Modeling
- A lot of ways to do this and models are out there, talking about populations: ___ is needed to get the population we need and it will cost this __ much
- Models are valuable for the different species
- Models will help generate some regional goals for specific JVs or other geographies
- Robinson et al. model is well suited to convert acres to bird numbers and setting goals
  - As is David Pavlacky et al. models … scale matters though!
- Watch bird population size versus trend metric though, for example, in the 3 billion birds paper **25.9% is the important number *not* 3 billion birds**: % or trend measures may be most relevant
- Models of acres are needed to arrest/reverse declines: this highlights the urgency and size of the task to stakeholders and funders
- Barry's model gets us close, but the 2-step approach creates some uncertainty linking trends back to acres
- Are models suitable for us to prioritize? Is there a need to prioritize? How do we translate what we know into implementation?

Models and Conservation Delivery
- Use of models would be improved if practices are specified within each region (i.e. similar to forestry practices recommendations)
- Models will be critical for understanding how to target and be efficient with conservation delivery
- Species trends are not attached to the problem and not attached to a threat: it is difficult to base conservation on a trend unless working with actions and knowing what <u>determinants</u> of the trend are
- Flip conversation: start with major threats on the landscape, instead of concern about expressing measures in terms of population size versus trend or relative numbers
  - Work out what the available actions are to address objectives to recover species
  - Don't set an objective you can't reach: determine available actions and satisfy multiple objectives with landowners and individual values.
- Risk layers help prioritize conservation action though integration of demographic thresholds/allee effects will add a lot of information beyond straightforward maps of risk
- N hectares is one thing, N hectares in the right places is another thing as Barry alluded to
- We need to be thinking about the long-term population goals due to inequalities in how expensive saving grassland is now vs. restoring it when it is gone
- We need to think about stuff that isn't showing up on land use like power lines, turbines & energy development... stuff that won't degrade a big footprint on the landscape, but will affect birds' abilities to use those areas
- Consideration of the landscape matrix in which the grasslands are found: while grasslands are the focus habitat, what value can other cover types (e.g. agricultural lands, shrublands) add to each species?
- One person was disappointed with the focus on retention and not enough on restoration.

Developing Targets Using Models
- What is the full-fuel gauge: what does it mean to be full?

- Perhaps focus should be on quality grassland whilst understanding that these efforts at the biome level are going ahead (WWF PlowPrint, JV8 grassland assessment)
- Need to know population trajectory, then how many acres will move the needle
- Need to stop encroachment & conversion: Managers need these targets
- Setting targets in terms of area may be too simplistic; complementary land-sparing AND land-sharing approaches can help get towards stabilizing trend but need to understand how sharing approaches (rotational grazing, etc.) contribute to trend; may need less that 4M acres to stabilize
- Cost of preventing land from being converted to ag might be a lot less than converting it back: targets need to take this into account
- Someone noted that the overall acreage goal is somewhat irrelevant at this stage - we're not going to exceed our goal in the near or medium-term. This is a long-haul endeavor and really just need to scale up conservation efforts in the short-term
- ***In Contrast:*** others mentioned that there is a need to put something out there to simply understand what order of magnitude we are even talking about (do we need 100s of millions of acres or dollars, or billions?)

Considering These Models Within Human Dimensions
- We can spend years modeling birds, been doing for decades, but we'll advance the most steps by working with people on the land
- Social pieces missing from the dashboard (e.g., who can implement conservation actions; ngo vs federal -- how can they be reached/informed etc.)
- Don't rule Human Dimensions out as people are the key influencers that can affect landscape
- Need to affect change on private land ... Sage grouse initiative shows innovative ways to get work done at the ground level
- Managers need communicate to land owners when the grassland actions go beyond protecting an existing grassland ... for example describe the action, where, how to do it, when to do it, for how long, etc."
- Engage more citizen science and landowner engagement
- Don't abandon opportunity and willingness of landowners when maps don't point there; clarity on maps and models needed
- Getting the baseline correct motivates, creating context and storytelling at the regional level, thus encouraging 'locals' to engage
- We need to work with producers' objectives and treating those on an equal level with our bird conservation objectives and getting both sides to agree
- Accept BLM land and intermingled lands, and make do with this mix: what we have may not be in core of species range but we have $$ and mandates to influence the land in there
- Target of birds may not be best to lead with for some communities ... it depends on the group you are talking with
  - Find the vocabulary that resonates with the group: it's all about interpretation-maps and purpose and transparency and communication about intent is key
  - Watch unintended consequences
  - Need to bring birds in with other issues and needs

Gaps/Needed Research
- ***Social Will and Management***
  - Overlay the species prediction maps with social maps to identify where there is greater interest in conservation

- o Identify the key unfragmented landscapes up and down the entire biome that might help direct organizing at the social layer
- o Landowner willingness, catalysts on the land
- o Socio economic drivers of conversion and how that impacts the 'at risk' grasslands
- o Compiling the number of actual landowners that understand and support the Roadmap
- o Compendium of existing graduate theses that have studied grassland ecology and management: there is great value for managers to use but it needs to be synthesized into practices
- **Temporal, movement**
  - o Temporally varying layers of risk; need temporal aspect to models
  - o Need to include more modeling efforts for the wintering grounds & where birds are most at risk within the FAC
  - o Understanding movement: we've talked about breeding and wintering, but nothing in between
  - o Need a better understanding of threats spatially-explicit across the biome
  - o There's an assumption that the limiting factors are in the breeding ranges - but we don't really know that for sure ... we really need to understand those limiting factors and have whole life cycle models to really understand what's happening in the biome
  - o Understanding of how acres preserved to benefit Mexican/S. Great Plains residents will translate to protecting wintering birds
  - o Nonbreeding data
  - o Full life cycle analyses - and winter range (especially with data from Mexico)
  - o More work on wintering grounds to better understand whether the major limiting factors occur during breeding or wintering
- **Costing**
  - o Modeling the cost effectiveness of all the options to help us invest in the most cost effective options as habitat is in a freefall everywhere
  - o Cost models: east west restoration is very different!
  - o Cost of various management strategies and how they influence wildlife/landowner
  - o Can gaps be met with cost share etc.?
  - o Cost of restoration.
- **More Nuanced Understanding**
  - o Restoration prioritization based on spatially-explicit information: where is 1 acre of restoration most valuable based on what we know about edge effects/patch size?
  - o Productivity vs. abundance: you might detect a bird in a wheat field, but did that bird successfully raise young?
  - o Understanding grassland degradation: situations like in the Flint Hills where there are still beautiful "pristine" grasslands, but most are completely burned every year and nesting success is terrible
  - o Are easements on private lands integrated into these risk maps? Is land ownership integrated in risk assessments: BLM/USFWS/NGO lands must approach 0 conversion risk
  - o Species-specific productivity/habitat relationships
  - o Expand from a focus on retention to restoration
- **Additional Gaps to Address**
  - o Incorporate climate change, climate model predictions, and how habitat may shift with climate change
  - o MOTUS data

- Soil Carbon distribution may help as these tools are utilized to highlight scale of problem and provide a layer of opportunity
- Studies on how regenerative ag. contributes to bird conservation; conversion tool for ag & regen ag