BASELINE - The U.S. Fish and Wildlife Service’s (Service) Southwest Region has a significant and extensive legacy of oil and gas exploration and production (Figure 1), a significant portion of current development (Figure 2, Figure 3) and subsequently, an expected significant portion of future development potential in the United States. The first two commercial applications of hydraulic fracturing (1949) occurred in Stephens County, Oklahoma and Archer County, Texas (Montgomery and Smith 2010). Resource availability, commodity prices, technological and process innovations, the politics of energy and “energy security”, settlement patterns, surface and mineral ownership patterns, and the differences in regulatory processes and permit requirements by varied jurisdictional authorities are important factors influencing current development trends in oil and gas and the potential impacts to Service Trust Resources.

Figure 2. Screen capture from Baker Hughes Active Rig Counts - February 10, 2012. http://gis.bakerhughesdirect.com/RigCounts/  

Figure 3. Number of active drilling rigs by type. Texas, Oklahoma and New Mexico account for 1,198 drilling rigs (60%) currently operational in the U.S. Data compiled from Baker Hughes Rig Counts website, February 10, 2012.
CURRENT TRENDS AND PROJECTIONS - The intensity of oil and gas development has strongly followed the respective commodity price. Continuing high oil prices have sustained increased oil development, while declining natural gas prices have reduced the amount of development as compared to the intensity of gas development in the recent past when gas prices were higher. However, gas well development is likely to stay moderately high in the near future, due to increased development of new natural gas storage facilities and transport pipelines connected to international export locations.

Based on current drilling rig count data (Baker Hughes, February 10, 2012; Figure 2), the composition of oil and gas development in the Southwest indicates oil rigs accounts for 69.7% (836 drilling rigs) and gas rigs accounts for 30.2% (362 drilling rigs) of the active development. Within the entire United States, the Southwest currently accounts for 60% (1,198 out of 1,989 drilling rigs) of the active drilling rigs (Figure 3). It is unreported how much of this activity is using the hydraulic fracturing methodology. However, it is believed approximately 60+% of all wells drilled today are fractured (Montgomery and Smith 2010). The actual rates of hydro-fracking occurring will likely vary based on the development company, new wells vs. existing wells, and the geologic formation being developed.

While not clearly reported for all jurisdictions within the Southwest, use of the hydraulic fracturing technique appears increasingly common for oil and gas development. For example, the Carlsbad Field Office of the Bureau of Land Management (BLM) had 677 total wells permitted in fiscal year 2011, with the majority being oil wells. All wells drilled will be hydro-fracked. Fiscal year 2012 permitting is already significantly higher than fiscal year 2011 and fiscal year 2013 should be higher in the number of new drills and thus hydro-fracking jobs compared to 2012 (Ty Allen, USFWS, Pers. Comm.). It is expected this scenario is fairly typical of the development occurring throughout the Southwest.

Thirty National Wildlife Refuges (NWR) within the Southwest Region currently have oil and gas activity, or have had some level of oil and gas activity in the past. The majority of activity has occurred on refuges located in Oklahoma and Texas. Some hydro-fracking is occurring on NWRs with current oil and gas development. NWRs have seen some increase in activity in leasing of federal minerals and geophysical (seismic) surveys, which are usually a precursor to drilling activity. Increased drilling activity located off NWR lands and in the adjacent vicinity of a NWR is an indicator of current activity.

As shale development becomes more economical and the price of the commodity stays elevated, companies will return to known areas that have yielded oil and gas in the past, but had become uneconomical to develop based on lower commodity prices and less feasible techniques of the past. Many NWRs may be affected by this expected increase in development, as most subsurface minerals are privately owned. On NWRs in which the minerals are federally owned, unless the federal minerals are being drained, NWRs are closed to mineral leasing and development.

TRUST RESOURCE CONCERNS RELATED TO OIL AND GAS HYDRO-FRACKING – The types and severity of impacts caused by hydro-fracking will vary by site, the quality and implementation of Best Management Practices (BMPs), and the conservation considerations of required conditions in permits issued by the varying jurisdictions.

The following is a brief summary of the identified Service Trust Resource and related concerns.

- Air and light pollution, example from burn off flares used to get rid of unwanted gas in oil wells (example high sulfur content gas expensive to process to a usable form).
- Surface and groundwater contamination from the well drilling and hydro-fracking process, including chemicals and other additives used in the frack water, as well as, in-situ naturally occurring deposits of contaminants and radioactive materials potentially removed from the surrounding hydro-fracked area.
- Soil, vegetation and animal communities’ response to changes in pH and other factors from contamination and byproduct deposition.
• Water use, especially when extracted from areas important to aquatic and aquatic dependent trust resource species and their habitats.
• Impacts to water quality and/or quantity; surface and groundwater from fracking and surface disturbance.
• Disposal process / methodology for “produced” water and hydro-fracking waste (deep high pressure injection wells, open pits, reduction in use of closed loop systems, etc.).
• Impacts related to mining and manufacturing of manmade proppant materials.
• Inability to minimize or avoid surface impacts associated with well development, due to desired drill direction (vertical, directional or horizontal) and subsequent well pad location.
• Habitat alteration, fragmentation and loss from development and related infrastructure.
• Traffic and operational noise disturbance to wildlife and habitat.
• Potentially triggering earthquake, especially in karst regions and areas with highly interconnected surface and ground water.
• Wildlife mortalities from traffic, construction, power lines, infrastructure, open pits, contamination, etc.
• Jurisdictional authorizes lowering minimum well siting surface densities (e.g., 1 well per 60 acres reduced to 1 well per 20 acres) and the resulting increase in habitat fragmentation and loss.
• Consistency of BMP use and requirement, especially with smaller operations.

Concerns specifically expressed by NWRs, which likely are relevant to other Service Trust Resources:
• Decreased flows of water from streams and drainages onto NWR lands, including lowered water table, potentially affecting wetlands and riparian areas.
• Water quality and quantity, including contamination of surface and ground water
• Shallow gas projects have greater potential for ground water contamination.
• Companies wanting to withdraw surface or groundwater from the NWR for hydro-fracking process. Having water removed from NWR lands, depends on water law for particular state. A private mineral owner may also have a right to remove ground water to develop their minerals.
• Air quality issues with the use of sand and other proppant used in hydro-fracking and increased traffic on roads.
• Potential surface and ground water contamination due to spills, improper storage of chemicals, improper waste disposal.
• Potential increase in sedimentation from erosion runoff on well locations and access roads.
• Concerns regarding implications of water, surface and ground, withdrawals and disposal injections in areas with karst geology.
• Concerns regarding implications of produced water and fracking waste, high pressure disposal well injections and the potential for effects from earthquake on federally-listed species karst habitats.
• Companies wanting to expand existing locations for new wells or reenter (work over) wells that have been previously plugged and reclaimed.
• Removal of habitat due to new pad locations. With hydro-fracking, typical pad size is 3-5 acres, the deeper the well the bigger the area needed.
• The number of wells proposed for development may overwhelm NWR staff time in properly permitting the activity.
• Increased activity may affect other public uses on NWR lands. For example, intense oil and gas activity in a specific area leads to deer avoiding the area which may affect hunting success in hunt area.
• Human related health concerns due to chemicals used.
• Species habitat, some species becoming more dependent on NWRs as off NWR lands become increasingly fragmented and continue to have loss of habitat for species. Refuges have little say in preventing the private mineral owners from exercising their mineral right on NWR lands.
• Access issues with companies wanting to cross NWR lands to get to private lands (easement issues?).
• Introduction of invasive species transported by oil and gas related traffic.

ENGAGEMENT MECHANISMS – The proportion of public to private landownership in the Southwest varies by state, with Oklahoma and Texas greater than 95% private land, while New Mexico and Arizona are
approximately 55% private land (Figure 4, Shows only percentage of Federal to other lands). Split estates, defined as different ownership (Federal, State, or Private) of the surface rights and the subsurface (mineral) rights are common and exist throughout the region. For example, the minerals managed by the BLM within the Southwest (Table 1) are an indication of one portion of the varied nature of surface ownership and mineral ownership and management.

Laws and requirements implanted by jurisdictional authorities pertaining to surface owner vs. mineral owner rights in oil and gas development varies by state, and sometimes by surface owner within a given state. In some cases, such as private mineral ownership, the mineral owner may be required to have a surface use agreement with the surface owner prior to the state agency approving the well permit. In other cases, the surface owner has limited rights in preventing a private mineral owner from developing their mineral estate.

This potential maze of regulatory requirements and responsible entities makes coordinated action very difficult. Depending on the jurisdictional authorities’ involved and surface owner vs. mineral owner, one to several state or Federal permits may be required to account for all of the actions ultimately resulting in development of an oil or gas well. As an example of the complex nature of the process, on proposed well sites with BLM federal surface, BLM permits the surface activity of building the pond and accession of federal minerals but the State has downhole authority and water control.

When laws require interagency coordination, typically when surface or minerals are in Federal ownership, it can be very effective and is imperative to protecting the Service’s Trust Resources. Coordination allows staff to discuss ideas, and find the most appropriate solution to an issue. However, in cases where the surface and/or minerals are state or privately owned, the Service typically has limited opportunity to coordinate, because it is not required. While the Endangered Species Act, Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act still apply to private actions with no Federal nexus, ultimately, there are less regulatory requirements placed upon developers to frack on non-federal lands that produce non-federal mineral.

Another potential engagement mechanism, which is a more proactive approach, includes working with state and Federal land managers to address oil and gas development programmatically in their respective land management plans, such as BLMs Resource Management Plans and Amendments.

State Authorities -
Oklahoma Corporation Commission
Texas Railroad Commission
New Mexico Oil Conservation Division of the Energy, Minerals and Natural Resource Department
Arizona Oil and Gas Conservation Commission

Other Authorities -
BLM and BLM managed federal minerals
- Energy Streamlining Pilot Program for Oil and Gas Permitting. Authorized in the Energy Policy Act of 2005, pass through funding by the oil and gas industry via BLM has been used by the Service (R2 and R6) to hire dedicated staff co-located in BLM offices with high oil and gas development workload to support streamlined regulatory compliance.

National Wildlife Refuge System Lands
- On lands in which the Service has secondary jurisdiction (e.g., overlay Refuges), other federal agencies may have differing regulations and policies that would put the Service at odds in regards to oil and gas development and protecting NWR resources.
- Easements may present a challenge, if the mineral ownership is private and the private mineral owner is different from the surface owner.
WHO OWNS THE WEST?
Federal Land as a Percentage of Total State Land Area


Figure 4. Approximate Federal land ownership as a percentage of total state land area, 2004.

Table 1. MINERAL AND SURFACE ACRES ADMINISTERED BY THE BUREAU OF LAND MANAGEMENT,
FISCAL YEAR 2010 WITHIN USFWS SOUTHWEST REGION

<table>
<thead>
<tr>
<th>State</th>
<th>Total State Acreage</th>
<th>Federal Minerals a</th>
<th>Federal Surface Lands b</th>
<th>BLM-Managed Public Lands d</th>
<th>Split-Estate Federal Minerals c</th>
<th>Indian Trust Minerals e</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arizona</td>
<td>72.69</td>
<td>35.8</td>
<td>33.0</td>
<td>12.2</td>
<td>3.0</td>
<td>20.7</td>
</tr>
<tr>
<td>New Mexico</td>
<td>77.77</td>
<td>36.0</td>
<td>26.5</td>
<td>13.4</td>
<td>9.5</td>
<td>8.4</td>
</tr>
<tr>
<td>Oklahoma</td>
<td>44.09</td>
<td>2.3</td>
<td>1.7</td>
<td>0.1</td>
<td>0.5</td>
<td>1.1</td>
</tr>
<tr>
<td>Texas</td>
<td>168.22</td>
<td>4.5</td>
<td>4.5</td>
<td>0.1</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Total BLM in R2</td>
<td>-</td>
<td>78.6</td>
<td>65.7</td>
<td>25.8</td>
<td>13.0</td>
<td>30.2</td>
</tr>
<tr>
<td>Total US BLM</td>
<td>-</td>
<td>699.7</td>
<td>643.2</td>
<td>247.9</td>
<td>57.2</td>
<td>56.0</td>
</tr>
<tr>
<td>BLM in R2 % of Total</td>
<td>-</td>
<td>11.2</td>
<td>10.2</td>
<td>10.4</td>
<td>22.7</td>
<td>53.9</td>
</tr>
</tbody>
</table>

a All statistics are in millions of acres, except last row which is percent. Table developed from data on BLM website, http://www.blm.gov/wo/st/en/info/About_BLM/subsurface.html.
The term Federal Minerals refers to on-shore Federal minerals that are part of the BLM’s responsibilities. The on-shore Federal mineral acreage approximates the sum of Federal Surface Lands acres and Split-Estate Federal Minerals acres shown in the next two columns. As of 1999, the total was approximately 700 million acres.

Federal Surface Lands include both the public domain and acquired lands of all Federal agencies. With the exception of an estimated 4 million acres of the acquired lands, Federal mineral rights exist in all Federal lands.

The term Split-Estate Federal Minerals refers to Federal mineral rights under private surface lands. These are patented lands with minerals reserved to the U.S. Reservations and may be for single, multiple, or all minerals. The 58 million acres is the midpoint of estimates ranging from 55 to 60 million acres (provided by the BLM’s Colorado State Office). This results in a significantly lower acreage than that shown in Table 3-2; we hope that any future updates will address this inconsistency.

On these public lands, the BLM manages both surface resources and subsurface minerals. The surface acreage is part of the Federal Surface Lands shown in the third column. The subsurface mineral acreage is part of the Federal Mineral estate included in the second column. As of 2010, the BLM’s public lands comprise 247.9 million surface acres; refer to Table 1-4, Public Land Statistics 2010.

As part of its trust management responsibility, the BLM provides technical supervision of mineral development on 56 million acres of American Indian trust lands except for Osage lands. All minerals in Indian trust lands are "leasable." Acreage information was obtained in 1999 from the Real Estate Services staff of the Bureau of Indian Affairs.

Navajo and Hopi oil and gas in Arizona and Utah are managed by New Mexico BLM.

Ute Mountain oil and gas in New Mexico and Colorado are managed by Colorado BLM.

**BEST MANAGEMENT PRACTICES –** The entities responsible for oil and gas permitting within a given jurisdiction typically are developing, or currently using BMPs as part of their permitting process. Typically, a given suite of measures within a BMPs document are considered “a work in progress”, being adapted and updated as conservation and development issues and technology change. These BMPs often vary based on the state, the location within a state and the requirements of the surface owner.

If requested, the Southwest Region can gather and share the currently available BMPs.

**DATA NEEDS –** The primary oil and gas related data need of the Service is for any information that quantifies the risk of the aforementioned concerns, informs our regulatory decision processes, and supports our conservation mission. Additionally, if the Service wishes to be successful in advocating for public trust resources we are entrusted to conserve, then we need to shift to being more proactive and less reactive, as well as evaluation in more programmatic manner, with individual project evaluation only when required. The proactive approach would require spatial identification of oil and gas development that intersect with the conservation and recovery needs of our trust resources. These overlapping datasets would be the foundation for development of increasingly targeted BMPs, and conversations with the jurisdictional oil and gas authorizes on ways to ensure industry and conservation needs are met.

The following is a list of some of the data needs identified by staff within the Southwest Region.

- Spatial data indicating generalized mineral ownership status (Federal, State, or Private).
- To analyze potential individual project and cumulative effects, data depicting all associated infrastructure such as roads, power lines, water lines, ponds, pits, well location, etc.
- Disposition of water rights on NWR.
- In the case of NWRs that have water wells, depth of water wells and baseline water quality.
- Characterization of oil and gas wells on NWRs, such as depth, directionality, type, and relation to fresh water zones.
- Water chemistry on local surface water sources to address potential MBTA issues. There are additional opportunities for coordination between NWR's, Environmental Contaminants, Water Resources and the Ecological Services Field Offices on water quality and quantity related issues.
- Guidance on approach/position related to identified concerns, example:
  - How does the Service address water table depletion, and its effects on habitat and wildlife?
  - How does the Service address frack pond water and potential lethal and sub-lethal impacts from chemical exposure to migratory birds?
NEXT STEPS / WAYS WASHINGTON CAN ASSIST FIELD OFFICES –

- Compilation and distribution of information gathered from the National Hydro-fracking call, as well as a discussion of how the Service is prepared to address identified issues of concern.
- Discuss authorities or lack thereof, for identified issues of concern.
- Efforts at Washington Office level to acquire enterprise agreements with entities having key oil and gas infrastructure datasets, to reduce duplicative efforts in Regions or Field Offices.
- Lessons learned and coordination of what works in other hydro-fracking active areas.

LITERATURE CITED
