

# NetRA Assessing the Trade-off Between Economic Development and Conservation of Ecosystem Services

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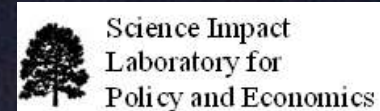
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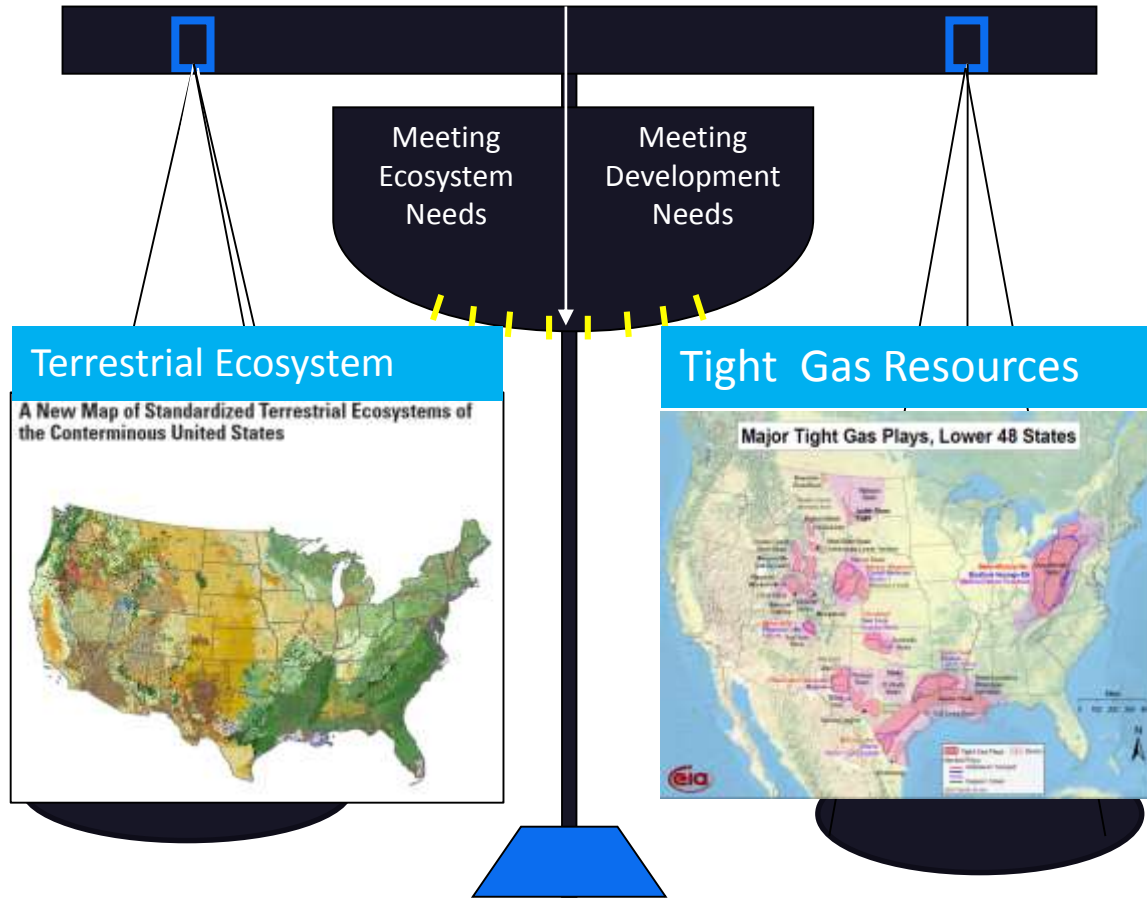
# Setting: NetRA Context/Background



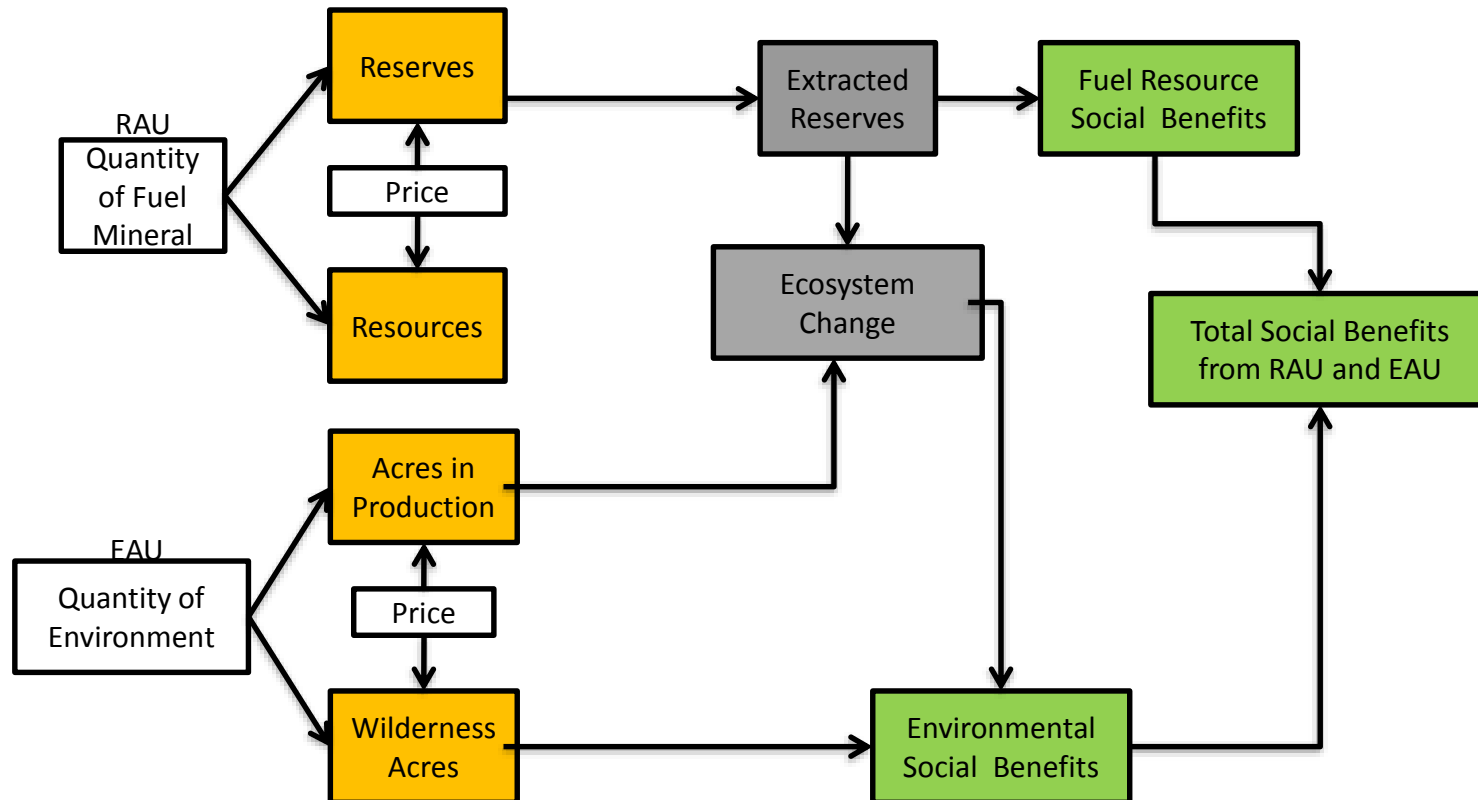
- **USGS Energy and Minerals Science Strategy (2013):**
  - Provide inventories and assessments of energy and mineral resources
  - Understand the effects of energy and mineral development on natural resources and society
- **Secretarial Order 3330 (October 31, 2013):**
  - “The Order will ensure consistency and efficiency in the review and permitting of new energy and other infrastructure development projects
  - ...while also providing for the conservation, adaptation and restoration of our nation’s valuable and natural and cultural resources.”<sup>1</sup>
- **Net Resource Assessment:**
  - NetRA is an analytical component of a Multi-Resource Analysis
  - Will be a Decision Support Tool (DST)

• <sup>1</sup> “Secretary Jewell Offers Vision for Conservation, Balanced Development, Youth Engagement in National Press Club Speech.” October 31, 2013

# NetRA Purpose: Balance



# NetRA Simple Framework



# Proof of Concept

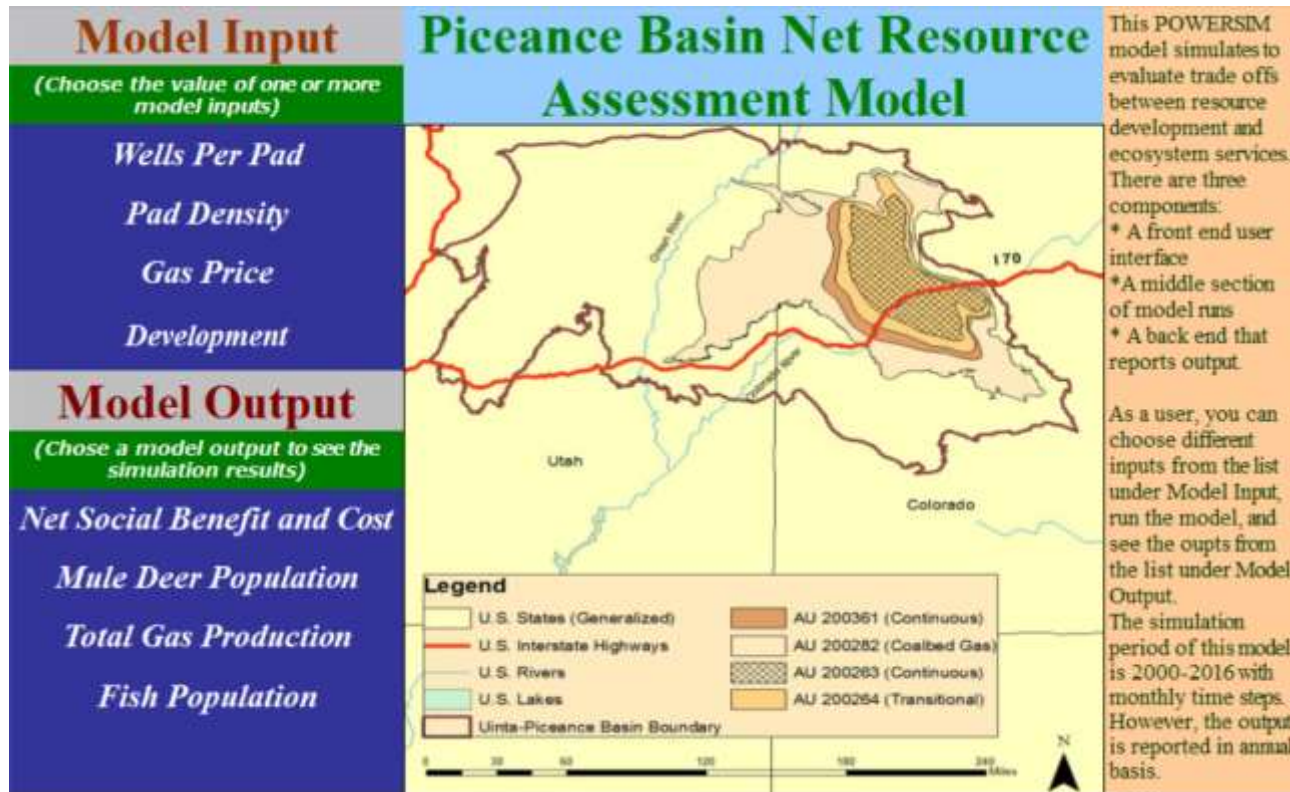
- **Definition:**
  - Realization of a certain method or idea to demonstrate its feasibility... who's purpose is to verify that some concept... has the potential of being used
- **Inputs:** Data resolution, map scales, and model compatibility will be evaluated
  - Data and model gaps will be identified
    - Earth science for natural resource stocks, engineering economics, biophysical and ecological data for ecosystem services stocks, market prices, regulations, and nonmarket values
- **Output:** A limited modeling framework that demonstrates the functionality of the DST
- **Example:** USGS Assessment Unit (AU) 200263 in the Piceance Basin, Colorado
- **Application:** Produce natural gas from the Mesaverde formation in a hypothetical example



Model of oil and gas drill pads and resource roads overlying National Aerial Imagery Program (NAIP) imagery, near Rifle, Colorado, 2007 (USGS sir20105064 2010)

# DST Front-End “Dashboard”

A development plan is established and constructed for a given scenario

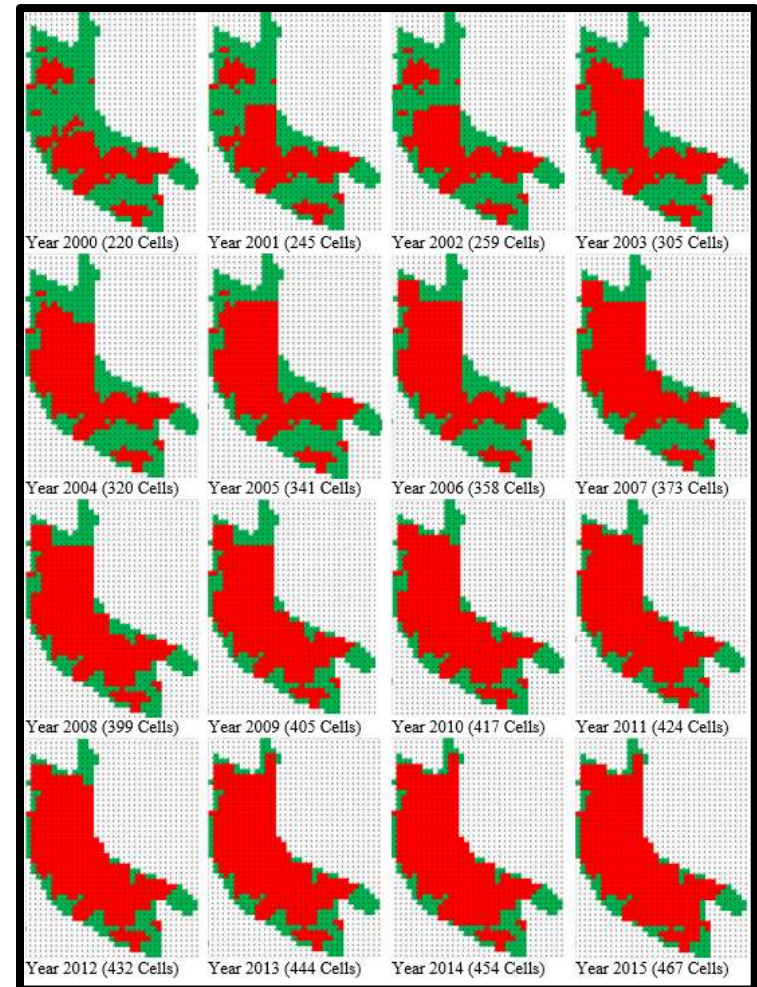


The Front-End includes:

- Input variables or choice variables
- Choices for model output
- Choice variable panel allows easy manipulation of input values on a slider-bar

# DST Middle – “Engine”

- **The Middle** simulates landscape changes, development and impacts to ecosystem services.
- Based on the selection of choice variables an outcome for a scenario is produced.
- **The Powersim model** is initiated with choosing the development area in a gridded map. (Green cells are not under development; Red cells are under development).
- **There are maps for each year of a simulation.** Outcomes from multiple scenarios serve as the support for a synthetic frequency distribution of the societal benefits, landscape changes and impacts to ecosystem services.



Selection of Development Area over Time  
In Proof of Concept Example

# End Output: Results (Net Social Benefits)

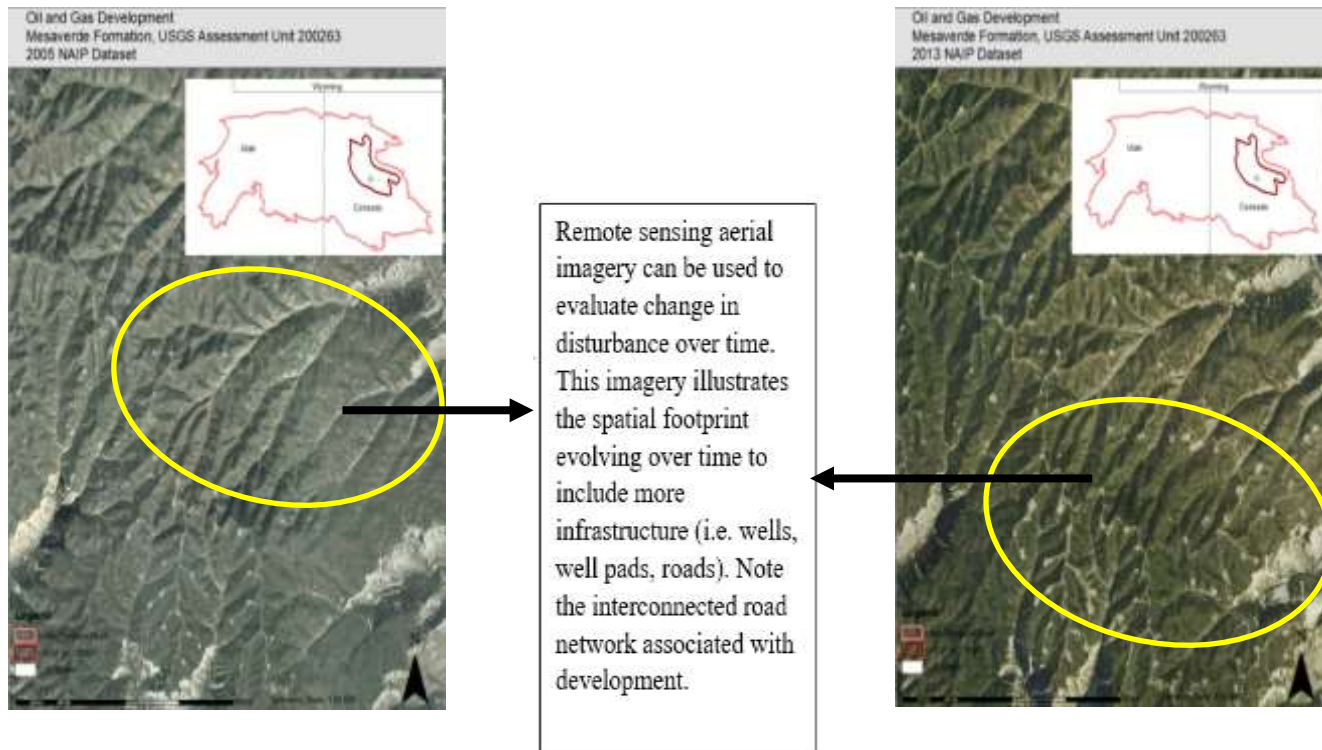
		Net Social Benefit (billions)			
		Years to Develop			
		1 year	5 year	10 year	20 year
Fixed Gas	1 well per pad (25 pads per cell)	-1.582	-13.578	4.842	-17.841
	1 well per pad (5 pads per cell)	-12.948	-18.444	-16.344	-25.802
	5 wells per pad (5 pads per cell)	47.241	32.476	47.731	19.560
	10 wells per pad (5 pads per cell)	55.235	96.127	132.225	76.261
Fixed Cells	1 well per pad (5 pads per cell)	-19.478	-13.188	-7.749	-8.747
	5 wells per pad (5 pads per cell)	47.440	37.732	56.326	36.614
	10 wells per pad (5 pads per cell)	122.677	101.382	136.42	93.316



# Scenario Analysis

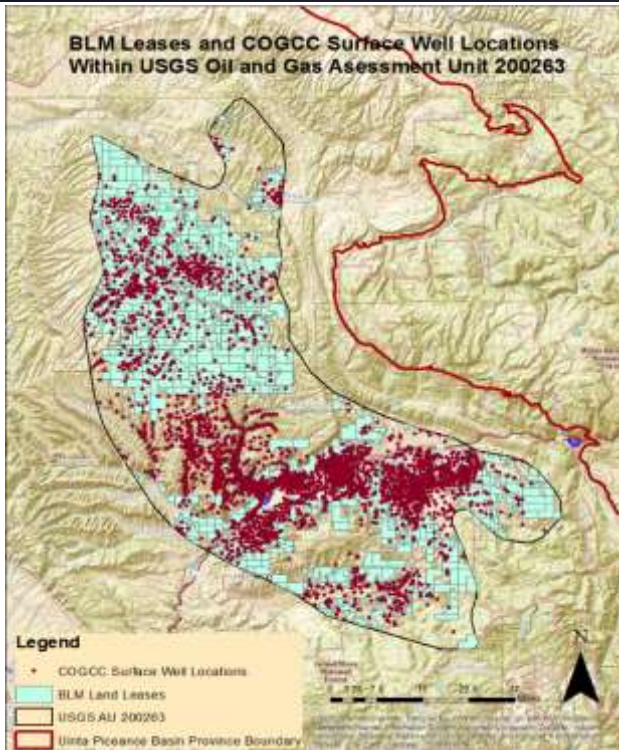


NetRA DST provides a tool to analyze the impact of gas production activity spatially.



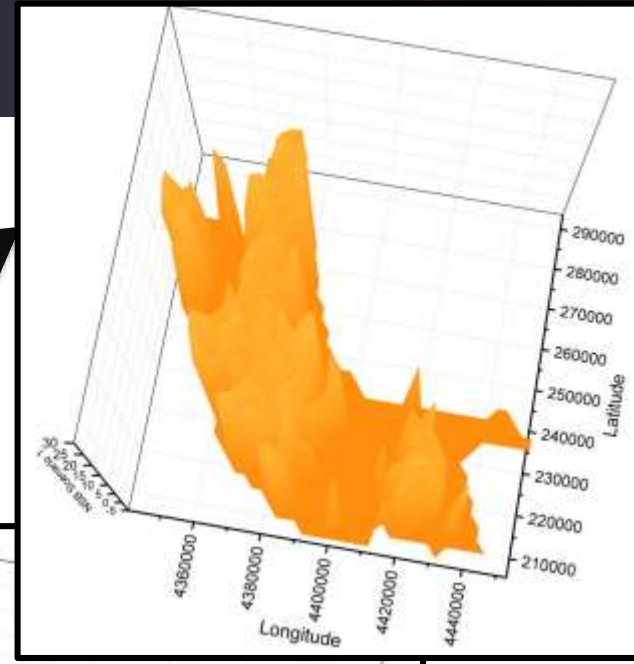
Aerial images of oil and gas development in AU 200263 in the Piceance Basin associated with oil and gas development.

# Scenarios and Model Outcomes and Outputs

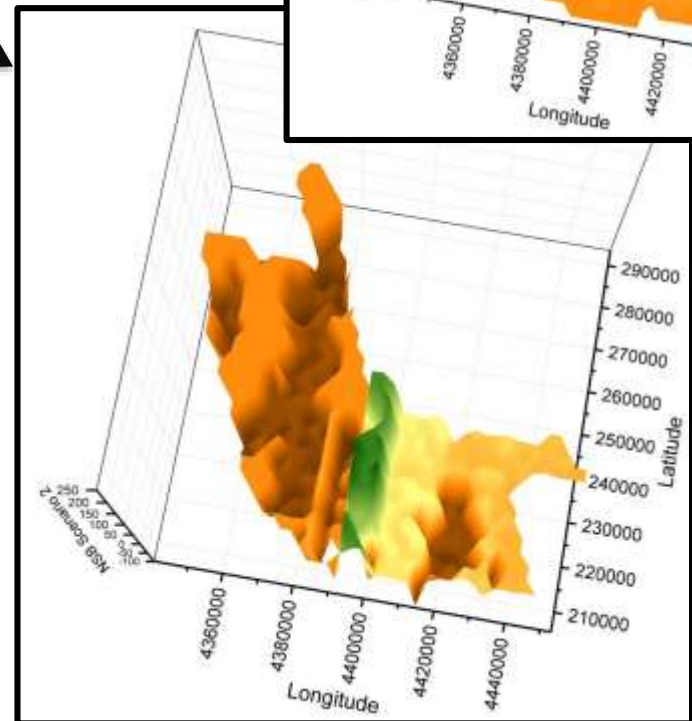


BLM Oil and Gas Leases Surface Well Locations with

**Net Social Benefit for Year 2004 and 5 Wells per Pad**



**Net Social Benefit for Year 2000 and 1 Well per Pad**



**Thank You**



# End Output: Results (Gas Production)

		Cumulative Gas Production (MCFG)			
		Years to Develop			
		1 year	5 year	10 year	20 year
Fixed Gas	1 well per pad (25 pads per cell)	639	639	639	639
	1 well per pad (5 pads per cell)	128	137	147	175
	5 wells per pad (5 pads per cell)	639	639	639	639
	10 wells per pad (5 pads per cell)	1279	1270	1255	1219
Fixed Cells	1 well per pad (5 pads per cell)	128	126	123	116
	5 wells per pad (5 pads per cell)	639	629	615	580
	10 wells per pad (5 pads per cell)	1279	1259	1231	1160

# End Output: Results (Deer Species)

		Number of Mule Deer				
		Years to Develop				
		1 year	5 year	10 year	20 year	
Fixed Gas	1 well per pad (25 pads per cell)	3949	3844	3798	3690	
	1 well per pad (5 pads per cell)	3950	3845	3799	3691	
	5 wells per pad (5 pads per cell)	3950	3845	3799	3691	
	10 wells per pad (5 pads per cell)	3950	3845	3799	3691	
Fixed Cells	1 well per pad (5 pads per cell)	3950	3950	3950	3950	
	5 wells per pad (5 pads per cell)	3950	3950	3950	3950	
	10 wells per pad (5 pads per cell)	3950	3950	3950	3950	