

Modelling Landscape Conservation of Greater Sage-Grouse In Relation to Oil and Gas Development

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Oil & Gas Development Is in the Public Eye!

Idaho and
Southwestern Montana
Greater Sage-Grouse
Draft
Land Use Plan Amendment and
Environmental Impact Statement

Volume 1



BLM
Forest Service

While Ellis said conservation plans should be based in science and not politically motivated, she supports both plans, and said having initiatives from both the state and BLM will help keep the bird off the Endangered Species list.

US Department of the Interior
Bureau of Land Management
US Department of Agriculture
Forest Service
October 2013

Sage Grouse proposals rile oil industry

By MICHAEL WRIGHT
Chronicle Staff Writer

The Bureau of Land Management has released three resource management plans for parts of Montana that are meant to conserve the Greater Sage Grouse, an imperiled chicken-sized bird.

The U.S. Fish and Wildlife Service has decided the bird is warranted for listing, but precluded by other species that are in more trouble. But, thanks to a recent court settlement, the U.S. Forest Service until Sept. 30 to decide whether to list the bird.

Montana has its own state plan for conserving the state and private land, the BLM proposals apply to that agency's land. The three proposals are for areas in Miles

Hi-Line and near the border. The proposals are open for a 60-day comment period. The

governor's office will also review the proposals for consistency with the state plan. One of the key differences between the

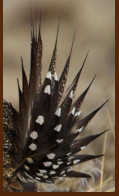




Project objective...

...to better understand how oil and gas development might affect areas important to greater sage grouse at a landscape level in the Northeastern portion of their range





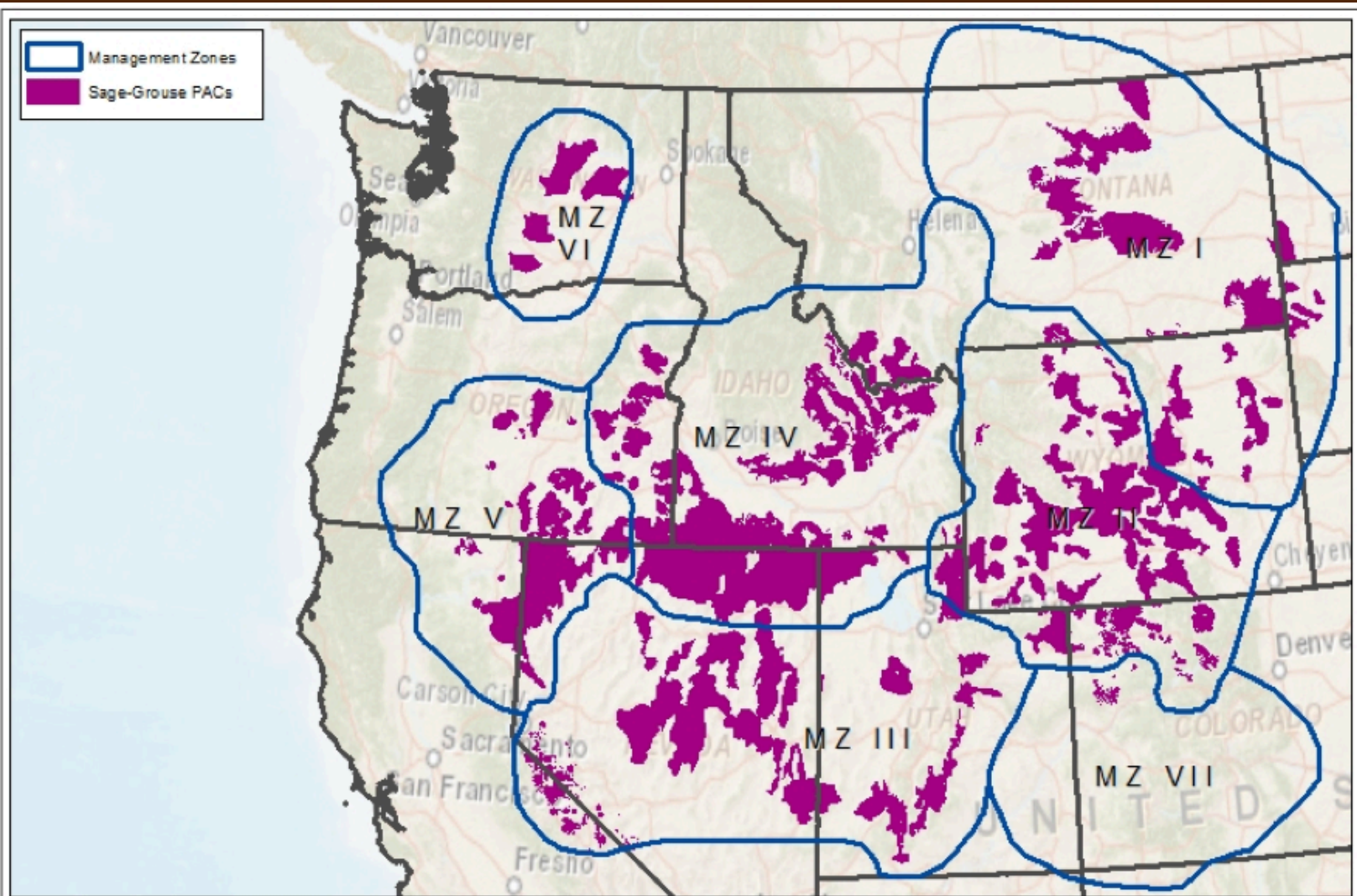
Outline

1. Landscape perspective described
2. Standardizing RFD data into number of oils and gas wells per township
3. Displaying projected development
 - Sage Steppe Partner Forum
4. Conceptual models and assessing risk [using Bayesian networks]

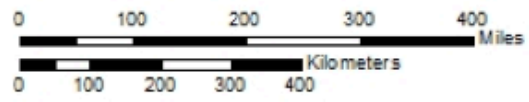


Landscape Perspective

Management Zones & Priority Areas for Conservation



Created By: US FWS, Wyoming ES
Map Date: 1/28/2013
Source: CAFG | COPW | IDFG | MTFWP |
NDGF | NDOW | ORDFW | UTDWR |
WDFW | WYGFD | BLM | WAFWA | FWS





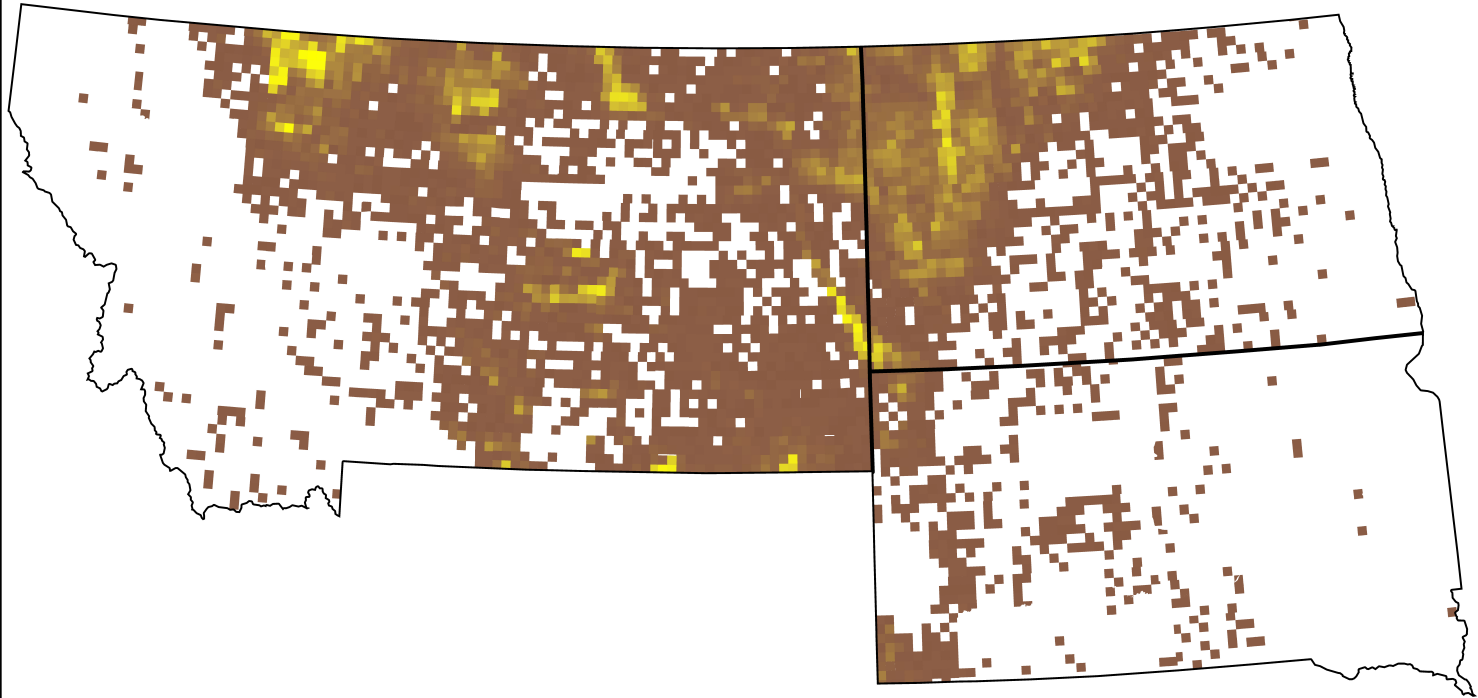
Landscape Perspective

- ❖ At a species, population, and local breeding level – large areas of habitat are involved
- ❖ There is movement of birds [and genes] across extensive geography, and interactions occur across a mosaic of habitats and geopolitical situations
- ❖ Numbers and locations are consequents in cause-effect relationships [positive & negative] that occur at multiple scales, responding to ecosystem condition and processes
- ❖ Annual life history needs are met across a mosaic of habitats

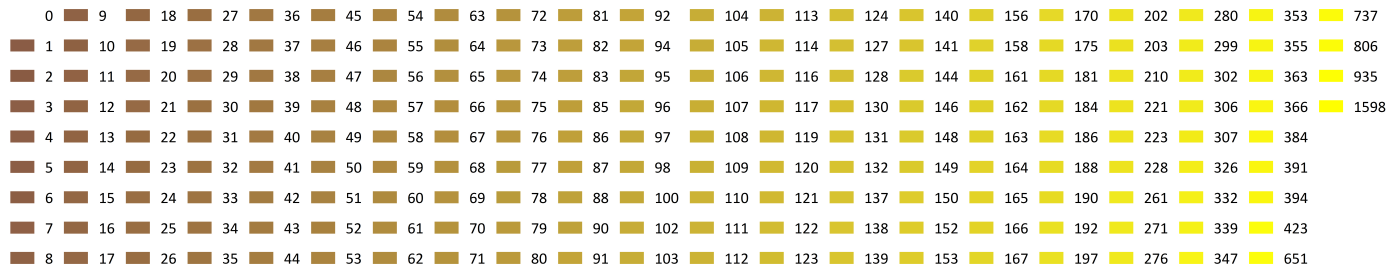


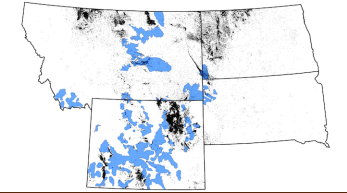
Landscape Perspective

The Existing Condition



Oil & Gas Well Density Mapped at Township Scale





RFD Spatial Data

Reasonable Foreseeable Development Scenario for Oil and Gas Activities in the Lewistown Planning Area, central Montana



Geologist at conglomerate outcrop in small coulee 1 mile west of Riceville, November 1930

**James F. Glover
and
Dean P. Stilwell**

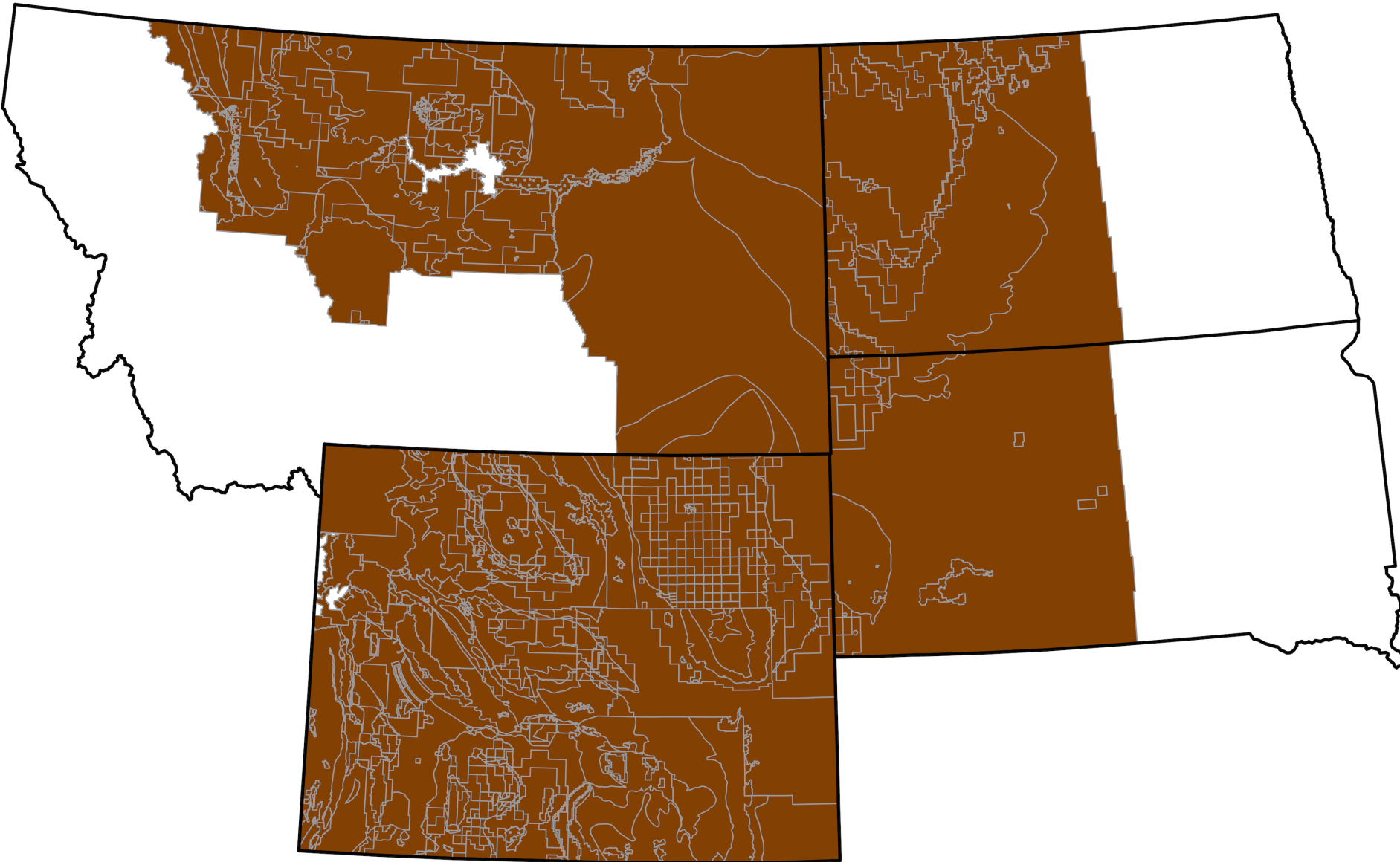
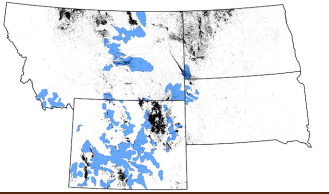
**United States Department of the Interior
Bureau of Land Management**

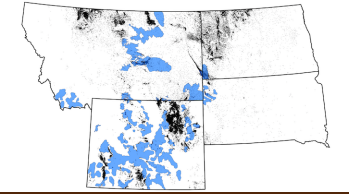
Final Report

June 13, 2014



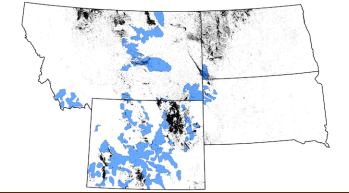
RFD Spatial Data





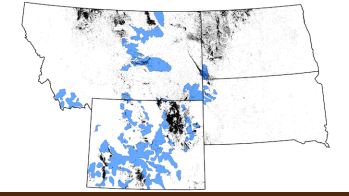
RFD Spatial Data

- RFD Data for WY, ND, SD, & MT – Miles City were provided via email from BLM in Casper
- RFD Data for MT – Dillon and HiLine were obtained from the web
- No RFD Data were available for MT – Billings



RFD Spatial Data

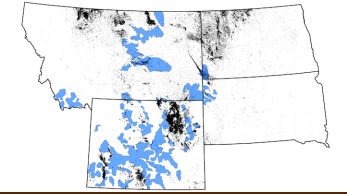
- Some attribute tables in the GIS data had quantified categories, e.g., 5-20 wells per township
- Others did not, e.g., VERY HIGH, HIGH, MODERATE, LOW, NONE, NEGLIGIBLE, NOT ASSESSED
- Number of categories used varied from 3 to 6
- Some offices had different categories for oil & for gas, some did not
- BLM later provided “midpoint” values for non-quantified categories
- One Office (Dillon, MT) had no quantification for the categories and those data were not used
- BLM assisted in sorting through this



RFD Spatial Data

FOR MT, ND, AND SD...

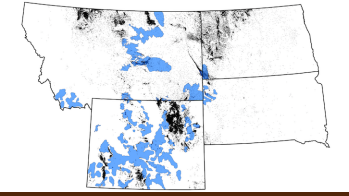
- a. All non-quantified categories, e.g., Very High, etc. populated with numeric data.
- b. Where ranges were provided, the representative value provided by BLM was used; or calculated where not provided.
- c. Maximum often an inequality, e.g., >100 . Therefore, the maximum category was assigned the next highest number. In this example, the “midpoint” value assigned would be 101.
- d. The common value among polygons was the midpoint estimate.



RFD Spatial Data

FOR MT, ND, AND SD...

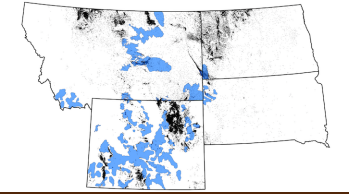
- e. For areas with separate estimates for conventional oil and gas and coalbed natural gas [CBNG], the estimates for a township were summed.
- f. 10 categories arbitrarily chosen and natural break algorithms for categorization in ArcGIS were used.
- g. Categories were symbolized at township scale. But, all townships not equal: (1) inaccuracies in base spatial CadNSDI (PLSS) data, (2) political boundary conditions, and (3) survey correction lines. We ignored this and did not normalize slivers, polygons of zero size, and townships of unequal size.



RFD Spatial Data

13 step process was followed for each data layer to accomplish this portion of the standardization –getting the number of oil and gas wells per township.

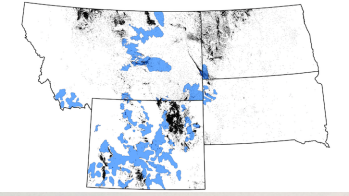




RFD Spatial Data

FOR WY...

- a. Individual Field Office spatial data merged for conventional oil & gas.
- b. Individual Field Office spatial data were merged for CBNG.
- c. These were combined using the union procedure.
- d. A field was added to that attribute table and the field calculator used to populate the field by summing the two fields.
- e. The new field was symbolized to make the map of the number of oil and gas wells per township.



RFD Spatial Data

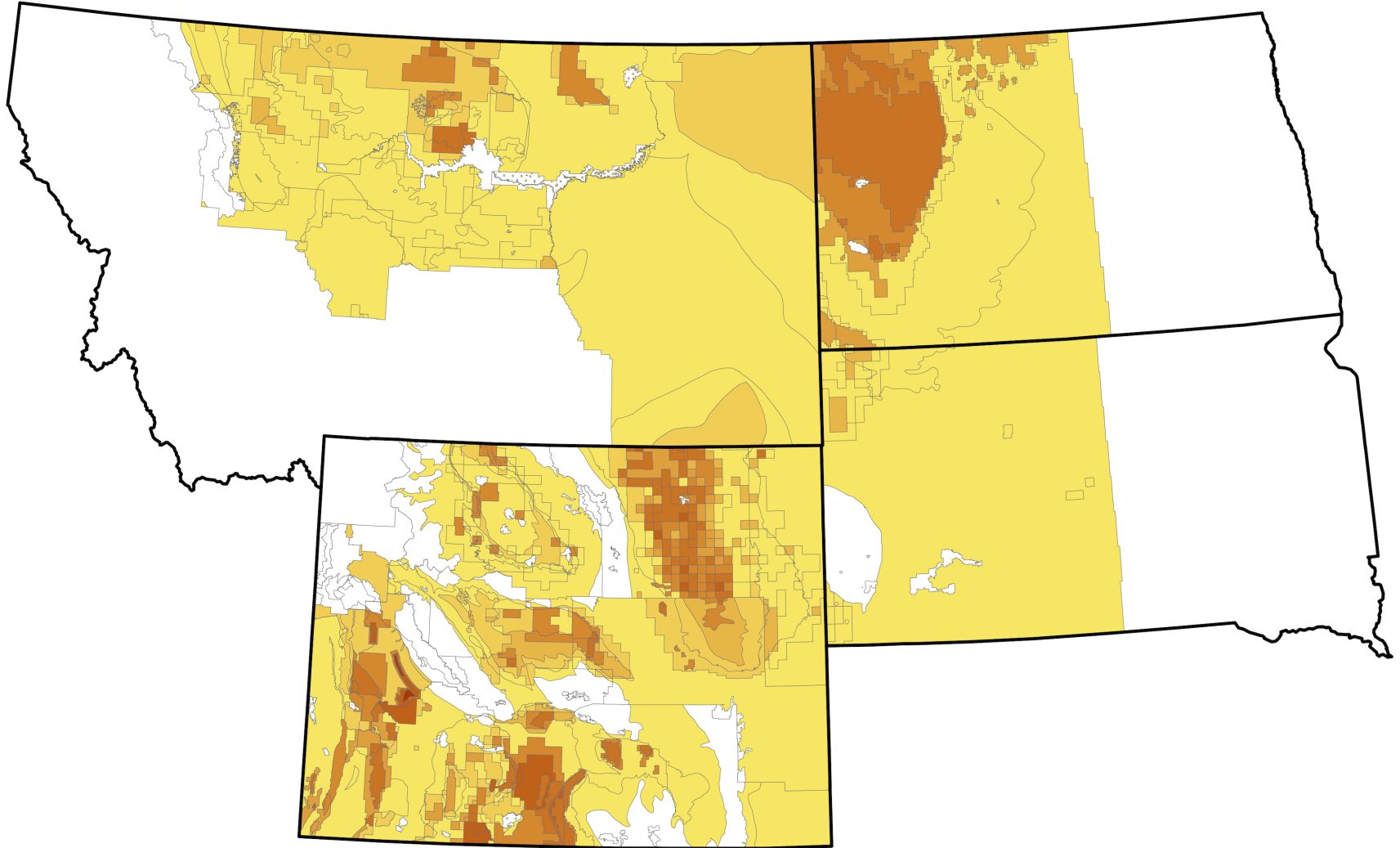
Now, across all four states, all the areas with RFD data have a single midpoint value of the projected number of oil and gas wells per township.

Projected Development Maps



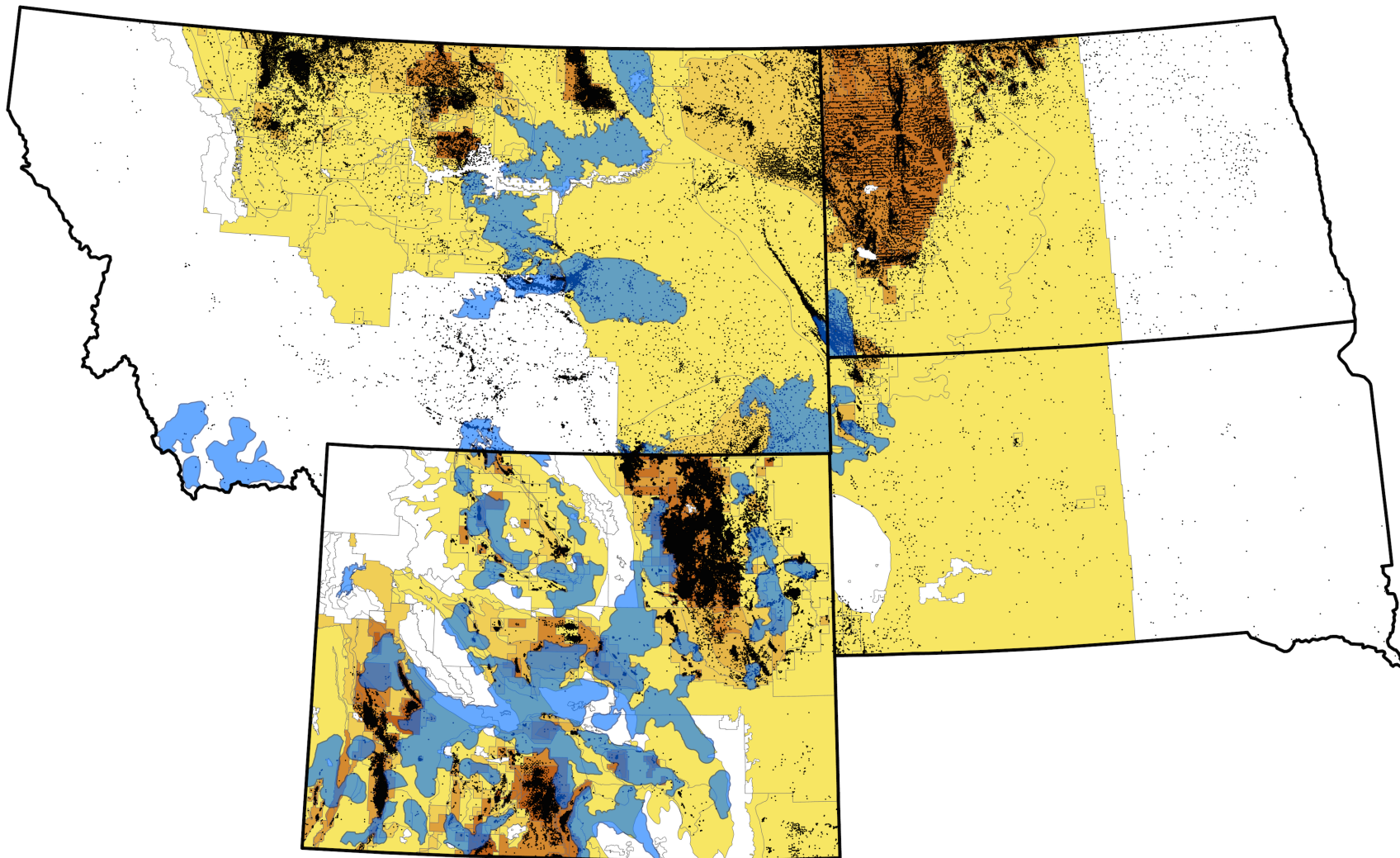


Projected Development Maps



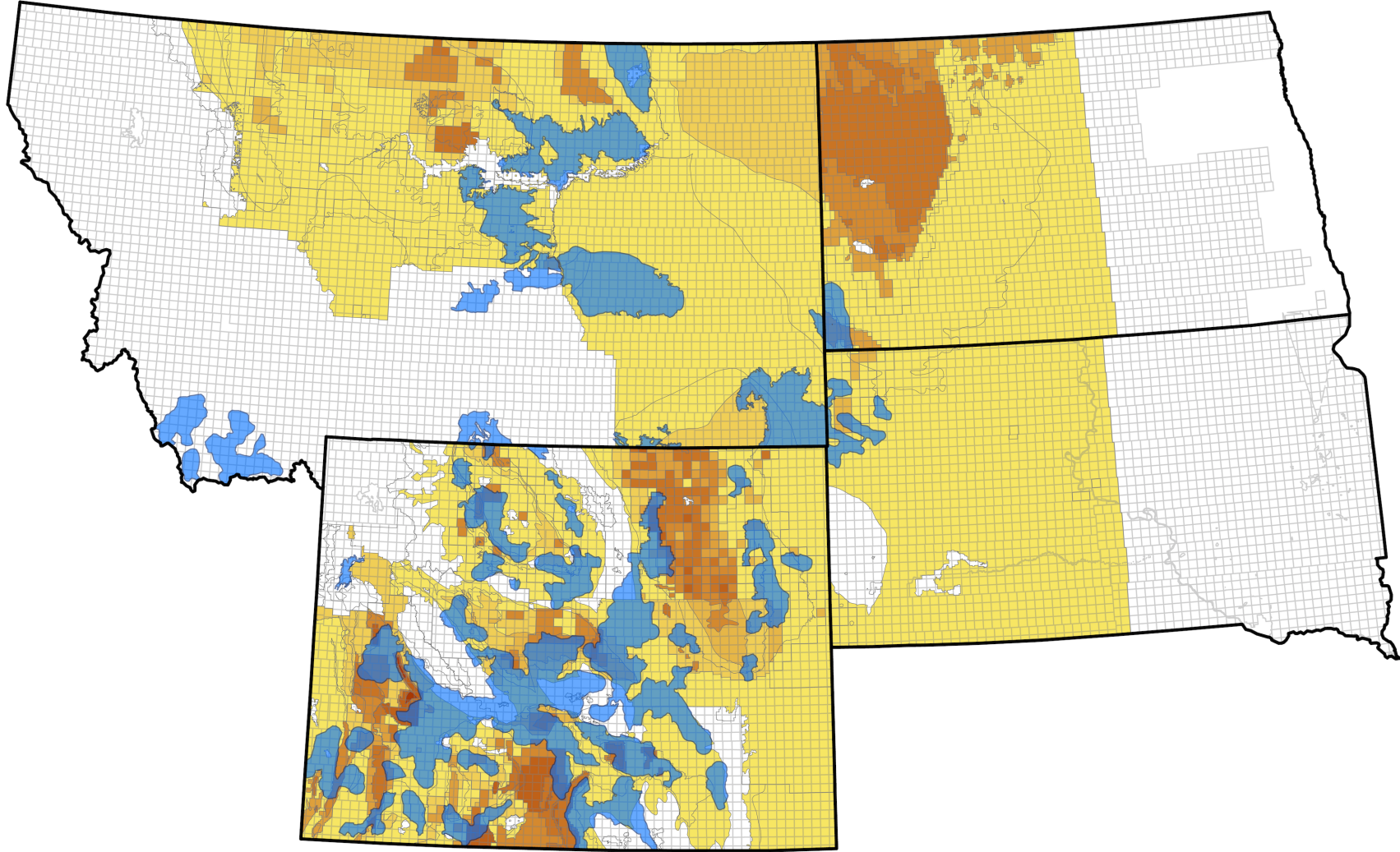


Projected Development Maps





Projected Development Maps



Projected Development Maps



Landscape Conservation Management & Analysis Portal

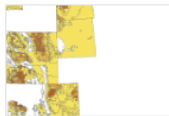
ScienceBase Catalog

LC MAP - Landscape Conservation Management and Analysis Portal About Collections Communities Add Item My Items My Tasks Help

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Communities → LC MAP - Landscape Conservation Management and Analysis Portal → Sage-grouse WAFWA-LCC Collaboration → ... → Produced_Data → Projected Number O&G Wells Combined for MT, ND, SD, WY



Provenance

Data source: Input directly

Catalog Item:

Created by: sojda@usgs.gov on Tue Jan 13 15:47:42 MST 2015
Last Updated by: sojda@usgs.gov on Tue Jan 20 14:16:01 MST 2015

Tags

Topics:

Oil and Gas wells: MT: ND: SD: WY

Categories:

Data

Types:

[ArcGIS REST Map Service](#)

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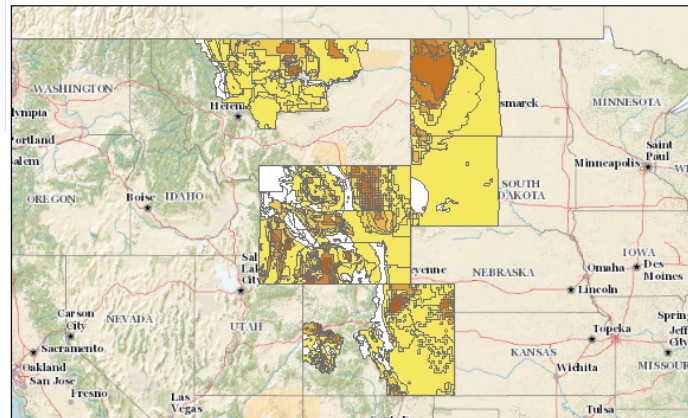
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PROJECTED NUMBER OF O&G WELLS FOR MT, ND, SD, WY BASED ON BLM'S RFD. Notes for Converting BLM's Reasonable Foreseeable Future Projections for Oil and Gas Wells into Standardized Numerical Categories: MT, ND, SD, WY Richard S. Sojda 26 May 2014 1. Spatial data for WY and SD was provided via email by Cathy Stilwell, GIS Specialist, BLM, Casper, WY 2. Spatial data for MT - HiLine was obtained from: http://www.blm.gov/mt/st/en/fo/malta_field_office/rmp/hiline_rmp/gis_maps.html 3. Spatial data for MT - Dillon was provided via email by Laurie Blinn, GIS Specialist, BLM, Dillon, MT 4. Spatial data for MT - Miles City was obtained from: http://www.blm.gov/mt/st/en/fo/miles_city_field_office/rmp/draft_rmp/miles_city_draft_rmp.html 5. Attribute table data were examined from the BLM Development Potential spatial data layers. The column labels differed among Field Office's (e.g., "potential", "devpot", "development", etc.) a. The non-quantified categories included: VERY HIGH, HIGH, MODERATE, LOW, NONE, NEGLIGIBLE, NOT ASSESSED. b. Different offices examined oil separate from gas; others combined the projection. c. The attribute tables contained non-quantified categories for the following FO/Districts/RMPs: Dillon, South Dakota, HiLine, Big Horn Basin, Casper, Kemmerer, Lander, Pinedale, and Rawlins. However, sometimes oil categories were not quantified, sometimes gas were not, sometimes the combined were not. d. When numerical categories were provided, they were presented as ranges, e.g., 5-20 wells per township. Numerical categories were not the same among offices, nor between oil and gas. e. Any areas classified as "Not Assessed" were given the value of "0" since they represent areas off-limits to oil and gas development, such as wilderness areas. f. Dean Stilwell, BLM Casper, WY, provided midpoints for categories that he developed for the BLM as an attachment to an email on 22 May 2014 [[StilwellEdits_DRAFT_notes_standardizing_RFD_categories_v2.docx](#)]. 6. Notes where decisions on categories were made are highlighted in bright green. Sometimes these decisions were arbitrary, but are so noted. 7. When categories overlapped, e.g., 2-10 and 10-20, midpoints were calculated by starting the higher category with the next higher number. In this example, 2-10 and 11-20. 8. Non-quantified categories in the attribute tables of the spatial data were quantified when possible as follows. MT/ND/SD: BILLINGS: No spatial data as of

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[Interactive Mapper View in National Map Viewer](#) - - [Open in Google Earth \(KML\)](#) - [Advanced Services](#)
[ArcGIS REST Service](#)



Communities

LC MAP - Landscape Conservation Management and Analysis Portal

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Parent Item: [Produced_Data](#)

Other Associated Items: (0)

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Projected Development Maps

Sage Steppe PARTNER FORUM

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- ▼ [WAFWA & LCC Projects](#)
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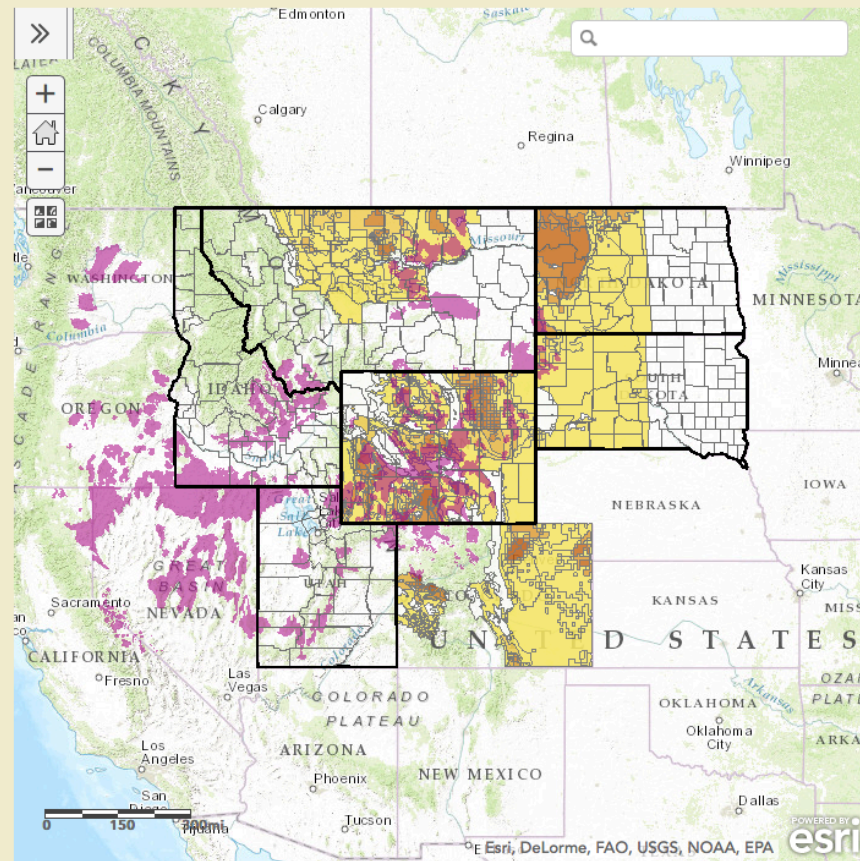
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Mapping the Future of Oil and Gas Development in Relation to the Conservation of GR Sage Grouse



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Sage Steppe Partner Forum...

- **Includes groups working in the high grasslands and shrublands of ID, MT, ND, OR, SD, UT, WY, & WA**
- **Need to develop a shared knowledge base around greater sage-grouse, sagebrush habitat, and their management across the historic range**
- **Multiple entities working on these issues, and the Forum only provides opportunity for additional collaboration.**



Sage Steppe Partner Forum...

- Wiki style web site to foster collaboration
- Has received funding for technical support to enhance the SSPF website, perform data administration, and engage partners in conservation planning and implementation.



Navigation

- Home
- Partner Contacts
- Resources
- To-Do's
- Updates & Discussions
- Files
- Calendar
- GNLCC Partner Forums
- WAFWA & LCC Projects
 - Mapping the Future of Oil and Gas Development in Relation to the Conservation of GR Sage Grouse
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Join Our Discussion



Join the Sage Steppe Partner Discussion (non-DOI Gmail account required to post)

Collaborative Workspace

This website provides Sage Steppe Partner Forum members forum information and a workspace for members to collaborate and contribute (ideas, news, project information, files, etc.) Features include:

- Partner contact information data entry
- Contact information listings
- News and update distribution
- Date/time tracking
- Document distribution

Attend the SSPF Webinar Series

Sagebrush conservation webinars held every Tuesday (1 pm Mountain Time) through March 2014. To register, visit the [Calendar](#) and click on the event. [View schedule \(PDF\)](#).



Webinar recording will be available on the [GNLCC webinar webpage](#) and [YouTube Channel](#).

Join or Invite Someone to the Forum

To learn more about joining the Partner Forum, contact a Great Northern LCC coordinator:

- Yvette Converse
- Tom Olliff
- Madeline Maley (British Columbia)

Task Status			
Owner	Description	Due Date	Complete
Matt Heller	Complete draft of the Sage Steppe Partner Forum Website	September 20, 2013	✓
Sean Finn	Confirm some forum webinar dates/times	November 27, 2013	✓

Showing 2 items from page [To-Do's](#) sorted by Due Date, Owner, Complete. [View more »](#)

SageSteppe Partner Information Spreadsheet

Sage Steppe Committee	Name of Group	Mission or Goal	Geographic Area(s)	Geographic S
Sage Steppe Work Group	And Lands Initiative	The ALI is a group of governmental and on-governmental organizations who have come together recognizing that eastern Washington's shrub-steppe landscape has been greatly reduced and fragmented by agricultural. The Cooperative Sagebrush Initiative (CSI) is an organization that is representing a broad	Eastern Washington	Sub Region (counties, drain basins, etc.)

Updates & Discussions

Wildfire and Invasive Species Wildfire and Invasive Species in the West: Challenges That Hinder Current and Future Management and Protection of the Sagebrush-steppe Ecosystem
A Gap Report from the Western Association of Fish ...
Posted Apr 21, 2014, 11:44 AM by Sean Finn

Powell Center Funding Opportunity for Research on Sage-Grouse Source: USGS: Powell Center Funding Opportunity for Research on Sage-Grouse The DOI Climate Science Centers and the USGS Ecosystems Mission Area are interested in promoting synthesis activities surrounding questions ...
Posted Feb 7, 2014, 1:47 PM by Matt Heller

Sagebrush ecology and conservation webinar series The Sage Steppe Partner Forum is pleased to announce an eight-week webinar series. The forum aims to share knowledge around Greater Sage-grouse, sagebrush habitat, and management across the ...
Posted Feb 24, 2014, 10:53 AM by Great Northern

Government of Canada Taking Action to Protect the Greater Sage-Grouse Environment Canada News Release OTTAWA, Ont. - September 17, 2013 - The Honourable Leona Aglukkaq, Minister of the Environment, Minister of the Canadian Northern Economic Development Agency and Minister for the Arctic ...
Posted Sep 19, 2013, 6:46 AM by Great Northern

USGS Funds Sage-Grouse Projects In June, the USGS funded six projects to further sage-grouse conservation efforts. This funding is related to the WAFWA, USFWS, Inter-LCC Greater Sage-Grouse Initiative funding. The projects ...
Posted Sep 18, 2013, 6:49 PM by Matt Heller
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Sage Steppe Partner Forum...

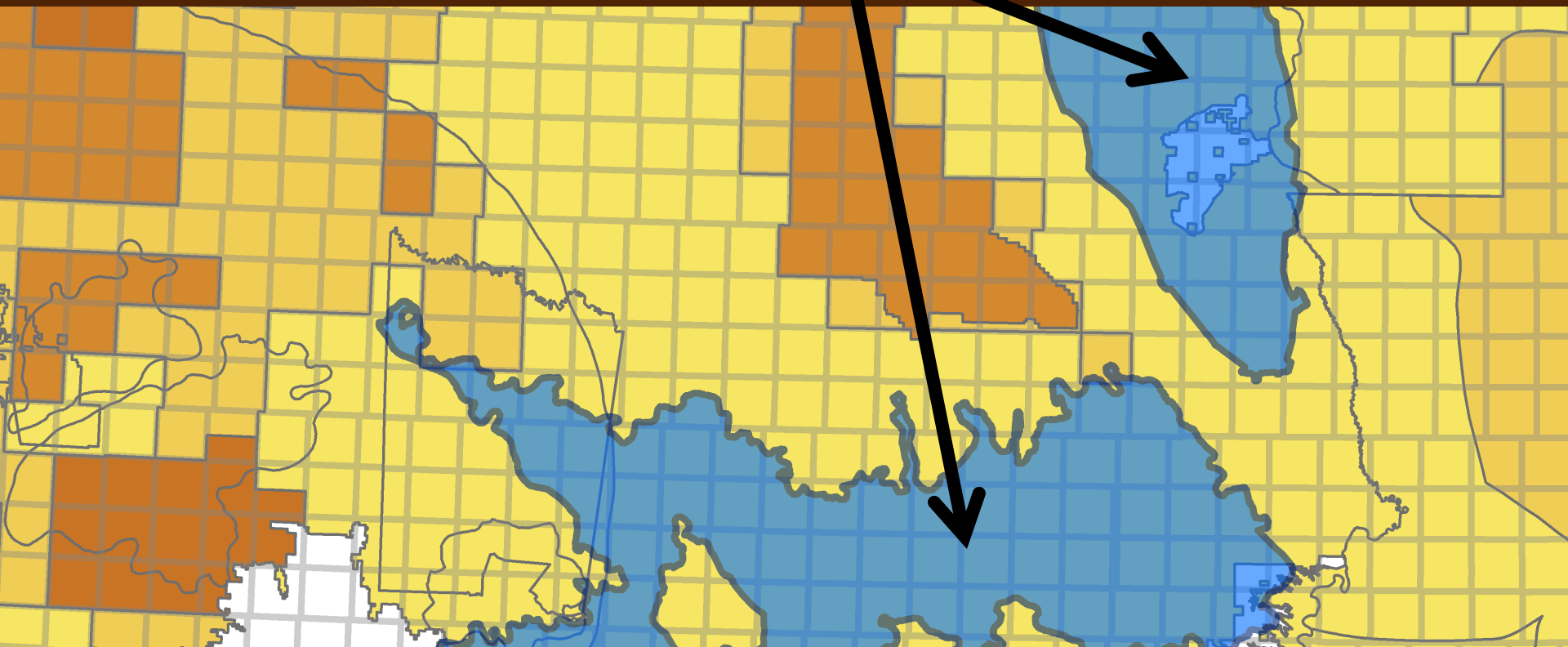
Sage-Steppe PARTNER FORUM

<http://greatnorthernlcc.org/partner-forums/sage-steppe>

<https://sites.google.com/site/forumsagesteppe/>



Future Considerations for Priority Areas for Conservation (PACs): Do boundaries need to change?





*International Environmental Modelling and Software Society (iEMSs)
7th Intl. Congress on Env. Modelling and Software, San Diego, CA, USA,
Daniel P. Ames, Nigel W.T. Quinn and Andrea E. Rizzoli (Eds.)
<http://www.iemss.org/society/index.php/iemss-2014-proceedings>*

Best Practice in Conceptual Modelling for Environmental Software Development

R.M. Argent^a, R.S. Sojda^b, C. Guipponi^c, B. McIntosh^d, A.A. Voinov^e

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*c. Universita' Ca' Foscari di Venezia and Euro-Mediterranean Centre for Climate Change, Venezia, Italia,
CGiupponi@unive.it*

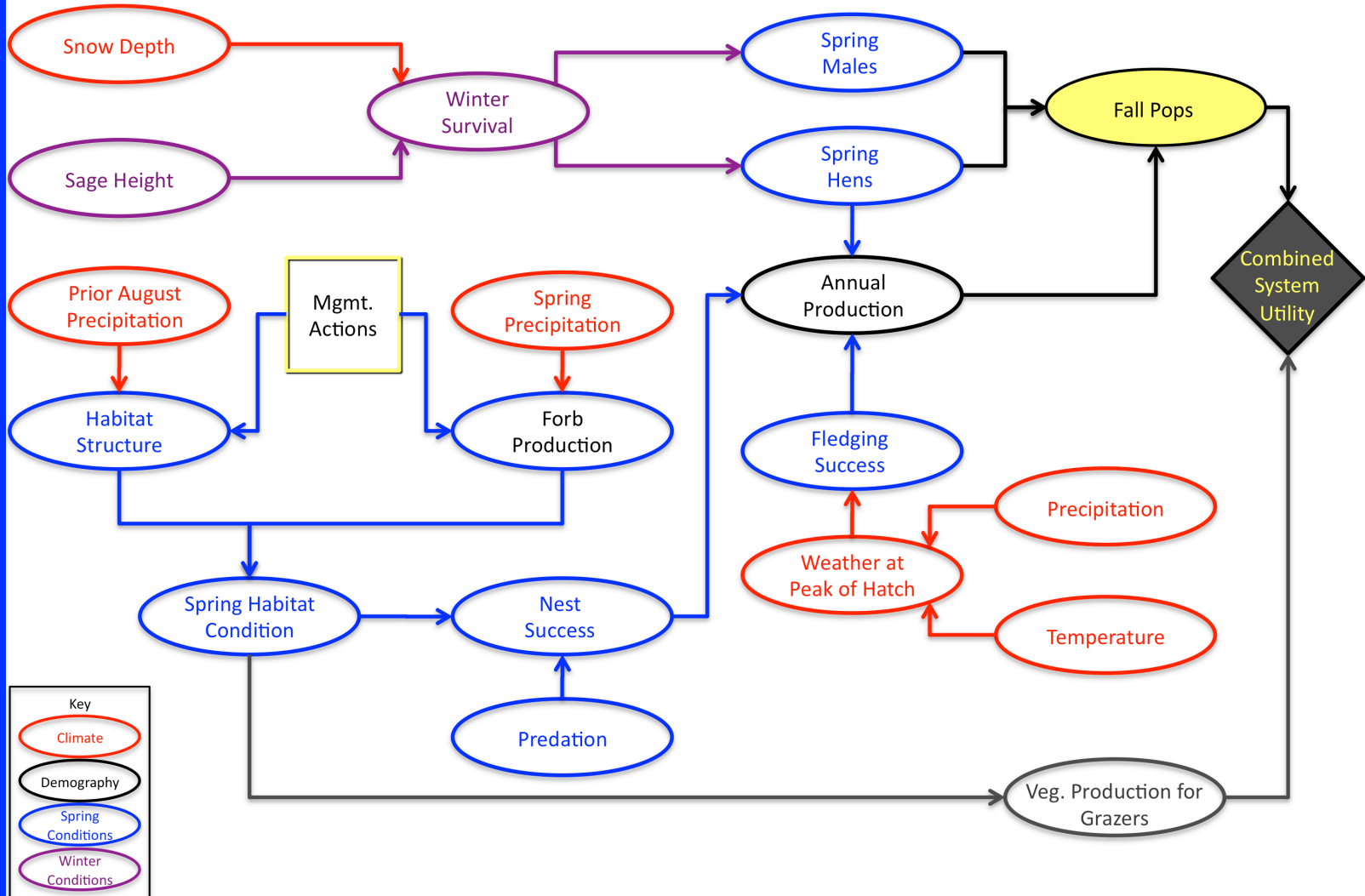
d. International Water Centre, Brisbane, Australia, B.McIntosh@watercentre.org

e. University of Twente, Enschede, The Netherlands, AAVoinov@gmail.com



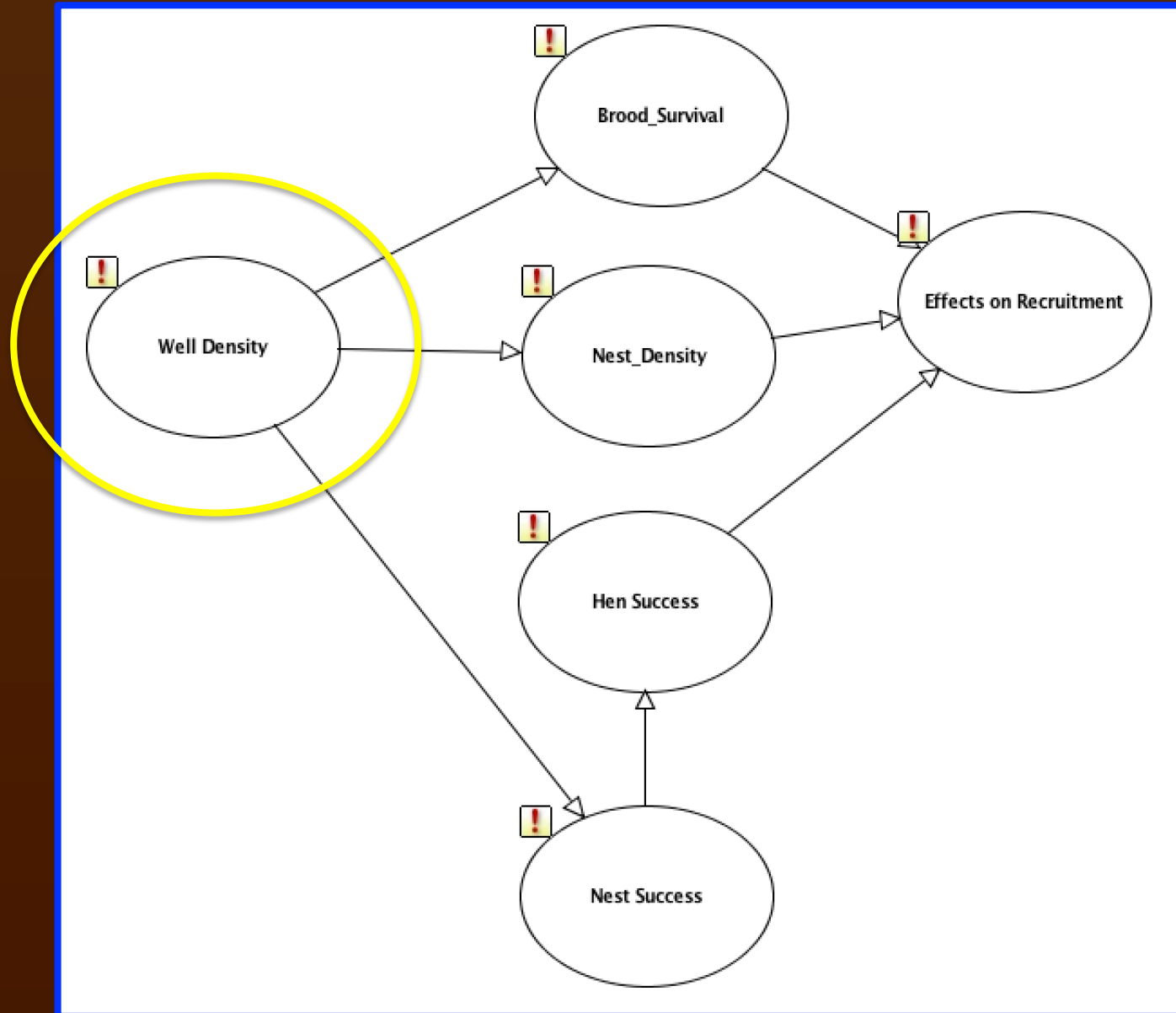
First: Identify key life history components

Sage-Grouse Demographics in Relation to Climate Change [Draft, v2]



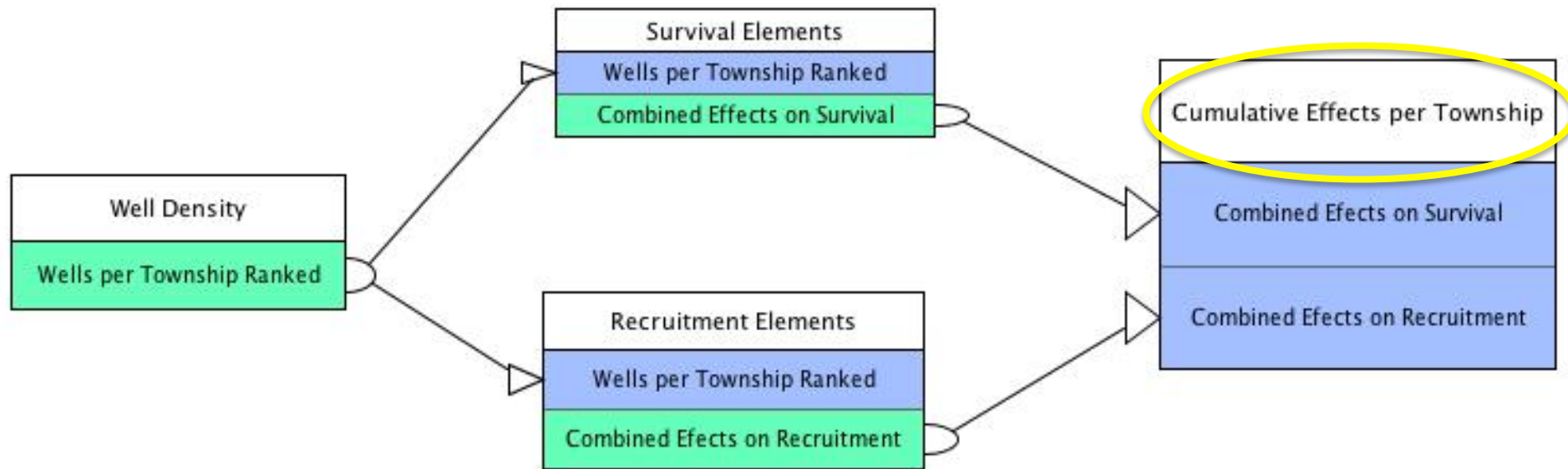


Second: Literature on Cause-Effect Relationships



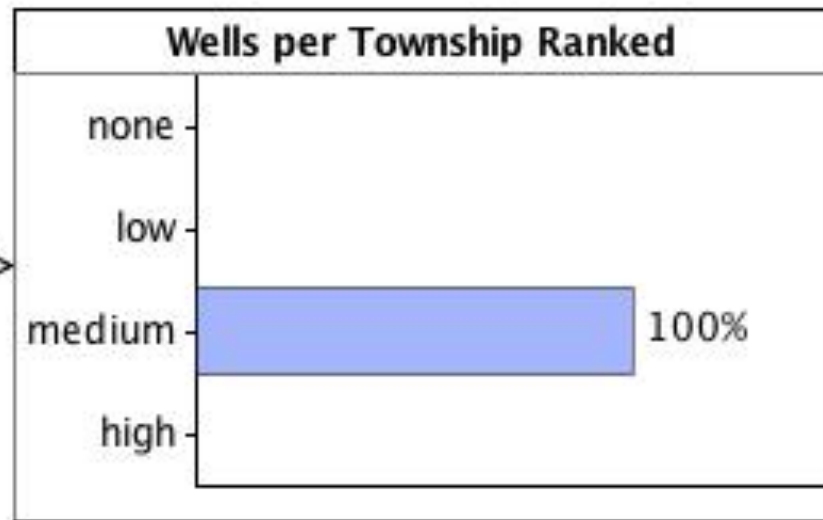
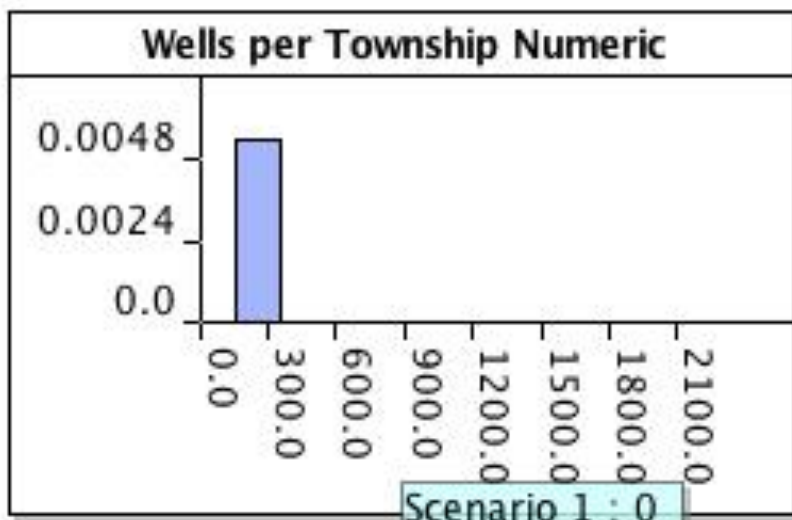


BBN Model Being Developed to Model the Risk to Greater Sage Grouse from Oil and Gas Development



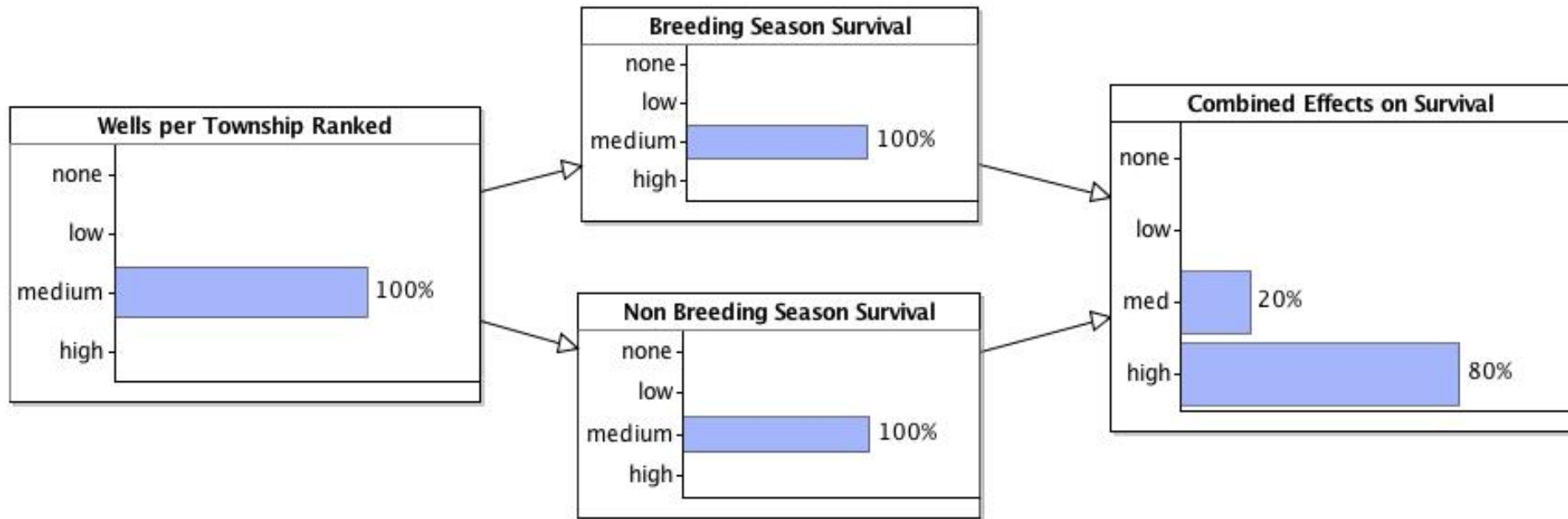


Well Density Converted



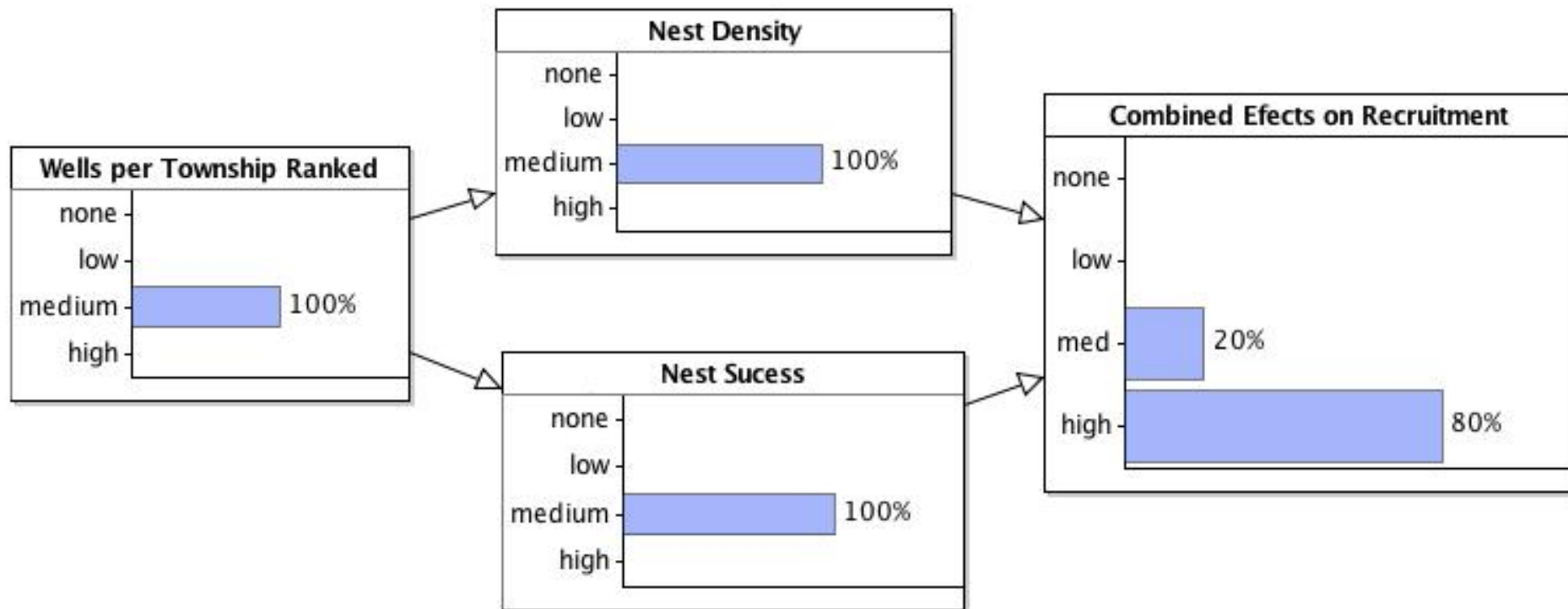


Elements of Effects on Grouse Survival



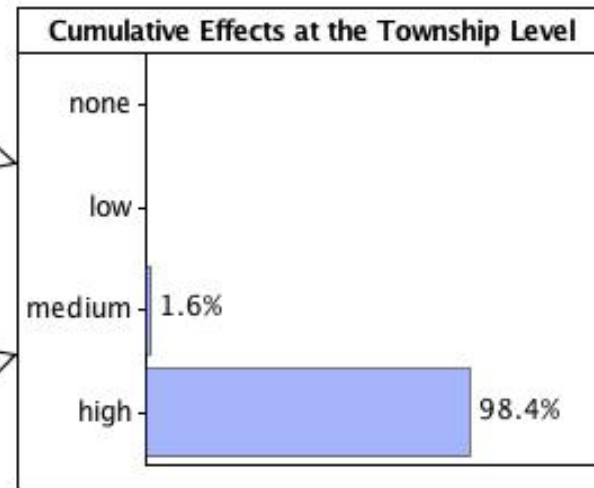
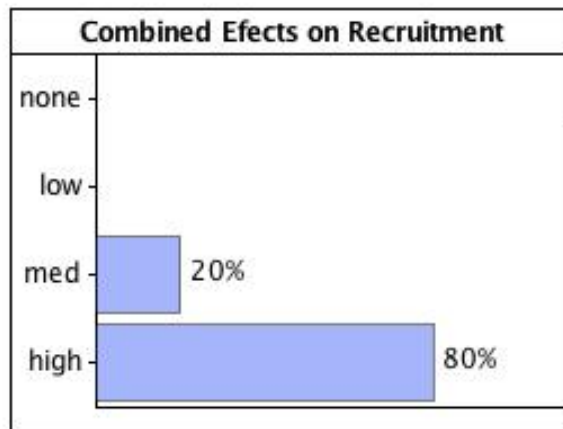
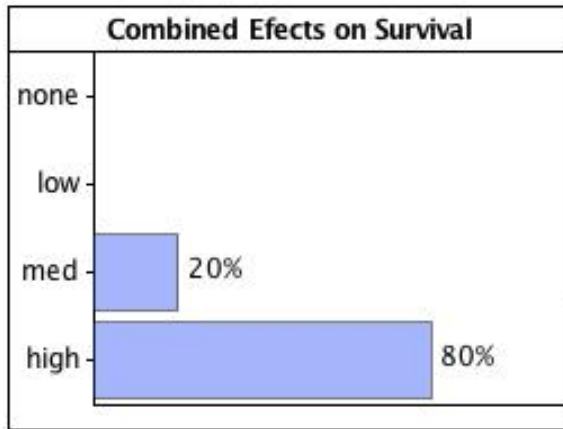


Elements of Effects on Grouse Recruitment





Cumulative Effect: FINAL OUTPUT





Bayesian Belief Networks & Influence Diagrams...

- **Causal links**
- **Quantitative & qualitative relationships**
- **Confidence probabilities**
- **Risk analysis**
 - **Vary these parameters & examine the change in outcome**



BUT, PACs are static in current form. Do we expect them to change based on things other than oil and gas development?



Multivariate Question:

- Root-side down
- Oil & gas
- Climate change
- Wind energy
- Grazing intensities/ beef prices



Questions?

