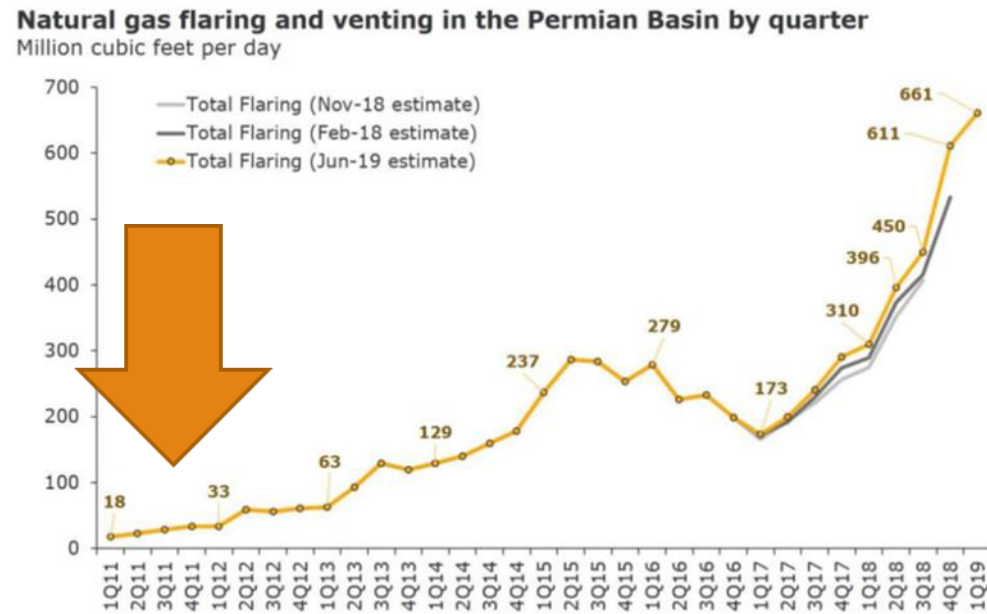
Meteorological Evidence



Figure 15 - Majority of the back-trajectories 2019-2020 exceedance days air parcels travel through the Ciudad Juárez metropolitan area in a consistent J pattern with many originating in the Midwestern United States or the Gulf of Mexico.

Source Apportionment Modeling

Texas O&G industry was **already** one of top 10 contributors to PdN ozone in 2011, back when we were here:



Source: Rystad Energy research and analysis, Rystad Energy ShaleWellCube



Source Apportionment Modeling

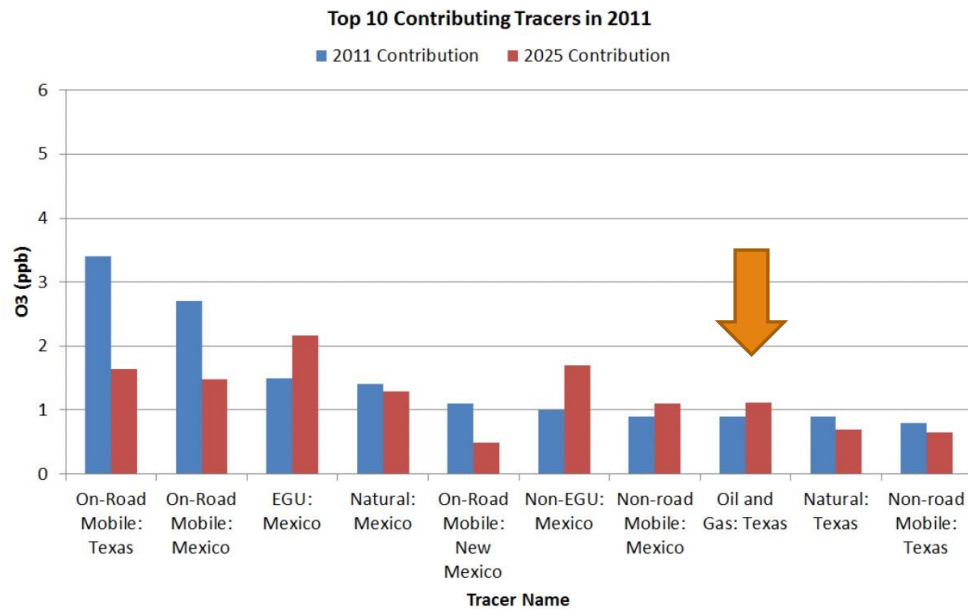
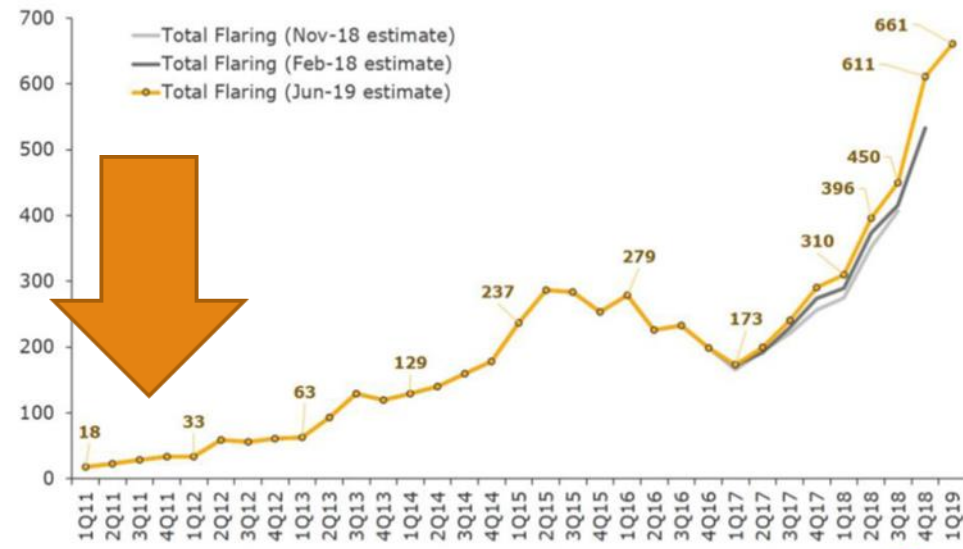


Figure 3-37. Contributions to the 2011 (blue) and 2025 (red) design values for the top ten contributing source groups in 2011 for the Desert View monitor. Source groups are ranked from left to right based on their contribution to the 2011 design values.

Natural gas flaring and venting in the Permian Basin by quarter
Million cubic feet per day



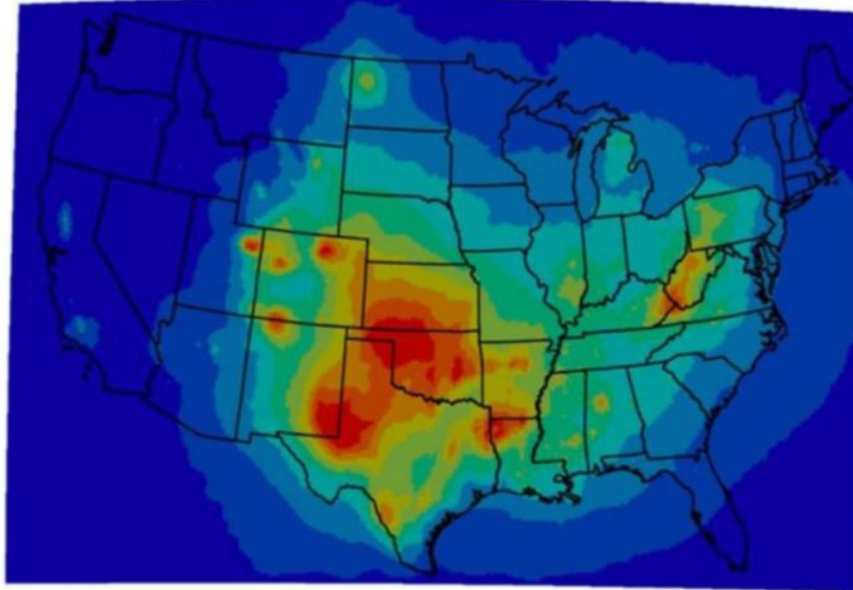
Source: Rystad Energy research and analysis, Rystad Energy ShaleWellCube



Permian (Texas Portion Only) contributes ~ 1 ppb to PdN ozone in 2011

Source Apportionment Modeling

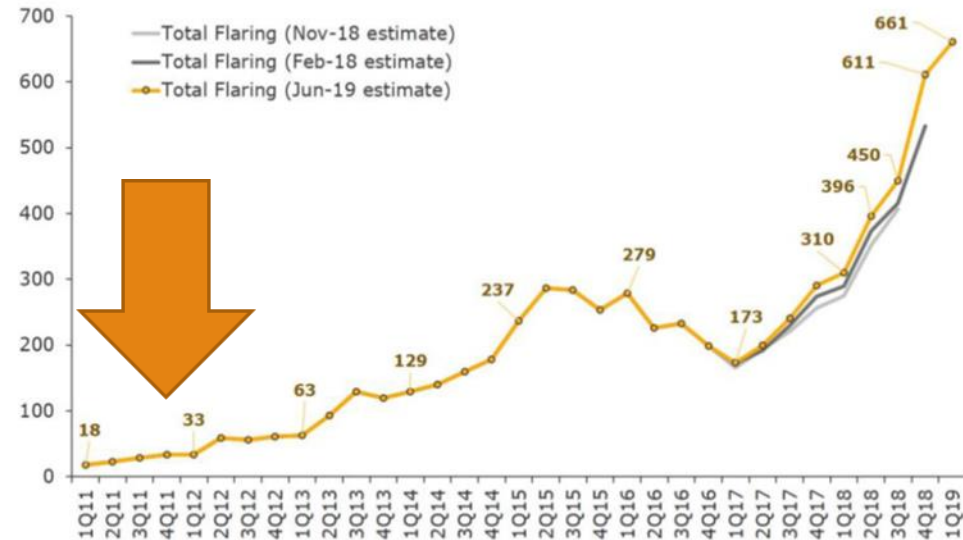
Summer Season Average Daily 8-Hour Maximum Ozone



Summer Season Average Daily 8-hour Maximum (ppb)



Natural gas flaring and venting in the Permian Basin by quarter
Million cubic feet per day



Source: Rystad Energy research and analysis, Rystad Energy ShaleWellCube



Extrapolating from 2011 emissions based on industry growth anticipated in 2014, study found that O&G would contribute between 1.4 and 2.6 ppb to peak ozone in PdN by 2025 (Fann et al. 52 Env't Sci. & Tech. 8095 (2018))

O&G Pollution Causes ~ 15 Premature Deaths per Year in El Paso-Las Cruces Area (2016 emissions levels)

BOP Publishing *Environ. Res.: Health* 1 (2023) 021006 <https://doi.org/10.1088/2752-5309/acc886>

ENVIRONMENTAL RESEARCH HEALTH

CrossMark

LETTER

OPEN ACCESS

RECEIVED
23 November 2022

REVISED
17 February 2023

ACCEPTED FOR PUBLICATION
28 March 2023

PUBLISHED
8 May 2023

Original content from

Air pollution and health impacts of oil & gas production in the United States

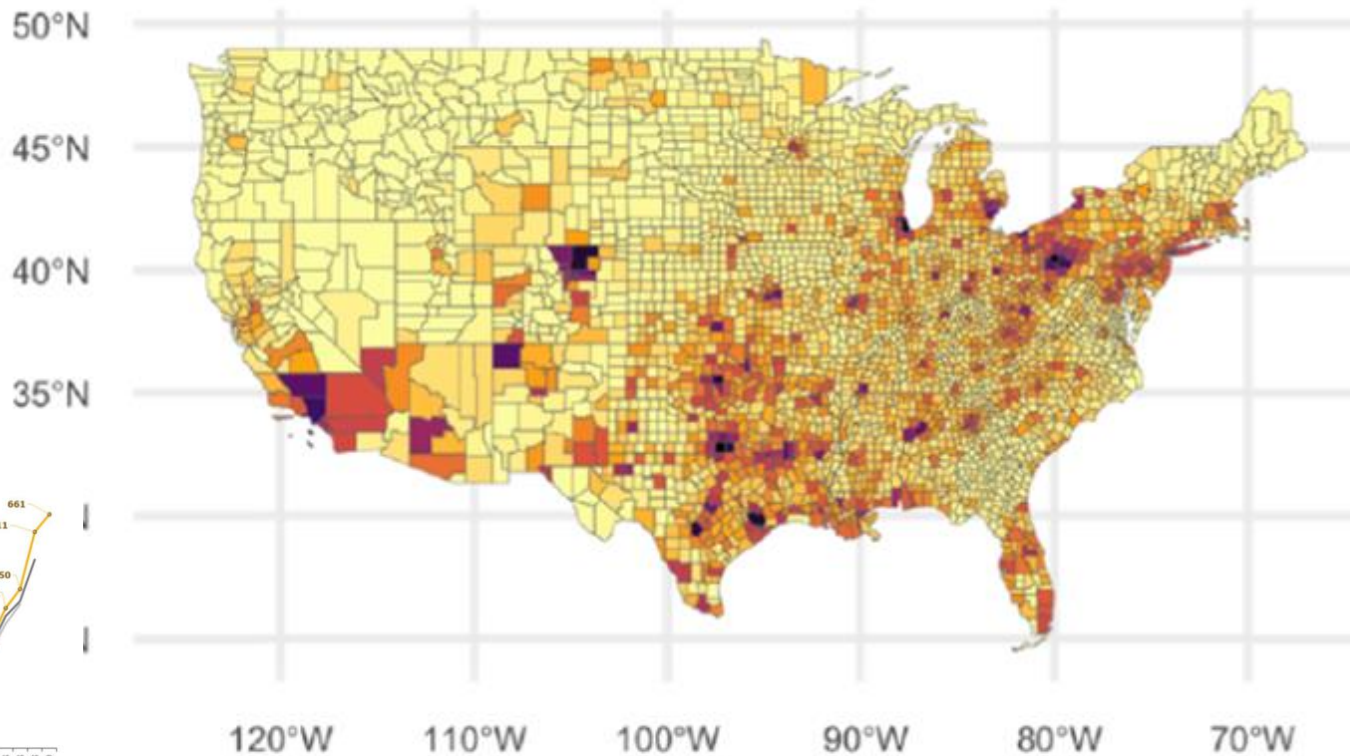
Jonathan J Buonocore^{1,4*}, Srinivas Reka², Dongmei Yang², Charles Chang², Ananya Roy³, Tammy Thompson³, David Lyon³, Renee McVay³, Drew Michanowicz³ and Saravanan Arunachalam³

¹ Boston University School of Public Health, Boston, MA, United States of America
² Institute for the Environment, University of North Carolina, Chapel Hill, NC, United States of America
³ Environmental Defense Fund, Washington, DC, United States of America
⁴ Physicians, Scientists, and Engineers for Healthy Energy, Oakland, CA, United States of America
 * Author to whom any correspondence should be addressed.

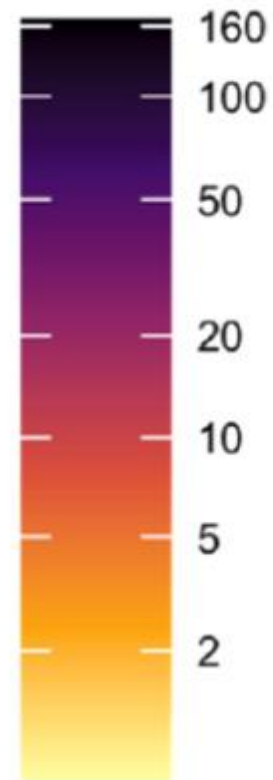
	Premature Deaths Total	Premature Deaths PM	Premature Deaths Ozone	Premature Deaths NO2
El Paso County	12	3.16	6.29	2.68
Dona Ana County	2.86	0.8	1.17	0.35

ortality due to PM_{2.5}, ozone, and NO₂

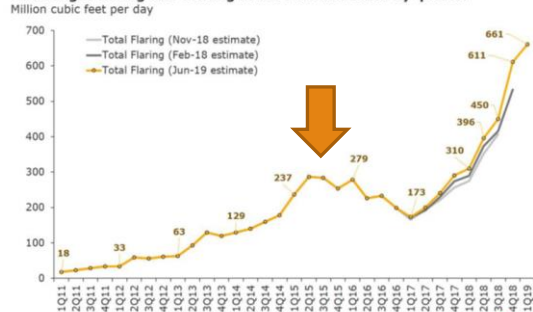
All Oil and Gas, 2016



Deaths



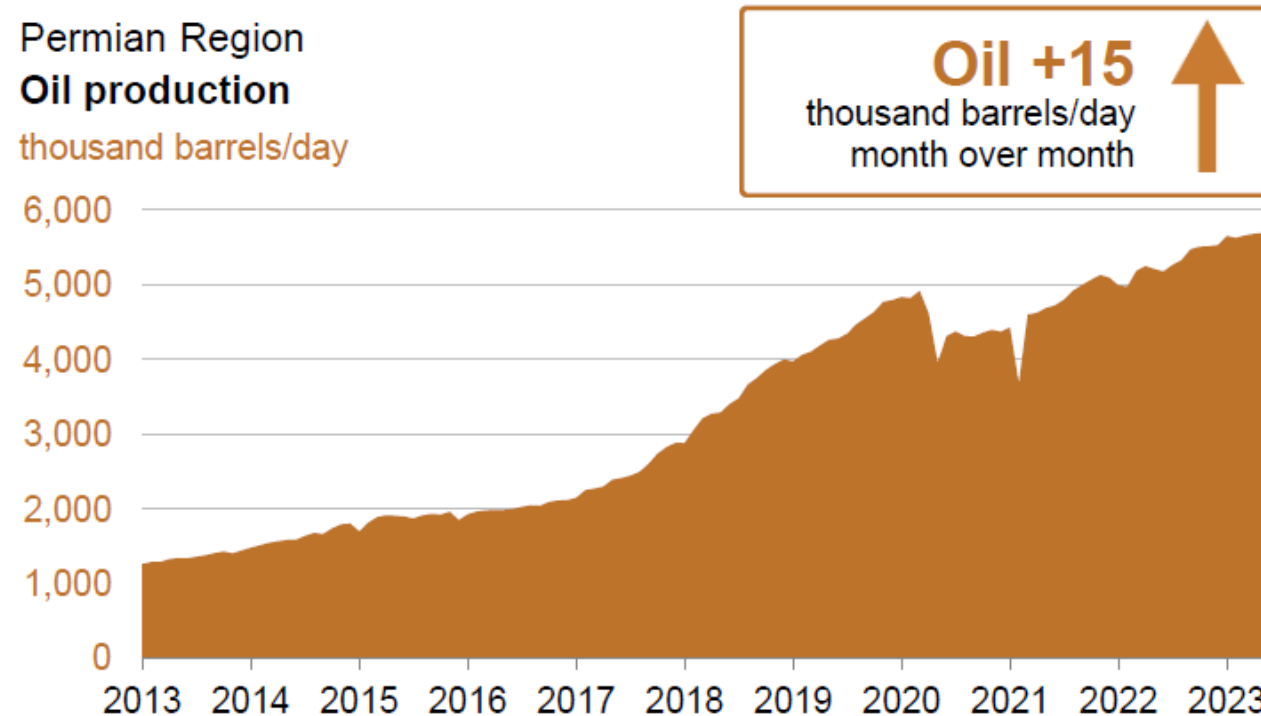
Natural gas flaring and venting in the Permian Basin by quarter



Source: Rystad Energy research and analysis, Rystad Energy ShaleWellCube



Production Has More than Doubled Since 2016 – What are Implications for Pollution?



* We don't know yet; modeling has not caught up.

* The impact was already substantial at much lower emission levels

Implications for Rulemaking

***States MUST control upwind emissions in nonattainment SIPs**

The SIP revision shall include, as applicable, other control measures on sources of emissions of ozone precursors **located outside the nonattainment area . . . located within the state if doing so is necessary or appropriate to provide for attainment of the applicable ozone NAAQS** in such area by the applicable attainment date.” [40 CFR 51.1312\(c\)](#)

***But will EPA require nonattainment SIPs for El Paso-Las Cruces Nonattainment Area?**

Implications for Rulemaking

* **EPA methane rule** is critically important. There may be incidental benefits for downwind regions, particularly if final rule prohibits routine flaring.

- But EPA cannot directly regulate NO_x under Section 111(d). Ozone in PdN is now largely NO_x limited, and NO_x typically a more significant factor in long-range ozone transport.

* **Good Neighbor Rule** will reduce NO_x from reciprocating combustion engines at transmission compressor stations in Texas. Should be expanded to apply to other engines in the O&G sector.

* **NM ozone-precursor rule** included strong limits on VOC and methane but fell short on limiting NO_x. Engine standards should be tightened; see Colorado.

Questions?

