Williston Basin 2016: Employment, Population, and Housing Projections

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North Dakota Energy Infrastructure and Impact Office

Study Leadership

Deb Nelson, Vision West ND Administrator
Daryl Dukart, Vision West Consortium Chair

Contributing Groups

DLN Consulting, Inc.
Center for Social Research, NDSU
Center for Rural Entrepreneurship, University of Nebraska, Lincoln
Presentation Goals

- Review the study methods, key inputs, and parameters
- Gain an understanding of how we arrived at our outcome
- How the results can provide guidance for future planning - complement the 19 webinars available for county-level estimates
- Additional considerations and What did we learn
Crude oil prices? Industry behavior?

- Crude oil price recovery??
  - When
  - How much
  - How long

- Industry behavior and activity with future prices??

- How do we get around this uncertainty?
Past prices and drilling activity?

Price ↓ Rig Count ↑

Price ↑ Rig Count ↓
Problems with Data

- Rig efficiencies
- Labor productivity is changing
- Well profitability is improving

- Past price-to-rig count relationships will not necessarily hold going forward

- Prices not only driver of activity

- Nonetheless, provides **general guidance** going forward
Account for recent gains in drilling efficiencies

- In 2017, 22% reduction in number of rigs to match drilling output 3 years ago

- 3,246 wells would be drilled with previous peak rig count (205 rigs per month for a year) using 2017 efficiencies

- In peak drilling year (2014), average monthly rig count was 190 rigs = about 2,350 wells drilled, in 20 years, only 125 rigs needed to match number of wells drilled in 2014

- **TAKE AWAY**—fewer rigs will be needed in the future to equal past drilling rates
Price discounts

- ND receives substantial price discounts
- Net price received in North Dakota is likely to be lower than prices typically discussed in media
# Study Scenarios

<table>
<thead>
<tr>
<th>Scenarios*</th>
<th>Prices**</th>
<th>Wells Completed Per Year</th>
<th>Rig Counts Per Year</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>First Purchaser Prices in ND</td>
<td>Low</td>
<td>Moderate</td>
</tr>
<tr>
<td>Low Price</td>
<td>$25-$60</td>
<td>400</td>
<td>600</td>
</tr>
<tr>
<td>Moderate Price</td>
<td>$60-$90</td>
<td>1,000</td>
<td>1,250</td>
</tr>
<tr>
<td>High Price</td>
<td>$&gt;90</td>
<td>1,700</td>
<td>2,000</td>
</tr>
</tbody>
</table>

* Price ranges are approximate as many factors influence development activities.
* Scenarios do not include re-fracking, CO\textsuperscript{2} EOR, or restrictions on fracking.
Petroleum Industry Employment Factors
Annual Changes over 2017-39

- **Drilling efficiency** - 21% improvement 2016 to 2040
- **Employment /drilling rig** - 120/rig to 100/rig by 2028 (17%)
- **Fracking Labor** - 14% improvement 2016 to 2026

**Oil field service**
- Model estimates service requirements based on well age
- Dynamic response in model, higher requirements in early years reduced requirements in later years

**Oil Well Transportation (crude oil production)**
- Transportation requirements adjusted to account for time till completion of gathering systems
- 75 percent reduction in oil well trucking labor requirements over 14 years
Well Counts with Future Scenarios

**Take Away**

- Unlikely that well count potential is exhausted in next 20 years, even in sustained high price environment.
- Low price environments can result in a doubling of well counts over next 20 to 25 years.
Oil and Gas Industry Employment by Scenario

Take Away

1) Low price does produce employment growth
2) High price creates rapid growth rates
3) Industry expansion will not be constant over projection period. Path forward will likely include periods of no (very little) expansion and periods of rapid expansion.
4) Given current situation, exact level of employment less important than pace of employment growth
Relative importance to Employment Changes within Petroleum Industry

Oil and Gas Employment
600 wells/yr

Employment in ND Williston Basin

Drilling  Fracking  Service and Production  Infrastructure

Oil and Gas Employment
2000 wells/yr

Employment in ND Williston Basin

Drilling  Fracking  Service and Production  Infrastructure
Economy wide Wage and Salary Employment

- Includes Petroleum industry

- Secondary job creation (from growth in petroleum industry)
  - Coefficients vary by scenario and by region

- Growth in other sectors/industries
  - Varies by scenario and by region
Economy Wide Employment

Williams, McKenzie, Dunn, Stark, and Mountrail Counties

Non Core Counties

Sources: ND Job Service, NDSU VisionWest Study
Reliance on Oil and Gas

Take Away

- Low price -- growth in other industries/economic sectors outpaces petroleum
- Moderate price - growth in other industries over long term is similar to petroleum
- High price - growth in other industries not on pace with expansion of petroleum industry

Source: NDSU
Reliance on Oil and Gas

**Take Away**

- **Low price** -- growth in other industries/economic sectors outpaces petroleum
- **Moderate price** -- growth in other industries over long term is similar to petroleum
- **High price** -- growth in other industries not on pace with expansion of petroleum industry

*Source: NDSU*
Components of Population Change

- Births
- Deaths
- Migration
  - Function of demographic changes
  - Function of resident/nonresident workforce (commuters)
  - Function of economic drivers

Cohort Population Models

Births, deaths, and migration are key inputs to forecasting population.

Study uses cohort modeling to capture these elements in the population forecasts.
Fertility and Mortality
Current data vary by county

Generic Pattern of Fertility Rates by 5-yr Cohort (0 to 0.3 per female)

Generic Example of Survival Rates by Gender, by 5-yr Cohort

Trends in Births and Deaths are available in the VisionWest County Webinars.
Net Migration Rates
Current data vary by county

Stark County
2014 Net Migration Rates

Burke County
2014 Net Migration Rates

Net Migration Trends are available in the VisionWest County Webinars.
Links between Employment and Population

- Employment requires Workforce (people)
- Workforce is comprised of working age adults (subset of the overall population)
- Not all working age adults have or are seeking jobs (participation rate)
- Not all working age adults in the workforce are employed (unemployment rate)

**Not all jobs are filled from local workforce**  Use commuter data to adjust for nonlocal workforce meeting local employment needs.
In-flows and out-flows of Workforce

Dunn County (in flows)
Where do people that work in Dunn County live?

- Dunn County: 90.7%
- Other ND: 59.8%
- MN, SD, MT: 25.3%
- Elsewhere: 10.5%

Percent of Wage and Salary Jobs

- All Study Counties
- Dunn County
- Other ND
- MN, SD, MT
- Elsewhere
In-flows and out-flows of Workforce

Dunn County (out flows)
Where do people that live in Dunn County work?

<table>
<thead>
<tr>
<th>Year</th>
<th>All Study Counties</th>
<th>Dunn County</th>
<th>Other ND</th>
<th>MN, SD, MT</th>
<th>Elsewhere</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002</td>
<td>33.46%</td>
<td>81.55%</td>
<td>82.13%</td>
<td>34.67%</td>
<td>28.19%</td>
</tr>
<tr>
<td>2003</td>
<td>37.24%</td>
<td>81.55%</td>
<td>82.13%</td>
<td>34.67%</td>
<td>28.19%</td>
</tr>
<tr>
<td>2004</td>
<td>37.24%</td>
<td>81.55%</td>
<td>82.13%</td>
<td>34.67%</td>
<td>28.19%</td>
</tr>
<tr>
<td>2005</td>
<td>37.24%</td>
<td>81.55%</td>
<td>82.13%</td>
<td>34.67%</td>
<td>28.19%</td>
</tr>
<tr>
<td>2006</td>
<td>37.24%</td>
<td>81.55%</td>
<td>82.13%</td>
<td>34.67%</td>
<td>28.19%</td>
</tr>
<tr>
<td>2007</td>
<td>37.24%</td>
<td>81.55%</td>
<td>82.13%</td>
<td>34.67%</td>
<td>28.19%</td>
</tr>
<tr>
<td>2008</td>
<td>37.24%</td>
<td>81.55%</td>
<td>82.13%</td>
<td>34.67%</td>
<td>28.19%</td>
</tr>
<tr>
<td>2009</td>
<td>37.24%</td>
<td>81.55%</td>
<td>82.13%</td>
<td>34.67%</td>
<td>28.19%</td>
</tr>
<tr>
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<td>28.19%</td>
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<td>28.19%</td>
</tr>
<tr>
<td>2012</td>
<td>37.24%</td>
<td>81.55%</td>
<td>82.13%</td>
<td>34.67%</td>
<td>28.19%</td>
</tr>
<tr>
<td>2013</td>
<td>37.24%</td>
<td>81.55%</td>
<td>82.13%</td>
<td>34.67%</td>
<td>28.19%</td>
</tr>
<tr>
<td>2014</td>
<td>37.24%</td>
<td>81.55%</td>
<td>82.13%</td>
<td>34.67%</td>
<td>28.19%</td>
</tr>
</tbody>
</table>

Graph showing the percentage of wage and salary jobs for Dunn County.
Step 1: What is the size of current workforce?

Resident Population
- Participation Rate
- Employment Rate

Commuters
- Outside the county
- Outside the region

Resident Workforce

Non-resident Workforce

Total Workforce
Step 2: How much workforce do we need?

**Future Scenario using Employment Model**

**Employment Change**
combined with **Workforce Characteristics**

**Demand**
- Future Labor Requirements
  - Residents
  - Nonresidents

**Supply**
- Existing Labor Pool
  - Greater Less Equal
    - Resident Workforce
  - Greater Less Equal
    - Nonresident Workforce
Step 3: Incorporate labor force (needs/changes) into cohort component model

- **Start (2015)**
  - Employment
  - Workforce Needed
  - Migration
  - New Population
  - Available Workforce

- **Period 2**
  - Employment
  - Workforce Needed
  - Workforce Present
  - Needs/changes
  - New Population
  - Available Workforce

- **Period 3**
  - Employment
  - Workforce Needed
  - Workforce Present
  - Needs/changes
  - New Population
  - Available Workforce
Housing Requirements?

- Housing now linked to population (previous studies linked housing to employment)

- Previously, lacked accurate housing inventories--data on housing inventory and characteristics was updated and verified as part of the 2016 ND Housing Needs Assessment

- Housing methods adopted from ND 2016 Statewide Housing Needs Assessment conducted by Center for Social Research at NDSU
Housing Inventory verified and updated part of 2016 Statewide Housing Needs Assessment

- Collected building permit data from 12 largest cities
- Applied computational process used by the Census, but used actual building permit data rather than building permit data from the U.S. Census Bureau’s Building Permit Survey
- For most jurisdictions, Census Bureau’s estimates were accurate and within a few percentage points
- Adjusted census estimates to reflect actual housing inventory
Inventory Adjustment: Total Housing Units

Difference in Census Estimate
Minot

<table>
<thead>
<tr>
<th>Year</th>
<th>Difference Total Units Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>-1.7%</td>
</tr>
<tr>
<td>2011</td>
<td>-5.0%</td>
</tr>
<tr>
<td>2012</td>
<td>-5.3%</td>
</tr>
<tr>
<td>2013</td>
<td>-3.9%</td>
</tr>
<tr>
<td>2014</td>
<td>-4.6%</td>
</tr>
<tr>
<td>2015</td>
<td>-3.6%</td>
</tr>
</tbody>
</table>
Step 1: Project population by age

Output from cohort model

Population divided into age groups

- 15 to 24 year olds
- 25 to 44 year olds
- 45 to 64 year olds
- 65 years and older
Step #2: Calculate population ratio and occupied housing

Householders by age as a percentage of total population:
- 25 percent
- 55 percent
- 64 percent
- 54 percent

Output from cohort model (data from scenarios):
- Population 15 to 24 year olds
- Population 25 to 44 year olds
- Population 45 to 64 year olds
- Population 65 years and older

Projected number of households by age which is also referred to as an estimate of occupied housing.

Householder: The person, or one of the people, who own a home, are purchasing a home, or have a rental contract. Householders can be either family members or non-family members. Findings do not take into consideration if householders are family or non-family.
Step #3: Project total housing units

1. Adjusted and Verified Estimates of Total Housing Units
2. Apply Projected Percent Increases in Occupied Housing Units
3. Estimate of Total Housing Units That Could Be Expected to Be Added Based on Projected Change in Population
Step #4: Projected total housing units by type of housing unit

Total Housing Units based on historical relationships combined with population size and composition

**Historical Relationships**

**Housing Data**

- Rented
  - Apt
  - Homes
  - Mobile

- Owned

Housing Units by Type -- Assume distributions by housing type the same as historical distributions
<table>
<thead>
<tr>
<th>Core County</th>
<th>Wells Drilled Per Year</th>
<th>2017 to 2035 Population</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Total Change</td>
</tr>
<tr>
<td>Dunn</td>
<td>600 (Low Price)</td>
<td>560</td>
</tr>
<tr>
<td></td>
<td>1,250 (Moderate Price)</td>
<td>1,300</td>
</tr>
<tr>
<td></td>
<td>2,000 (High Price)</td>
<td>2,100</td>
</tr>
<tr>
<td>Williams</td>
<td>Low</td>
<td>6,900</td>
</tr>
<tr>
<td></td>
<td>Mod</td>
<td>16,500</td>
</tr>
<tr>
<td></td>
<td>High</td>
<td>26,800</td>
</tr>
<tr>
<td>McKenzie</td>
<td>Low</td>
<td>3,700</td>
</tr>
<tr>
<td></td>
<td>Mod</td>
<td>5,550</td>
</tr>
<tr>
<td></td>
<td>High</td>
<td>8,300</td>
</tr>
<tr>
<td>Mountrail</td>
<td>Low</td>
<td>2,450</td>
</tr>
<tr>
<td></td>
<td>Mod</td>
<td>3,800</td>
</tr>
<tr>
<td></td>
<td>High</td>
<td>5,200</td>
</tr>
<tr>
<td>Stark</td>
<td>Low</td>
<td>3,800</td>
</tr>
<tr>
<td></td>
<td>Mod</td>
<td>9,800</td>
</tr>
<tr>
<td></td>
<td>High</td>
<td>17,300</td>
</tr>
</tbody>
</table>

**Take Away**

Population growth still occurs in low price environment, about 1% or less per year.

When industry starts expanding over 1,200 wells per year, population growth is generally over 2% per year.

With expansion of 2,000 wells/yr, population growth will be very challenging and average 2.5% to just over 3% per year.
### Permanent Population with Petroleum Industry Growth in North Dakota

<table>
<thead>
<tr>
<th>Non Core County</th>
<th>Wells Drilled Per Year</th>
<th>2017 to 2035 Population</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Total Change</td>
</tr>
<tr>
<td>Adams</td>
<td>600 (Low Price)</td>
<td>200 9%</td>
</tr>
<tr>
<td></td>
<td>2,000 (High Price)</td>
<td>525 22%</td>
</tr>
<tr>
<td>Billings</td>
<td>Low</td>
<td>24 3%</td>
</tr>
<tr>
<td></td>
<td>High</td>
<td>145 16%</td>
</tr>
<tr>
<td>Bowman</td>
<td>Low</td>
<td>200 6%</td>
</tr>
<tr>
<td></td>
<td>High</td>
<td>820 25%</td>
</tr>
<tr>
<td>Bottineau</td>
<td>Low</td>
<td>290 4%</td>
</tr>
<tr>
<td></td>
<td>High</td>
<td>1,200 18%</td>
</tr>
<tr>
<td>Burke</td>
<td>Low</td>
<td>90 4%</td>
</tr>
<tr>
<td></td>
<td>High</td>
<td>430 19%</td>
</tr>
<tr>
<td>Divide</td>
<td>Low</td>
<td>-40 -1.5%</td>
</tr>
<tr>
<td></td>
<td>High</td>
<td>360 14%</td>
</tr>
<tr>
<td>Golden Valley</td>
<td>Low</td>
<td>250 13%</td>
</tr>
<tr>
<td></td>
<td>High</td>
<td>430 24%</td>
</tr>
</tbody>
</table>

**Take Away**

For most counties, population growth still occurs in low price environment, less than 1% per year.

With expansion of 2,000 wells/yr, population growth will approach or slightly exceed 1% per year.
<table>
<thead>
<tr>
<th>Non Core County</th>
<th>Wells Drilled Per Year</th>
<th>2017 to 2035 Population</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total Change</td>
<td>Average Annual</td>
</tr>
<tr>
<td>Hettinger</td>
<td>600 (Low Price) 81 3% 4</td>
<td>0.2%</td>
</tr>
<tr>
<td></td>
<td>2,000 (High Price) 330 12 17</td>
<td>0.6%</td>
</tr>
<tr>
<td>McHenry</td>
<td>Low 400 7% 21</td>
<td>0.3%</td>
</tr>
<tr>
<td></td>
<td>High 1200 20% 63</td>
<td>1%</td>
</tr>
<tr>
<td>McLean</td>
<td>Low 250 2.5% 13</td>
<td>0.1%</td>
</tr>
<tr>
<td></td>
<td>High 1400 15% 74</td>
<td>0.7%</td>
</tr>
<tr>
<td>Mercer</td>
<td>Low 36 0.7% 2</td>
<td>0.02%</td>
</tr>
<tr>
<td></td>
<td>High 990 11% 52</td>
<td>0.6%</td>
</tr>
<tr>
<td>Renville</td>
<td>Low -5 -0.2% -0.3 -0.01%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>High 370 14% 19</td>
<td>0.7%</td>
</tr>
<tr>
<td>Slope</td>
<td>Low -10 -1.3% -0.5 -0.07%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>High 30 4% 1.7</td>
<td>0.2%</td>
</tr>
<tr>
<td>Ward</td>
<td>Low 6260 9% 330</td>
<td>0.5%</td>
</tr>
<tr>
<td></td>
<td>High 17300 25% 911</td>
<td>1.2%</td>
</tr>
</tbody>
</table>

**Take Away**

For most counties, population growth still occurs in low price environment, less than 1% per year.

With expansion of 2,000 wells/yr, population growth will approach or slightly exceed 1% per year.
Population Comparisons among other recent studies
Core Oil Producing Counties

2016 ND Housing Needs Assessment is similar to the 2000 wells/yr scenario

ND Department of Commerce projections are around the 2,300 wells/yr scenario

All three studies provide valuable information and would be expected to have somewhat varying results based on different fundamental assumptions and methods.
Population Comparisons among other recent studies
Non Core Oil Producing Counties

2016 ND Housing Needs Assessment similar to the 2,000 wells/yr scenario

ND Department of Commerce projections are around the 2,300 wells/yr scenario

All three studies provide valuable information and would be expected to have somewhat varying results based on different fundamental assumptions and methods.
All 5-year cohort migration rates for children were based on rates used in the 2016 Statewide Housing Needs Assessment. That study’s population forecasts most closely align with the moderate price forecast. Under those factors, population of children increase over the next 5 years, but then show only minor growth over remainder of period.

Reliance on past migration rates for children may “over” or “under” estimate migration and change in population of children, depending upon county and growth scenario.
Service Population

- Includes permanent population
- Includes commuters and non-local workforce
- Important for some infrastructure planning (e.g., transportation)
- Important for local government service delivery (e.g., police)
- Should not be used for development of permanent housing needs
- Indicates importance of having overflow/temporary/conditional housing

Methodology

1) Examined trends in service population as a percentage of permanent population
2) Used commuter data to estimate number of non-local workers, added non-local workers to permanent population
3) Both methods produced very similar estimates
Service Population
Core Oil producing Counties

Williams, McKenzie, Dunn, Mountrail, and Stark Counties

Service Population

Historical
2300 wells/yr
2000 wells/yr
1750 wells/yr
1500 wells/yr
1250 wells/yr
1000 wells/yr
800 wells/yr
600 wells/yr
400 wells/yr
Service Population
Non Core producing Counties

Non Core Counties
Service Population

- Historical
- 2300 wells/yr
- 2000 wells/yr
- 1750 wells/yr
- 1500 wells/yr
- 1250 wells/yr
- 1000 wells/yr
- 800 wells/yr
- 600 wells/yr

Service Population

- 2002: 122,675
- 2005: 129,877
- 2008: 122,675
- 2011: 129,877
- 2014: 138,183
- 2017: 146,496
- 2020: 154,810
- 2023: 163,123
- 2026: 171,436
- 2029: 179,750
- 2032: 188,063
- 2035: 196,377
- 2038: 204,690

Historical: 166,938
2300 wells/yr: 154,364
2000 wells/yr: 141,514
1750 wells/yr: 131,817
1500 wells/yr: 122,119
1250 wells/yr: 112,421
1000 wells/yr: 102,722
800 wells/yr: 93,024
600 wells/yr: 83,326
Core and Non Core Counties Permanent and Service Populations

Take Away

- Core Oil Producing Counties
  - Service population ranges from 15 to 23 percent of permanent population
- Non Core Oil Producing Counties
  - Service population ranges from 7 to 10 percent of permanent population
Service Population -- Additional Thoughts

Reasons for Service Population

1) Specialized labor
2) Workers unwilling to re-locate
3) Job uncertainty
4) ** Not finding what they want **
   (housing has been identified as huge factor influencing worker relocation to ND)

Communities need to continue to address quality of life amenities and address factors in their control. No matter what is done, not all workers will relocate. Small adjustments in retaining non-local workers will have meaningful impacts on local permanent populations.

**Source: Workforce Characteristics Study, 2015, NDSU**
Housing Requirements for Permanent Population

Core Counties Housing Inventory Requirements
600 wells/yr

<table>
<thead>
<tr>
<th>Period</th>
<th>Annual housing units required above current inventory*</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016 to 2020</td>
<td>825</td>
</tr>
<tr>
<td>2021 to 2025</td>
<td>620</td>
</tr>
<tr>
<td>2026 to 2030</td>
<td>495</td>
</tr>
<tr>
<td>2031 to 2035</td>
<td>515</td>
</tr>
<tr>
<td>2016 to 2035</td>
<td>14,170 (total)</td>
</tr>
<tr>
<td>Average Annual</td>
<td>700</td>
</tr>
</tbody>
</table>

*Inventory obtained from 2016 ND Housing Needs Assessment

Source: 2016 ND Housing Needs Assessment' NDSU VisionWest Study

NDSU NORTH DAKOTA STATE UNIVERSITY
Housing Requirements for Permanent Population

Non Core Counties Housing Inventory Requirements
600 wells/yr

- Expected Inventory
- Current Inventory

<table>
<thead>
<tr>
<th>Period</th>
<th>Annual housing units required above current inventory*</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016 to 2020</td>
<td>345</td>
</tr>
<tr>
<td>2021 to 2025</td>
<td>300</td>
</tr>
<tr>
<td>2026 to 2030</td>
<td>200</td>
</tr>
<tr>
<td>2031 to 2035</td>
<td>345</td>
</tr>
<tr>
<td>2016 to 2035</td>
<td>7,170</td>
</tr>
<tr>
<td><strong>Average Annual</strong></td>
<td><strong>360</strong></td>
</tr>
</tbody>
</table>

*Inventory obtained from 2016 ND Housing Needs Assessment

Source: 2016 ND Housing Needs Assessment' NDSU VisionWest Study
Housing Requirements for Permanent Population

### Core Counties Housing Inventory Requirements

**2000 wells/yr**

<table>
<thead>
<tr>
<th>Period</th>
<th>Annual housing units required above current inventory*</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016 to 2020</td>
<td>3,020</td>
</tr>
<tr>
<td>2021 to 2025</td>
<td>1,510</td>
</tr>
<tr>
<td>2026 to 2030</td>
<td>1,260</td>
</tr>
<tr>
<td>2031 to 2035</td>
<td>1,280</td>
</tr>
<tr>
<td><strong>2016 to 2035</strong></td>
<td><strong>40,850</strong></td>
</tr>
<tr>
<td><strong>Average Annual</strong></td>
<td><strong>2,040</strong></td>
</tr>
</tbody>
</table>

*Inventory obtained from 2016 ND Housing Needs Assessment

Source: 2016 ND Housing Needs Assessment' NDSU VisionWest Study

- **Core Counties Housing Inventory Requirements**

**2000 wells/yr**

![Core Counties Housing Inventory Requirements Graph](image)

- **Series 2**: Red bars
- **Current Inventory**: Blue line

**Total Housing Units**

<table>
<thead>
<tr>
<th>Year</th>
<th>2016</th>
<th>2018</th>
<th>2020</th>
<th>2022</th>
<th>2024</th>
<th>2026</th>
<th>2028</th>
<th>2030</th>
<th>2032</th>
<th>2034</th>
<th>2036</th>
<th>2038</th>
<th>2040</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>47433</td>
<td>63561</td>
<td>73449</td>
<td>81362</td>
<td>89314</td>
<td>97229</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: 2016 ND Housing Needs Assessment' NDSU VisionWest Study
Housing Requirements for Permanent Population

Non Core Counties 2,000 wells/yr

<table>
<thead>
<tr>
<th>Period</th>
<th>Annual housing units required above current inventory</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016 to 2020</td>
<td>1,600</td>
</tr>
<tr>
<td>2021 to 2025</td>
<td>550</td>
</tr>
<tr>
<td>2026 to 2030</td>
<td>490</td>
</tr>
<tr>
<td>2031 to 2035</td>
<td>640</td>
</tr>
<tr>
<td>2016 to 2035</td>
<td>18,860</td>
</tr>
<tr>
<td><strong>Average Annual</strong></td>
<td><strong>940</strong></td>
</tr>
</tbody>
</table>

*Inventory obtained from 2016 ND Housing Needs Assessment

Source: 2016 ND Housing Needs Assessment, NDSU VisionWest Study
## Comparison of Recent Changes in Housing Inventories

<table>
<thead>
<tr>
<th></th>
<th>Core Oil Producing Counties</th>
<th>Non Core Counties</th>
</tr>
</thead>
<tbody>
<tr>
<td>Housing Units Added (total)*</td>
<td>23,625</td>
<td>---</td>
</tr>
<tr>
<td>Units Added (annual average)*</td>
<td>5,900</td>
<td>---</td>
</tr>
<tr>
<td>Housing Units Required (1,250 wells/yr)(additional)**</td>
<td>9,000</td>
<td></td>
</tr>
<tr>
<td>Units Required (1,250 wells/yr) (average annual)**</td>
<td>1,800</td>
<td></td>
</tr>
</tbody>
</table>

**NOTES:**

* Based on 2010 Decennial Census reported inventory, adjusted by 2016 ND Statewide Housing Needs Assessment
** Using current housing inventories reported in 2016 Statewide Housing Needs Assessment

Sources: 2016 ND Housing Needs Assessment; NDSU VisionWest Project
Housing Mix -- Core Oil Producing Counties

Mix of housing types has been changing in some counties. Trends in housing mix were briefly discussed in the County Webinars. Changes in housing types, and anticipated market needs (cost, amenities, location, etc.), must be included when estimating the additional housing needed.

Core Counties Current Housing Mix

- Single Family 67%
- Mobile Housing 14%
- Apartment Complexes 14%
- Apartments 2 to 4 units 5%

Core Oil Producing Counties (assuming no change in current housing mix)

<table>
<thead>
<tr>
<th>Housing Type</th>
<th>2017-2020</th>
<th>2017-2035</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single Family Homes</td>
<td>6,000</td>
<td>17,700</td>
</tr>
<tr>
<td>Apartments (2 to 4 units)</td>
<td>420</td>
<td>1,200</td>
</tr>
<tr>
<td>Apartment Complexes (5 units or greater)</td>
<td>1,275</td>
<td>3,700</td>
</tr>
<tr>
<td>Mobile Homes</td>
<td>1,300</td>
<td>3,800</td>
</tr>
</tbody>
</table>

Source: NDSU VisionWest Project
Housing Mix -- Non Core Counties

Mix of housing types has been changing in some counties. **Trends in housing mix** were briefly discussed in the County Webinars. Changes in housing types, and anticipated **market needs** (cost, amenities, location, etc.), must be included when estimating the additional housing needed.

### Non Core Counties (assuming no change in current housing mix)

<table>
<thead>
<tr>
<th>Housing Type</th>
<th>2017-2020</th>
<th>2017-2035</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single Family Homes</td>
<td>8,400</td>
<td>11,650</td>
</tr>
<tr>
<td>Apartments (2 to 4 units)</td>
<td>880</td>
<td>1,220</td>
</tr>
<tr>
<td>Apartment Complexes (5 units or greater)</td>
<td>1,290</td>
<td>1,790</td>
</tr>
<tr>
<td>Mobile Homes</td>
<td>1,240</td>
<td>1,715</td>
</tr>
</tbody>
</table>

**Source:** NDSU VisionWest Project
Recent Trends and Other Research Findings

- Household Composition
- Trends in the mix of housing of housing
- Workforce characteristics
- Changing makeup of the population, results of state wide housing needs assessment
  - Seniors
  - Younger population
  - First-time homebuyers
  - Cost burdened seniors
  - Age of housing inventory
Characteristics: Household composition

- Continued increase in non-family household
- Continued increase in married with out children
- First increase in households that are married with children
- Potentially substantial implications for future mix of housing
Percent of Total Housing, by Type of Housing Unit

Stark County, North Dakota

Source: U.S. Census 5-year American Community Survey
Results from Workforce Characteristics Study

Primary Residence of Employees of Firms that Participated in Survey

- Yes: 60%
- No: 40%

- North Dakota
- Elsewhere
Non-Resident Workforce Intentions to Move to North Dakota

- Yes: 19%
- No: 81%
Type of Housing

Type of Housing Used While Working in North Dakota, by Residency

- Owned housing: 61.2% in North Dakota, 3.9% elsewhere
- Rented housing: 29.4% in North Dakota, 6.3% elsewhere
- Employer provided housing: 31.3% in North Dakota, 54.8% elsewhere

North Dakota: n=1,158
Elsewhere: n=489
Projected Change in Population by Age
Stark County

Source: 2015 North Dakota Housing Needs Assessment

- Less Than 25 Years of Age: 33.1%
- Ages 25 to 44: 27.8%
- Ages 45 to 64: 24.0%
- 65 Years and Older: 71.6%
Projected Change in Number of Households By Type of Homebuyer, Stark County

Source: North Dakota Statewide Housing Needs Assessment
Cost-Burdened Seniors, Region VIII

North Dakota Householders Ages 65 and Older Spending 30% or more of Household Income Toward Housing Costs, by Tenure, Planning Region VIII, 2014

<table>
<thead>
<tr>
<th>Tenure</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homeowners 65+</td>
<td>16.7%</td>
</tr>
<tr>
<td>Renters 65+</td>
<td>43.9%</td>
</tr>
</tbody>
</table>

Source: U.S. Census Bureau, 2014 ACS 5-Year Estimates
Projected population percent change by income level, 2014-2029

Region 8
- Extremely Low: 37.6%
- Very Low: 33.6%
- Low: 29.3%
- Lower Moderate: 29.4%
- Moderate: 24.9%
- Upper: 24.2%

Stark County
- Extremely Low: 51.0%
- Very Low: 43.7%
- Low: 40.4%
- Lower Moderate: 36.3%
- Moderate: 32.4%
- Upper: 30.8%
Age of Housing Inventory, Stark County

Total Occupied Housing by Year Built
Stark County

- Built 1990 to Present: 21.7%
- Built 1960 to 1989: 53.8%
- Built Prior to 1960: 24.5%

13,441 total units
Total Occupied Housing Units, by Year Built

Dunn County

- Total: 1,359
- Built Prior to 1960: 36.8%
- Built 1960 to 1989: 49.6%
- Built 1990 to Present: 13.6%

NDSU NORTH DAKOTA STATE UNIVERSITY
# Study Strengths and Limitations

<table>
<thead>
<tr>
<th>Modeling</th>
<th>Strengths</th>
<th>Limitations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employment</td>
<td>-) Broad range of future employment</td>
<td>-) Future price uncertainty</td>
</tr>
<tr>
<td></td>
<td>-) All employment is included (not just Oil and Gas)</td>
<td>-) Petroleum Industry behavior in the future</td>
</tr>
<tr>
<td></td>
<td>-) Captures dynamics with labor and industry efficiencies</td>
<td></td>
</tr>
<tr>
<td>Population</td>
<td>-) Capture dynamics with cohort modeling</td>
<td>-) Future commuting behavior unknown</td>
</tr>
<tr>
<td></td>
<td>-) Includes commuting activity</td>
<td>-) Linking commuters to economic sectors?</td>
</tr>
<tr>
<td>Housing</td>
<td>-) Uses updated and verified housing inventories</td>
<td>-) Key relationships remain unchanged over projection period</td>
</tr>
<tr>
<td></td>
<td>-) Housing inventory changes with size and composition of population</td>
<td>-) Not a marketing study, does not address housing preferences</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-) Did not address specific needs to accommodate service population</td>
</tr>
</tbody>
</table>
What Did We Learn - Workforce and Commuters

- Substantial change from historical patterns, new changes driven by recent economic expansion

- Employment at a specific location may/may not translate to residents of that location

- Employment in one location can affect population in another location

- Workforce is not limited to those residing in the immediate area
What Did We Learn -- Employment

- Do not expect a repeat of employment explosion 2010 to 2014
- Petroleum industry is in different economic position than few years ago, exact behavior difficult to forecast, efficiencies (both labor and $) will affect North Dakota
- Total employment in low price environment continues to slowly expand (expect little further contraction)
- Total employment growth in high price environment will bring about substantial challenges for local governments
What Did We Learn -- Population

- Population has become younger
- In low price environments, slow population growth
- In high price environments, growth rates will challenge ability of communities to keep up, especially over longer periods
- Substantial service populations will be present during moderate and high price environments
What Did We Learn -- Housing

- Housing inventories will need to continue to grow, and important that housing supply includes service population.

- Rate of growth will be less than experienced from 2010 to 2014, but will present challenges in moderate and high price growth environments.

- Probably of equal consideration is making sure the correct mix of housing is supplied!!
  - Affordability
  - Rent / own
  - Permanent and temporary
  - **What do local residents and new residents want?**
Additional Resources Available

- North Dakota Compass [http://www.ndcompass.org/](http://www.ndcompass.org/)
- Census on the Map [http://onthemap.ces.census.gov/](http://onthemap.ces.census.gov/)
Feel Free to Reach Out and Contact Us

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