Initial Development of Grassland Decision Support Tools for the Gulf Coast Prairie Landscape Conservation Cooperative

September 2015

Missouri Resource Assessment Partnership
David D. Diamond
Lee F. Elliott
C. Diane True

NatureServe
Patrick Comer
Patrick Crist
Cameron Scott
## Contents

List of Tables ...........................................................................................................................................

v  
Acknowledgements ..................................................................................................................................... 1  
Project Abstract .......................................................................................................................................... 1  
Introduction ............................................................................................................................................... 3  
Project Scoping ........................................................................................................................................ 3  
Development of Datasets .......................................................................................................................... 5  
   Entire LCC ............................................................................................................................................... 8  
   Oklahoma-specific Datasets .................................................................................................................... 12  
   Texas-specific Datasets ........................................................................................................................... 14  
Dynamic Decision Support Tools ............................................................................................................... 20  
   Audience and Pilot DST Organizations ................................................................................................ 21  
Methods .................................................................................................................................................... 21  
   Management questions to be supported ................................................................................................. 21  
   Decision Workflow ................................................................................................................................ 23  
      For reactive use ................................................................................................................................. 23  
      For proactive use .............................................................................................................................. 23  
   Information workflow ............................................................................................................................ 23  
DST Development .................................................................................................................................... 24  
Pilot implementation activities .................................................................................................................... 25  
   Results .................................................................................................................................................... 29  
   Recommendations for Future Work ..................................................................................................... 30  
Discussion .................................................................................................................................................. 32  
References ................................................................................................................................................ 33  
Appendix 1. Project Scoping Workshop Locations and Attendees .......................................................... 34  
Appendix 2. Data layers available on the GCP LCC Conservation Planning Atlas ................................... 37  
Appendix 3: Detailed information workflow ............................................................................................ 41  
Appendix 4: GCP LCC Dynamic DSS Pilot – Tester feedback forms ...................................................... 42
List of Figures

Figure 1. Current vegetation of the Gulf Coast Prairie LCC based on merging of two state-based mapping efforts................................................................. 8
Figure 2. Extent of existing grasslands by type for the GCP LCC................................................................. 9
Figure 3. Ruderal deciduous woody vegetation (red) is more abundant than ruderal evergreen vegetation (green) in the GCP LCC..................................................................................................... 10
Figure 4. Grassland landscape patches ........................................................................................................... 11
Figure 5. Density of ruderal evergreen and mixed shrubland and woodland by county. Darker counties have more ruderal woody vegetation cover .......................................................................................................... 13
Figure 6. Evergreen land cover change in eastern Oklahoma from circa 1987 to 2014 ....................... 14
Figure 7. Western and eastern study areas were selected for LiDAR dataset development in southcentral Texas ........................................................................................................................................ 15
Figure 8. Vegetation height for the western and eastern study areas in southcentral Texas ...... 16
Figure 9. Vegetation height generated using 10 m pixels over-estimates shrub cover (brown) versus 1 m pixels ......................................................................................................................................... 16
Figure 10. Shrub canopy generated from 30 m LiDAR data ......................................................................... 18
Figure 11. Shrub canopy estimated from 30 m satellite data from LANDFIRE ........................................ 19
Figure 12. Shrub canopy estimates at 30 m resolution from LiDAR varied versus those from satellite data ............................................................................................................................................ 20
Figure 13. Information workflow indicating inputs, analytical processes, outputs, and supported decisions ........................................................................................................................................... 24
Figure 14. Tool interaction diagram ................................................................................................................ 25
Figure 15. Dynamic DST pilot project location and area ................................................................................. 26
List of Tables

Table 1. Scoping workshop location, grassland habitat types, conservation decisions needing support, and potential pilot areas and focus ...................................................................................................................................... 4
Table 2. Primary datasets developed and aggregated at the GCP LCC Conservation Planning Atlas .......................................................................................................................................................... 6
Acknowledgements

Duane German, Amie Truer-Kuehn, Allan Janus, Mark Howery, Bruce Hoagland, and Kayti Ewing were instrumental in development of the Ecological Systems (current vegetation) datasets for Texas and Oklahoma, and helped with other aspects of the project. Gulf Coast Prairie Landscape Conservation Cooperative (GCP LCC) staff provided critical input, including Bill Bartush, Cynthia Edwards, and Blair Tirpak. Robert Perez of Texas Parks and Wildlife, Jeff Pennington and Kyle Johnson of Oklahoma Department of Wildlife, and Brandon Reavis of Natural Resources Conservation Service helped shape the effort via participation early on. Others who contributed to project scoping and review meetings also provided much valuable input (full list in Appendix 1). Jon Hayes, Rebecca Chester, Mike Morrow, and Bill Vermillion evaluated the dynamic decision support tool.

Project Abstract

Grassland conservation is a priority within the GCP LCC. We held a series of meetings and conference calls with partners to identify areas of need both conceptually and geographically. Based on the meeting outcomes, we identified specific tasks that could be accomplished within our scope, including development of datasets and demonstration of a freely available decision support software tool (DST): NatureServe Vista. We generated more than 30 new datasets and posted more than 35 datasets on the GCP LCC Conservation Planning Atlas (CPA). Data were provided for three geographic regions that corresponded to the areas of interest of different partners: the entire LCC, Oklahoma only, and two, 2-county areas in the Coastal and Fayette Prairies of Texas. Partners found high potential for use of LiDAR data for fine-resolution evaluation of grassland, shrubland, and woodland habitat. The dynamic DST was developed in concert with partners active in Texas, and was tested by staff from several organizations. Partners indicated that there was potential utility of the dynamic DST (given adequate training), especially in areas with rapidly changing conditions.

Future projects will have the advantage of knowledge generated from this project. Specific partner needs can be approached within a better-developed framework and should be able to build off datasets we have provided. Some examples of needs that could be addressed include:

(1) Refinement of data needed to enhance targeting and management of juniper and deciduous ruderal shrublands and woodlands throughout the LCC,
(2) Refinement of data for targeting and management of woody species / grassland mosaics that enhance habitat for specific species, such as Northern Bobwhite, using LiDAR-based shrub and tree distribution and density,
(3) Further consideration and refinement of grassland landscape patches and attribution for conservation importance based on biological and landscape condition attributes throughout the LCC as a support to regional-scale conservation planning,

(4) Development of grassland quality data from a combination of on-the-ground surveys, LiDAR vegetation height and density data, and air photos for specific areas of interest, especially near public lands and private conservation lands,

(5) Development of use case scenarios and training designed for partners who want decision support using data sets posted on the Conservation Planning Atlas,

(6) Use of the dynamic DST by partners in regional planning applications where currently available data are sufficient to support the types of decisions being made.

(7) Use of the dynamic DST by partners in multi-county planning applications areas where conservation or development actions are proceeding apace, such as urbanizing areas along the I-35 corridor, or in the vicinity of Houston, but where data requirements for existing grassland location/quality/condition are limited.
Introduction

The Gulf Coast Prairie Landscape Conservation Cooperative (GCP LCC) has identified grassland habitats and associated species as priorities for conservation. A number of partners are working on grassland projects within this geography, but operating at different scales and focusing on different priority targets. There are expanding opportunities to pool resources and develop consistent datasets on a broad scale. There are also expanding opportunities to apply spatial analysis tools in conservation decision support efforts. Through partner collaboration, efficient and effective datasets and tools may be identified for widespread use and benefit.

The goals of this project were to (1) help identify pilot project areas to test decision support tools and advance landscape conservation in valued grassland areas, setting the stage for subsequent priority-setting and further actions, and (2) develop GIS data and decision support tools to facilitate subsequent conservation efforts. Results of this project should be of immediate use in selected landscapes and should point toward ways forward in other areas.

Project Scoping

A series of scoping workshops were held in Edmond OK, Austin TX, Kingsville TX, and Lafayette LA to offer opportunities for group discussion of these key topic areas. Each workshop covered the same topics, but concentrated on issues relevant to partners in each region of the LCC. Workshops helped to further introduce participants to the project scope, and then complete in-depth discussion on 1) grassland habitat types of significant interest, 2) the types of conservation decision supports that could be developed with new data and tools, and 3) key landscapes that could provide for one or more pilot project areas for mapping and decision support applications. The aim was to use input from these workshops to create a detailed project work plan, with an intention to orient all project tasks to maximize its utility to GCP LCC partners.

Table 1 provides a concise summary of common themes emerging from workshop discussions. Much interest in grassland habitats centered on the ecological condition of the characteristic grasslands within each region. In this sense, there was less emphasis on prioritizing among grassland or savanna types, but instead greater emphasis was placed on addressing common grassland threats for a given region of the LCC. Threats most often mentioned included effects of fragmentation, woody encroachment (from various sources), and invasive species. In most cases, strategies centered on maintenance or restoration of grassland-dominated landscapes.

Common themes emerging from discussions of conservation decisions were more varied, but centered on informing where to take conservation actions. Those actions could include land acquisition, easements, or implementing restorative practices. Strategies frequently mentioned included creating stronger linkages between grassland conservation priorities and landowner incentive programs, such as EQIP and GRIP.
Table 1. Scoping workshop location, grassland habitat types, conservation decisions needing support, and potential pilot areas and focus.

<table>
<thead>
<tr>
<th>Workshop Location</th>
<th>Grassland Habitats</th>
<th>Conservation Decisions</th>
<th>Potential Pilot Areas and Focus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Edmond</td>
<td>Savanna landscapes: spatial mosaic and heterogeneity; much of which was lost due to fire suppression and other land uses. Native grassland remnants (unplowed if possible, but emphasis is on current native composition)</td>
<td>Linking priority habitat areas to NRCS field office decisions on funded practices (e.g., cedar encroachment coverage informing targets for investment for restoration in prairie chicken habitat). Are the (documented) practices in place having (or will have) their intended effects? (e.g., time series analysis [back caste to present] to document trends in habitat condition) [caution about costs and repeatability of time series] What is the collective conservation investment in the Cross Timbers? (Who? Where? What is being done?)</td>
<td>Oaks/prairies JV bird monitoring/habitat evaluations along monitoring routes (N and S) – what is there now, what are foreseeable trends? Impacts of practices over time (JV/NRCS collaboration?) NRCS customized data layers that could be used statewide to speed up decisions and address capacity limits. Deep Fork as one wildlife area related to cedar encroachment issue to assess trends and effects of practices (see TNC NC12 site); look for multi-county pieces. Priority southern OK counties for Oaks and Prairies.</td>
</tr>
<tr>
<td>Austin</td>
<td>All types of grasslands with woody encroachment</td>
<td>Financial assistance, EQIP and GRIP—where to fund, how much funding is needed, what the effect would be on the birds. Would like to be able to ID users for outreach on benefits of participation. Often get one landowner and word spreads for others to participate.</td>
<td>Focal counties (~10) identified for quail, but can also compare to TNC priority areas.</td>
</tr>
<tr>
<td>Kingsville</td>
<td>Northern sandsheet counties in STX for NOBO (Ingleside Sand Sheet)</td>
<td>Decision types listed but not prioritized; e.g., Incentivize the landowner – economic (NRCS, LIP, quail stamp) Outreach, demonstration sites Habitat response to grazing methods Restoration/Enhancement locations Acquisition locations (protection)</td>
<td>Counties: Hidalgo, Brooks, Jim Wells, Duval, Jim Hogg, Zapata, Starr counties, San Patricio, Nueces, Bee, Kleberg, Kenedy, Willacy, Cameron</td>
</tr>
<tr>
<td>Lafayette</td>
<td>coastal prairie and it’s variations – pasture, improve pasture, rangeland (the mosaic)</td>
<td>Where to acquire Where to restore Where to manage</td>
<td>Chenier Plain – Calcasieu and northern Cameron Parish (larger size if possible – cost / data – expanded Jefferson and Chambers? TX mid coast (lower portion) – GRIP’s focal area – Central mid-coast Goliad Co.– west of Wallard</td>
</tr>
</tbody>
</table>
One distinct need emerged in several workshops to facilitate mapping of partner projects and priorities (i.e., “who is doing what, and where?”) in order to facilitate collaboration and efficiency in grassland conservation among LCC partners.

Potential pilot project areas included a series of multi-county areas, some extending across state borders, where multiple partners could engage with NatureServe and MoRAP in the application of updated data sets to support common conservation decisions. Much debate centered on the needs and capacities of users who viewed “decision support tools” primarily as “static” map products (each reflecting GIS analysis of updated spatial information) vs. decision support software tools that enable “what if” types of spatial queries that support dynamic planning processes. No apparent consensus on this issue emerged from the workshops, other than the idea that at least some project outputs would include the former; i.e., “static” map products.

The process of gathering input from partners helped define data needs and project focus areas. Based on these interactions, two primary areas of action were defined in detail for the project workplan, including:

1. The accumulation of existing data and development of new datasets that to help partners set priorities for conservation and management; these datasets will be “static” until revised, so together they form a “static” decisions support tool (DST), and;
2. Demonstration of a dynamic DST in an area of importance to partners in Texas that uses these new datasets together with other existing datasets; hence the dynamic nature of this tool is that different scenarios can be constructed and explored with input data.

Following we first describe new datasets and maps created for the static DST, followed by a section focused on the dynamic DST.

**Development of Datasets**

Partners in Oklahoma and Texas expressed some overlapping data needs and some unique needs. We therefore developed some datasets across the entire LCC, and some that were unique to each focus region, including the entire LCC, the LCC within Oklahoma, and a region of the Texas Coastal Bend, each of which will be described below. These datasets have been aggregated and are available at the GCP LCC Conservation Planning Atlas (retrievable at [http://gcplcc.databasin.org/](http://gcplcc.databasin.org/); Table 2; Appendix 2).
Table 2. Primary datasets developed and aggregated at the GCP LCC Conservation Planning Atlas. Other data are also available on the CPA (Appendix 2).

<table>
<thead>
<tr>
<th>Data Layer</th>
<th>Extent</th>
<th>Brief Description</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Texas Ecological Systems map</td>
<td>Texas</td>
<td>current vegetation developed from 30 m resolution satellite data, 10 m image objects from NAIP photos, and modeling with abiotic data</td>
<td>Texas Parks &amp; Wildlife Department and Missouri Resource Assessment Partnership</td>
</tr>
<tr>
<td>Oklahoma Ecological Systems map</td>
<td>Eastern Oklahoma</td>
<td>current vegetation developed from 30 m resolution satellite data, 10 m image objects from NAIP photos, and modeling with abiotic data</td>
<td>Oklahoma Department of Wildlife Conservation and Missouri Resource Assessment Partnership</td>
</tr>
<tr>
<td>Prairie landscape patches by size</td>
<td>GCP LCC</td>
<td>Patches of &gt;=70% grassland cover within a 1 sq km neighborhood; patches smaller than 25 ha were eliminated from this data layer</td>
<td>Missouri Resource Assessment Partnership</td>
</tr>
<tr>
<td>Prairie landscape patches by type</td>
<td>GCP LCC</td>
<td>Patches of &gt;=70% grassland cover within a 1 sq km neighborhood; patches smaller than 25 ha were eliminated from this data layer</td>
<td>Missouri Resource Assessment Partnership</td>
</tr>
<tr>
<td>Prairie landscape patches by road density</td>
<td>GCP LCC</td>
<td>Patches of &gt;=70% grassland cover within a 1 sq km neighborhood; patches smaller than 25 ha were eliminated from this data layer</td>
<td>Missouri Resource Assessment Partnership</td>
</tr>
<tr>
<td>Prairie landscape patches by land condition</td>
<td>GCP LCC</td>
<td>Patches of &gt;=70% grassland cover within a 1 sq km neighborhood; patches smaller than 25 ha were eliminated from this data layer</td>
<td>Missouri Resource Assessment Partnership</td>
</tr>
<tr>
<td>Disturbance land cover types</td>
<td>GCP LCC</td>
<td>Urban, crop, and other woody and herbaceous disturbance land cover types from the Ecological Systems maps</td>
<td>Missouri Resource Assessment Partnership</td>
</tr>
<tr>
<td>Ruderal shrublands and woodlands</td>
<td>Eastern Oklahoma</td>
<td>Woody land cover types on prairie or bottomland soils</td>
<td>Missouri Resource Assessment Partnership</td>
</tr>
<tr>
<td>Evergreen (juniper) cover change</td>
<td>Oklahoma: limited footprint</td>
<td>Increase and decrease in evergreen cover from 1987 to 2015 based on analysis of 30 m resolution satellite imagery</td>
<td>Missouri Resource Assessment Partnership</td>
</tr>
<tr>
<td>County ranks for ruderal types</td>
<td>GCP LCC in Oklahoma</td>
<td>Depiction of %ruderal land cover by county in Oklahoma</td>
<td>Missouri Resource Assessment Partnership</td>
</tr>
<tr>
<td>Data Layer</td>
<td>Extent</td>
<td>Brief Description</td>
<td>Source</td>
</tr>
<tr>
<td>-------------</td>
<td>-------------------------------------------------</td>
<td>------------------------------------------------------------------------------------</td>
<td>---------------------------------------------</td>
</tr>
<tr>
<td>LiDAR data</td>
<td>Texas study areas: Austin/Colorado and Wilson/Karnes Counties</td>
<td>fine-resolution digital elevation model (DEM), digital surface model (DSM), vegetation height (nDSM), and woody cover at different resolutions for the two study areas; estimate of shrub and tree cover for the southern pilot areas</td>
<td>Missouri Resource Assessment Partnership</td>
</tr>
</tbody>
</table>
Two separate state-based efforts (Elliott et al. 2014, Diamond and Elliott 2015) were merged to form a unified current vegetation map of the US portion of the GCP LCC (Figure 1). This process involved cross-walking of the datasets where different names were applied to the same vegetation concepts in the two states, and modification of results where differences at the state line were apparent. This dataset served as the basis for several of the new datasets we created.

![Current Vegetation for GCP LCC: TX & OK Results Combined](image)

**Figure 1.** Current vegetation of the Gulf Coast Prairie LCC based on merging of two state-based mapping efforts.

### Entire LCC

Mapped type names in the merged Texas and Oklahoma dataset were coded for major grassland type to provide an overview of grasslands in the GCP LCC (Figure 2). Ruderal woody vegetation types were also identified and coded for display and further analysis (Figure 3).
Figure 2. Extent of existing grasslands by type for the GCP LCC. "Pasture" indicates a preponderance of highly disturbed and/or non-native grasslands within the mapped type.
Figure 3. Ruderal deciduous woody vegetation (red) is more abundant than ruderal evergreen vegetation (green) in the GCP LCC.
Grassland landscape patches were identified by summarizing percent grassland from the current vegetation dataset within a circular, 1 sq km neighborhood (circle of radius 564.18 sq m). This analysis was limited to the region where tallgrass types were predominant in pre-European settlement times, and therefore excluded grassland of the Edwards Plateau in Texas and Rolling Plains in Texas and Oklahoma. These landscape patches were then characterized by size, type (ecological system used to define LANDFIRE Biophysical Setting\(^1\)), road density, landscape condition (Hak and Comer, NatureServe (NS) in review), and percent of disturbance type vegetation within the patch (Figure 4).

Figure 4. Grassland landscape patches (70% grassland within a 1 sq km circular neighborhood) were identified and attributed with a number of variables such as size and condition.

\(^1\) http://landfire.gov/NationalProductDescriptions20.php
Oklahoma-specific Datasets

MoRAP, in conjunction with the Oklahoma Biological Survey of the University of Oklahoma, produced a vegetation and landcover GIS data layer for Oklahoma (Diamond and Elliott, 2015). This effort was accomplished with direction and funding from the Oklahoma Department of Wildlife Conservation and state and federal partners (particularly the Gulf Coast Prairie and Great Plains Landscape Conservation Cooperatives). The legend for this raster layer is based on NatureServe’s Ecological System Classification\(^2\) (Comer et al. 2003, Comer and Schulz 2007), with finer thematic units derived from land cover and abiotic modifiers of the System unit. Data for development of a supervised classification of landcover was collected in the field by Oklahoma Biological Survey staff and through photo interpretation of aerial imagery by MoRAP staff. This dataset was used with decision tree classifier on 3 dates of Landsat imagery, abiotic data, and additional available data to perform a supervised classification to a simplified set of landcover classes. Improved thematic resolution was achieved using image objects at 10 m resolution based on NAIP imagery. The landcover classes, along with Environmental Protection Agency (EPA) Level IV Ecoregion, SSURGO soils, DEM-based variables, and hydrology variables, were applied to the image objects and were used to interpret ecological context and assign appropriate vegetation type or landcover to the objects. Vector data was then transformed to a 10 m raster product to simplify presentation and use. Project and partner ecologists have produced detailed descriptions of most Ecological Systems that were mapped in this effort. Project ecologists have also developed an Interpretive Booklet that includes a general description of each mapped type, a general range map for each type, and a photograph representing the type (when available). The interpretive booklet also includes detailed product methodology and is available to download at the GCP LCC Conservation Planning Atlas.

We summarized the aerial extent of ruderal woodland and shrubland by county for Oklahoma to help facilitate county-based decisions such as distribution of funds for brush clearing (Figure 5). Additional information such as area of ruderal deciduous shrubland and woodland, non-native and ruderal herbaceous vegetation, and row crops were also summarized by area (data delivered via EXCEL file only).

We compared evergreen land cover from 1987 to 2015 using remote sensing techniques, because the increase in eastern redecedar (*Juniperus virginiana*) is of particular interest to partners (Figure 6). Satellite imagery from the Landsat 5 Thematic Mapper sensor and the Landsat 8 Operational Land Imager were used to investigate changes in overall evergreen vegetation occurring between the 1986-1989 and 2013-2014 time periods. Two path/rows of imagery, from the spring, summer, and fall seasons for each time period, were mosaicked together. The imagery was then subset to remove the presence of clouds from the datasets. Images were further subset using the impervious data from the 2011 version of the National Land Cover Database. Unsupervised classification was used to split each time period image into two classes, evergreen vegetation and everything else. Each subsequent time period was subjected to successive unsupervised

\(^2\) Type descriptions may be found at [http://explorer.natureserve.org/](http://explorer.natureserve.org/)
Classification routines until confused classes were minimized. The resultant classifications were then used to model a raster data layer that included four classes of change information, Change from Evergreen, Change to Evergreen, No Change – Evergreen, and No Change – Not Evergreen. The entirety of each scene may not have been used as the aim was to cover the largest areal extent while minimizing the impact of cloud cover. Therefore, portions of scenes were used to fill in where cloud cover existed in other image dates. Even though this process was used, complete coverage of the 27/35-27/36 image footprints was not possible due the limited number of scenes available within the prescribed time periods.

Figure 5. Density of ruderal evergreen and mixed shrubland and woodland by county. Darker counties have more ruderal woody vegetation cover.
Figure 6. Evergreen land cover change in eastern Oklahoma from circa 1987 to 2014. The green in the SE part of the image represents pine, and other green represents eastern red cedar.

Texas-specific Datasets

We obtained and processed LiDAR to define land surface elevation and vegetation height for two areas in Texas (Figure 7). LiDAR data collection was funded by the Texas Water Development Board. LiDAR LAS files were acquired from Texas Natural Resources Information System (TNRIS). Data were analyzed at different spatial resolution, from 1 m pixels to 30 m pixels. Ground surface elevation (digital elevation model – DEM) was defined as the lowest measured return within the pixel, and surface elevation (tallest objects, digital surface model, DSM) was defined as the highest elevation within the pixel. Object height is the difference between the DEM and DSM values (nDSM, or normalized DSM). A good deal of manual editing was required to remove mistakes in the data. In Wilson & Karnes Counties, the LiDAR dataset was fully classified, and the classification was accurate enough to consistently and reliably filter out buildings, power lines and other man-made structures. Although the Austin & Colorado Counties LiDAR dataset was fully classified, the classification was not accurate enough to consistently and reliably filter out buildings. Thus, the full point cloud was
used to create the DSM. In addition, more than 8 hours of computer time was required to produce the DEM and DSM at 10 m spatial resolution for each area. For smaller areas of interest within both the northern and southern study areas, we produced 5 m and 1 m spatial resolution data. Due to limitations in time and storage space, it was not possible to provide this finer resolution data for the entire study area.

**LiDAR Analysis for Texas**

Vegetation height was calculated as the difference between the DEM and DSM (Figure 8). Buildings and power lines were removed from the data insofar as possible, but some of these remain in the dataset as mistakes. A comparison between 10 m and 1 m pixels showed that 10 m pixels significantly over-estimate the extent of shrub cover (Figure 9). This could be significant in terms of species habitat modeling, or in calculations of the area of shrub clearing desired.

Figure 7. Western and eastern study areas were selected for LiDAR dataset development in southcentral Texas.
Figure 8. Vegetation height for the western and eastern study areas in southcentral Texas.

Figure 9. Vegetation height generated using 10 m pixels over-estimates shrub cover (brown) versus 1 m pixels.
Finally, we estimated shrub canopy cover at 30 m resolution from LiDAR data and compared results with those from LANDFIRE, which were generated from 30 m resolution satellite data (Figure 10, 11). To estimate cover at 30 m resolution from LiDAR, we scored each 1 m pixel as herbaceous (<1 m tall), shrub (1 to 3 m tall) or tree (>3 m tall), and then summed these scores within 30 m pixels and calculated averages for each height. As expected, the results in terms of spatial resolution were much sharper using LiDAR versus satellite imagery (Figures 10, 11). In addition, LiDAR-based estimates showed less area in lower shrub cover and more in intermediate shrub cover versus satellite estimates (Figure 12).

Overall, however, the satellite-based shrub estimates from LANDFIRE seemed reasonable, given the resolution of the original input data, and the fact that these data are accessible nationwide. Additional evaluations of this nature would be valuable to better understand the relative utility of structural data from these two sources in different circumstances throughout the GCP LCC.
2013 Lidar 30 m % Shrub Canopy Cover – Wilson and Karnes counties – GMIT Sub

- Recode pixels from 1 meter <DEM raster > 1 meter and <= 5 meter to equal 1
- Aggregate 1 meter pixels to 30 meters using the sum function to determine the number of 1 meter shrub pixels (based on height) that comprise a 30 meter pixel
- Divide the aggregated pixel sum by 900 (total number of 1 meter pixels within a 30 meter pixel) to determine the percentage of 1 meter pixels within the 30 meter pixel that are considered shrub (based on height)
- 30 meter dataset to be used to compare with LANDFIRE EVC

Figure 10. Shrub canopy generated from 30 m LiDAR data.
% Shrub Canopy – 2011 30 m Landfire EVC
Wilson and Karnes – GMIT Sub

Figure 11. Shrub canopy estimated from 30 m satellite data from LANDFIRE.
Dynamic Decision Support Tools

In the series of workshops and meetings described earlier, the group settled on supporting two types of decision support tools (DSTs):

- Static DSTs that are synthesis data products that can inform specific management questions at the landscape scale and made accessible from the Conservation Planning Atlas. These are typically generated by expert spatial analysts and can be viewed, used in a GIS, but not altered or updated by the end users.

- Dynamic DSTs are software tool/toolkits that can be used interactively to answer one or more management questions at different scales using regional and local data. In this case, the user can update data, incorporate other/local data, change model parameters, and rerun analyses.

The static DSTs for the project are represented by the datasets described above. Subsequent efforts by the GCP LCC could center on providing orientation to these datasets through the Conservation Planning Atlas and gathering additional user perspectives on their utility for...
common planning decisions. The remainder of this section focuses on the dynamic DST pilot project.

**Audience and Pilot DST Organizations**
The intended audience for this DST consists generally of agency and organization staff that make decisions regarding where conservation dollars are spent (e.g., land acquisition and land improvement projects) and what actions should be supported. For this pilot, the organizations that directly participated in testing and evaluating the DST were FWS and TPWD. Individuals from other organizations participated in DST meetings including USGS, TNC, The Noble Foundation, Ducks Unlimited, American Bird Conservancy, Mississippi State, the University of Oklahoma, the Oklahoma Department of Wildlife Conservation, and the Louisiana Department of Wildlife and Fisheries. Participants were involved in:

- Advising/guiding the pilot
- Contributing data and expert knowledge
- Conducting hands on testing of the DST
- Contributing to the pilot evaluation

**Methods**
The pilot was initiated with a presentation of the proposed activity in December 2014 and concluded with a presentation of the results and input from the testers in a web meeting September 3, 2015. In our response to the RFP we identified NatureServe Vista™, a free ArcGIS extension (www.natureserve.org/vista) as appropriate for the project. Because of resource and time limitations it would not be feasible to create a custom software tool (nor would it be desirable if suitable off-the-shelf tools exist). From the scoping derived from the previously described workshops, Vista appeared capable of addressing the identified management questions as described in the following section.

**Management questions to be supported**
Management questions are those questions that need to be answered to support resource management decisions. For a dynamic DST, these tend to be fairly routine questions that can benefit from the automation provided by a software tool. The following management questions were provided by partners in the May and Oct 2014 workshops:

- Targeting where to apply financial assistance from the Environmental Quality Incentives Program (EQIP) and Agricultural Conservation Easement Program (ACEP; including the former GRP) to maximize the resource conservation value (this question is elaborated below)
- Determining what actions are needed/appropriate for a location
- Determining how much funding is needed for a specific area/project
- Identifying what would be the effects of practices on habitats and species such as birds
- Identifying landowners for outreach for participation in conservation programs
**Focal management questions**

From the candidate questions above, focal questions were selected for the dynamic DST pilot:

- Targeting where to direct conservation action is the primary management question. Many considerations were raised by partners, and to the degree supported by data and existing DST functions, we sought to accommodate these. These include:
  - Which areas will provide the most benefit if conserved ("bang for the buck")?
    - Based on:
      - Amount of habitat in an area
      - Condition of the habitat (possibly applying a condition threshold below which it would need restoration). Condition may be a measured, mapped attribute of the input maps or modeled based on the presence of stressors that can degrade condition.
      - Proximity of the area to existing conservation projects and reserves (with options of whether the area must be adjacent to, within a certain distance of, or ranked on a gradient according to distance to conservation project or reserve)
  - Possible other variables that were raised but not accommodated for lack of data that could be provided by the partners (the data can be added at any time to the DST):
    - Presence of wildlife populations (would require partners to determine what species, if different species have different value, if population size/condition are necessary to the decision)
    - Where is funding available (could be an attribute of parcels or other data source from funding programs)
    - Landowner willingness (attribute of parcels that partners could manually enter)
    - Landowner resources to match (attribute of parcels that partners could manually enter)
    - Cost of conservation or other economic inputs (e.g., from development growth models, energy growth models, and county tax data)

In further discussions with partners, it became evident that most conservation decisions focus on farm bill (EQIP) incentives for individual landowners. Also, decisions about funding tend to be “reactive” meaning that agencies are responding to landowner applications. Partners suggested that a DST that could provide more information about parcels and their context would be helpful. Another desire was generally expressed to provide DST functions to support more “proactive” conservation by identifying parcels that could provide more strategic conservation benefits.
Therefore, these two types of decisions, reactive and proactive, became the focus for the pilot DST.

**Decision Workflow**
Decision workflow describes the human process for making the decision. Additional information/documentation is required to fully understand the workflow, but generally:

**For reactive use**
When a landowner submits an application or indicates interest in conservation actions, the property is selected, the action is proposed, and a report is generated of the benefits. Additionally, or alternatively, the property can be visually inspected within the DST relative to the generated importance weight/rank, context, etc. to support a decision. While both workflows are supported by the DST, for pilot purposes only the latter was used.

**For proactive use**
The user would periodically (e.g., when funds come available) run an assessment to identify/rank properties that provide the desired values subject to other variables. This would facilitate targeting landowners for outreach whether for conservation programs or acquisition. The most efficient and effective approach would identify conservation targets and set quantitative goals for a region/landscape where each action would maximize goal achievement. In lieu of a systematic conservation approach, the DST could identify relative conservation value of parcels to support good, if not optimal, choices. Similar to the reactive workflow, the DST supports both of these functions but only the latter, more manual exploratory approach was used.

**Information workflow**
This workflow uses a box and arrow diagram to illustrate the flow from source data through analysis to decision products Figure 13). It also specifies tools/tool functions used to conduct analyses. The diagram below is a simple, high level workflow to illustrate the basic components. A more detailed workflow is provided in Appendix 3.
Figure 13. Information workflow indicating inputs, analytical processes, outputs, and supported decisions. Numerous other sub-decisions can be informed by this workflow.

**DST Development**

The DST had to rely on existing tools because of time and cost constraints. However, the use of existing tools is highly recommended regardless to reduce the costs of development and especially for long-term maintenance. Following, we diagram the tool components of the DST (Figure 14). For this pilot test, evaluators did not make use of their own local data but that is a capability of the DST. Also, results were not uploaded to the CPA because they were of a pilot nature and not suited to decision use at this time.
Pilot implementation activities

Conducting the pilot consisted of the following activities and steps:

1) Initial invitations to participate in the DST technical teams were sent by the LCC in October 2014. The following people were identified to participate:
   - Bill Vermillion - GCJV
   - Steve DeMaso - GCJV
   - Kirk Feuerbacher - TNC
   - Sonja Najera - TNC
   - Tim Anderson - FWS
   - Jon Hayes - TPWD
   - Pat Merkord - NPAT
   - Jaime Gonzales - KPC
   - Kyle Brazil - WHF
   - Robert Perez - TPWD

2) A project kickoff web meeting was held in January 2015. The following items were addressed at this 2-3 hour meeting:
   a) Overview of the dynamic DST concept and confirm the management decisions to be supported.
   b) Demonstration of the NatureServe Vista DST to provide an understanding of capabilities and user experience.
c) Discussion of whether there should be two separate projects or one regional project and the specific project boundaries (e.g., buffering). The partners had previously agreed on piloting in two pairs of counties in coastal Texas and we concluded that these could be combined in a single regional project.

![Diagram of project boundaries and areas](image)

Figure 15. Dynamic DST pilot project location and area. Pink outline in inset is within the GCP LCC boundary. Blue outline is pilot project boundary. Large map shows the focal counties in dark blue, the included intervening counties in light gray, and a 19km buffer region in light blue.

d) Clarification of roles and commitments, establishment of a group communication structure.

e) Finalizing habitats and species to be included and roles in providing data and expert knowledge. Initial input from this meeting was discussed with the ecologists from
MoRAP and NatureServe relative to suitable data and four conservation elements were selected for the pilot:

i) Blackland & Coastal Prairie comprised of Gulf Coast coastal prairie and Blackland prairie ecological systems.

ii) Post oak savanna comprised of savanna grassland, sandyland grassland, and sandy mesquite savanna grassland ecological systems.

iii) Potential bobwhite quail habitat comprised of the above vegetation types but with areas of >50% tree cover removed.

iv) A set of remnant grassland patches from Austin County to illustrate use of that data.

f) Determination of who will participate in hands on application and evaluation of the DST. Final roles in testing were not established until mid-summer 2015.

3) Database construction was conducted from February through June 2015. The following tasks were conducted during this activity:

a) Developed a data inventory and review form and posted it on the project collaboration site (CPA).

b) Requested DST team members to upload or otherwise provide relevant available data and update the data inventory form.

c) Integrated the data into the Vista DST.

4) Expert knowledge development. Vista requires information on each conservation element that describes its conservation/viability requirements (e.g., minimum occurrence/patch size) and parameters that describe how it responds in the presence/proximity of stressors and conservation practices. We asked team members to self-select for providing this information. One member (Jon Hayes) joined the ecologists from MoRAP and NatureServe to populate the inputs. Often this information has not been well documented in the scientific literature and requires judgment calls by users with local knowledge of the targeted resources and values, and a willingness to articulate those judgments in a DST environment. The inputs are recorded and documented in an Excel spreadsheet which is part of the DST delivery to the GCP LCC.

5) Conduct initial test application (June 2015). Once all data and expert knowledge was input, this activity operated the DST (by NatureServe) to generate the initial outputs. Technical team staff reviewed the results with Jon Hayes and some refinements to model parameters were made. This work completed the pilot DST that was provided to the test partners. We emphasize, however, that this is a pilot project and these settings and outputs are not intended for actual decision making but all settings and data can be readily updated.

6) Final application and evaluation by partners was conducted June-August 2015. An evaluation of the utility and usability of the DST is important to understand whether:

1. The DST should be propagated to partners as is (meaning the software tool provides the capability but appropriate data and models for specific areas should be developed)

2. The DST shows promise but needs additional development

3. The DST isn’t useful and should not be propagated or further developed at this time.
This activity consisted of the following:

a) A full group (all participants in the larger Grassland DST project) webinar was conducted. General updates to the full project were given and specific to the Dynamic DST, a PowerPoint overview was presented followed by a live demonstration. At that point further solicitation of testers was made.

b) We developed a set of evaluation questions for testers as follows:
   1. Was the DST easy to install on your agency’s system/your computer? (very easy, somewhat easy, somewhat difficult, could not be installed)
      a. If not please note difficulties and if they were resolved:
   2. Was the initial orientation web meetings sufficient for you to use the system? (completely, partially, not at all)
      a. If not, did you receive follow up support and was that sufficient?
   3. Is the system capable of providing useful functions and information for the “reactive” decision making (examining a proposed action on an applicant’s parcel for whether it is a good use of conservation funds/effort) (definitely, potentially, partially, not at all; please focus on the software functionality and then describe shortfalls because of data limitations under item “a” below)
      a. If your answer is “somewhat,” “potentially,” or “partially,” please describe what would be needed to answer “definitely”
      b. If your answer is “not at all” please describe why not
   4. Is the system capable of providing useful functions and information for the “proactive” decision making (examining a broad area within the project boundary to proactively identify parcels/areas that would provide potentially high conservation benefits) (definitely, potentially, partially, not at all; please focus on the software functionality and then describe shortfalls because of data limitations under item “a” below)
      a. If your answer is “somewhat,” “potentially,” or “partially,” please describe what would be needed to answer “definitely”
      b. If your answer is “not at all” please describe why not
   5. What is your concluding recommendation about the DST:
      a. The DST should be propagated to partners now
      b. The DST shows promise but needs additional development in the following areas (please describe, can include software functionality and data development for example):
      c. The DST isn’t useful and should not be propagated or further developed at this time (please describe reasons for this finding):
   6. If you answered “a” or “b” above, please describe further who you think should use the DST (which agencies, what kind or positions in the agencies):
7. If you answered “a” or “b” above, please describe further what specific applications the DST should be used for (can name specific program decisions or describe general type of applications):

c) The testing group was finalized and instructions for installing the Vista software and GCP Vista ArcMap project were provided. Following installation, a deeper orientation web meeting was conducted to provide a light-level of training with offer to provide one-on-one interactive web support to the testers. A few such web sessions were conducted with two members and additional email and phone support was provided. All of the training and support was intended for very high level use of limited tool functions to conduct the evaluation and did not represent typical complete training and support for Vista.

7) Final evaluation was conducted in a full group web meeting September 3, 2015. In this web meeting, NatureServe provided a summary overview of the Dynamic DST pilot objectives and process, an introduction to the Vista DST and the pilot project data contents, and a live demonstration of the DST. Two of the testers in attendance were then invited to provide their evaluation results and further evaluations were provided via the evaluation forms provided to each tester and found in Appendix 4.

Results
As described above, the dynamic DST was developed by NatureServe, largely using existing regional and national datasets because other local data did not exist or was not made available. The completed pilot DST (with analyses pre-run) was provided to the evaluation partners and an orientation was provided along with individual support if requested. At the conclusion of the project, the DST was provided for download to any of the LCC partners along with contact information for obtaining NatureServe support (for a fee) if a partner desired to go further with DST implementation. Three individuals self-selected to conduct hands-on testing of the tool and provided evaluations. Here we summarize the results of the evaluations by evaluation question; actual evaluation forms are provided in Appendix 4. We follow the summary with some interpretation and clarification.

Was the DST easy to install on your agency’s system/your computer?
Responses mostly indicated it was somewhat easy to install. Minor issues were encountered related to data sources, but they did not create a roadblock to use or were easily cleared up. The tool could be packaged more carefully to avoid most of these minor issues and training would cover the rest. One evaluator indicated it was somewhat difficult to install and would benefit to a “read me” or other instructions that guide a user through the process and help them verify that all components installed correctly.

Was the initial orientation web meetings sufficient for you to use the system?
Evaluators found the web meetings to be useful and thorough, but felt that until they got in and started to play with the tool, true understanding of what it was doing was difficult. Related to that, better description of the results layers and how to interpret them would have been beneficial.
Is the system capable of providing useful functions and information for the “reactive” decision making (examining a proposed action on an applicant’s parcel for whether it is a good use of conservation funds/effort)?
Most evaluators saw “definite” use for the tool in reactive decision making. One evaluator saw “potential,” limited only by the fact that they felt users would “need a fairly detailed understanding of system underpinnings” first.

Is the system capable of providing useful functions and information for the “proactive” decision making (examining a broad area within the project boundary to proactively identify parcels/areas that would provide potentially high conservation benefits)?
Responses were mostly identical to those for the “reactive” use above. One evaluator indicated better vegetation cover data would be needed to identify grassland distributions.

What is your concluding recommendation about the DST
While one evaluator felt the tool should be propagated to partners now, most evaluators felt that additional development was needed, particularly in the area of data development, especially vegetation cover data. Without this data they felt it would be difficult to “comfortably make decisions based on the outcomes of the tool.” A thorough review of the inputs used to determine grassland condition would also be useful as many potential users would expect both grassland distribution and condition models to be accurate, whether that is realistic or not.

Please describe further who you think should use the DST (which agencies, what kind or positions in the agencies):
It would be useful to biologists and planners in land management, realty, and conservation agencies. In order for the tool to be adopted it would be important for it to be presented in the right context and with an applied example rather than just a conceptual demonstration.

Please describe further what specific applications the DST should be used for (can name specific program decisions or describe general type of applications):
In general the tool could be useful in evaluating any spatially definable habitat or as a preliminary step in identifying important areas for conservation actions, to be validated with on-the-ground observations. One evaluator plans to “use it for GRIP project evaluation and potentially using the landscape planning features in the future to optimize program delivery.”

Recommendations for Future Work
Here we summarize recommendations from the evaluators (per above, individual recommendations can be reviewed in the evaluation forms in Appendix 4). We also provide some interpretation and our own recommendations.

A recurring recommendation on this project was to address data deficiencies, particularly in the distributions of high-quality grasslands. This project addressed a number of important decisions identified in the project scoping, most with practically applicable data that could be efficiently
developed and maintained, and documented a number of options for targeted investment in new data to facilitate identification of areas suitable for investment in grassland conservation. However, available spatial data and remote sensing methods do not tend to enable rapid identification of high-quality grasslands in the context of the GCP LCC. This is simply due to the long land use history of this region, the effect of past and current land management on grassland quality, and the practical limitations of remote sensing. Many user demands for higher quality data identified in this effort can only be addressed by systematic field inventory and documentation by grassland experts. Nonetheless, both the “static” and “dynamic” DST components identified numerous opportunities to focus conservation actions with available data, and to prioritize areas where systematic field surveys could be most productive.

The ability to readily refresh the tool with improved data and analyses is a design feature of NatureServe Vista as it provides easy capabilities to swap out data and prompts users to refresh analyses in these cases. Incorporation of applicable reference data would be very helpful, including parcel/landowner level data, areas of current conservation work, level of existing conservation work, etc. Incorporation of these data would more directly support the focal management questions.

Additional evaluation of all input data would be recommended in order to adjust the models and improve upon results. This can happen first through expert review where results are examined in areas that are well known, and/or through field evaluation, and adjustments are made to model parameters to bring the results in line with the experts’ knowledge. Concerns about input data and model output precision are quite often a scale issue where the smaller extent you examine, the higher expectations for precision you tend to have. This isn’t limited to this pilot or tool but is a general issue with all GIS outputs based on remote sensing products and analytical models—there are limits to their ability to precisely replicate the real world. It may be that the DST applicability is more suited to larger extent/coarser scale landscape assessment and planning than individual site decision making; but again, it depends on the type of decision in need of support.

The level of training and support provided on this pilot project was intentionally low to accommodate testers’ available time and help determine whether minimal support was adequate for the types of intended applications. Recommendations identified several areas where added training/documentation would be highly beneficial to understanding, efficient application, and appropriate use. First, a cheat sheet, project guide, or quick reference would be very helpful. This could describe basic components of the tool, their function, and the appropriate way in which to use them or interpret them, specific to the particular Vista project content and purpose. It might also identify components that a user can see, but which can largely be ignored for specific uses. For users with limited GIS knowledge some additional training in the basics of navigating through the project are necessary. Overall, if this tool was intended to be used “out-of-the-box” it would need to be packaged and documented accordingly.
Discussion
The first task for the Grassland Decision Support Tool project was to scope the project and identify specific priority needs to be addressed. Subsequent tasks outlined development of products that could be modified based on the scoping. Task 2 outlined identification of grassland types and their distribution, and identification of the location of on-going partner activities. Task 3 outlined spatial analyses designed to facilitate decision making, and Task 4 involved demonstration of a Dynamic Decisions Support Tool and associated software. All of these tasks were successfully completed, and more than 30 new datasets were developed, presented, and added to the Gulf Coast Prairie Conservation Planning Atlas, and the Dynamic DST was demonstrated and tested by partners.

The face to face scoping meetings with partners resulted in good feedback, and these meetings were more productive and informative in general than phone conferencing. We found a wide diversity of partner interests, and areas of concern ranged from region-wide to state-wide, to local groups of counties, to regions within a few kilometers of ownership boundaries (e.g., wildlife management areas of federal wildlife refuges). We approached these meetings from an “early discovery” point of view. Given time and resource constraints of the project, the needs of a limited number of partners could be addressed.

The Dynamic DST component of the project was challenging due to the pilot nature where partner participants were only lightly invested in it and had little time to deeply engage, provide local data, and input expert knowledge. That said, the pilot evaluation indicated that the testers felt the Vista tool had applicability to the management questions and is either ready for immediate application (with appropriate data and model refinement) or with additional work, primarily on obtaining appropriate data and developing appropriate guidance and training.
References

Hak, J.C. and P. J. Comer. in review. Modeling Landscape Condition for Biodiversity Assessment – Application in Temperate North America. Ecological Indicators
Appendix 1. Project Scoping Workshop Locations and Attendees

Edmond, OK May 7, 2014

Paige Schmidt       USFWS-NWRS-I&M       paige_schmidt@fws.gov
Justin Roach        USFWS Tishomingo NWR  justin_roach@fws.gov
Ralph Godfrey       USFWS                ralph_godfrey@fws.gov
Jay Pruett          TNC                  jpruett@tnc.org
Ken Gee             OPJV                 Kennethgee@gmail.com
Todd Fagin          Oklahoma Biological Survey  tfagin@ou.edu
Jim Giocomo         OPJV                 jgiocomo@abcbirds.org
Bill Bartush        GCP LCC              bill_bartush@fws.gov
Mark Howery         ODWC                 mhowery@zoo.odwc-state.ok.us
Brandon Reavis      USDA-NRCS            brandon.reavis@ok.usda.gov
Jeff Pennington     ODWC                 keystonewma@yahoo.com
Emma Kuster         SC CSC               emmakuster@ou.edu
David Diamond       MoRAP, Univ Mo       ddi@missouri.edu
Allan Janus         ODWC                 allanjanus@hotmail.com

Austin TX May 8, 2014

Kevin Connally      USFWS               kevin_connally@fws.gov
Charlotte Reemts    TNC                  creemts@tnc.org
Jim Mueller         FWS                  jim_mueller@fws.gov
Scott Rowin         FWS                  scott_rowin@fws.gov
Wendy Connally      Travis Co.          Wendy.connally@co.travis.tx.us
Cynthia Edwards     GCP LCC              c.kallio.edwards@gmail.com
Todd Snelgrove      TAMU-IRNR            tsnelgrove@tamu.edu
Matt Wagner         TPWD                 matt.wagner@tpwd.texas.gov
<table>
<thead>
<tr>
<th>Name</th>
<th>Organization</th>
<th>Email</th>
</tr>
</thead>
<tbody>
<tr>
<td>Terry A. Rossignol</td>
<td>FWS</td>
<td><a href="mailto:terry_rossignol@fws.gov">terry_rossignol@fws.gov</a></td>
</tr>
<tr>
<td>Debroah Holle</td>
<td>FWS</td>
<td><a href="mailto:deborah_holle@fws.gov">deborah_holle@fws.gov</a></td>
</tr>
<tr>
<td>Thomas P Adams</td>
<td>FWS</td>
<td><a href="mailto:thomas_p_adams@fws.gov">thomas_p_adams@fws.gov</a></td>
</tr>
<tr>
<td>Jon Hayes</td>
<td>TPWD/OPJV</td>
<td><a href="mailto:jon.hayes@tpwd.texas.gov">jon.hayes@tpwd.texas.gov</a></td>
</tr>
<tr>
<td>Jeff Raasch</td>
<td>TPWD</td>
<td><a href="mailto:jeff.raasch@tpwd.texas.gov">jeff.raasch@tpwd.texas.gov</a></td>
</tr>
<tr>
<td>Jim Giocomo</td>
<td>OPJV</td>
<td><a href="mailto:jgiocomo@abcbirds.org">jgiocomo@abcbirds.org</a></td>
</tr>
<tr>
<td>Jason Singhurst</td>
<td>TPWD</td>
<td><a href="mailto:jason.singhurst@tpwd.texas.gov">jason.singhurst@tpwd.texas.gov</a></td>
</tr>
<tr>
<td>David Forrester</td>
<td>TPWD</td>
<td><a href="mailto:david.forrester@tpwd.texas.gov">david.forrester@tpwd.texas.gov</a></td>
</tr>
<tr>
<td>Bobby Eichler</td>
<td>TPWD</td>
<td><a href="mailto:bobby.eichler@tpwd.texas.gov">bobby.eichler@tpwd.texas.gov</a></td>
</tr>
<tr>
<td>Robert Perez</td>
<td>TPWD</td>
<td><a href="mailto:robert.perez@tpwd.texas.gov">robert.perez@tpwd.texas.gov</a></td>
</tr>
<tr>
<td>Amie Treuer-Kuehn</td>
<td>TPWD</td>
<td><a href="mailto:amie.treuer-kuehn@tpwd.texas.gov">amie.treuer-kuehn@tpwd.texas.gov</a></td>
</tr>
<tr>
<td>Duane German</td>
<td>TPWD</td>
<td><a href="mailto:duane.german@tpwd.texas.gov">duane.german@tpwd.texas.gov</a></td>
</tr>
<tr>
<td>Russell Castro</td>
<td>NRCs</td>
<td><a href="mailto:russell.castro@tx.usda.gov">russell.castro@tx.usda.gov</a></td>
</tr>
<tr>
<td>Lee Elliot</td>
<td>MoRAP</td>
<td><a href="mailto:elliottle@missouri.edu">elliottle@missouri.edu</a></td>
</tr>
<tr>
<td>James Broska</td>
<td>FWS</td>
<td><a href="mailto:james_broska@fws.gov">james_broska@fws.gov</a></td>
</tr>
<tr>
<td>Jesus Franco</td>
<td>ABC/RGJV (phone)</td>
<td><a href="mailto:jfranco@abcbirds.org">jfranco@abcbirds.org</a></td>
</tr>
<tr>
<td>Don Wilhelm</td>
<td>FWS (phone)</td>
<td><a href="mailto:don_wilhelm@fws.gov">don_wilhelm@fws.gov</a></td>
</tr>
<tr>
<td>Woody Woodrow</td>
<td>FWS (phone)</td>
<td><a href="mailto:woody_woodrow@fws.gov">woody_woodrow@fws.gov</a></td>
</tr>
</tbody>
</table>

Kingsville, TX May 13, 2014

<table>
<thead>
<tr>
<th>Name</th>
<th>Email</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tyler Campbell</td>
<td><a href="mailto:tcampbell@eastfoundation.net">tcampbell@eastfoundation.net</a></td>
</tr>
<tr>
<td>Lenny Brennan</td>
<td><a href="mailto:lennybrennan713@gmail.com">lennybrennan713@gmail.com</a></td>
</tr>
<tr>
<td>Trent Teinert</td>
<td><a href="mailto:trent.teinert@tpwd.texas.gov">trent.teinert@tpwd.texas.gov</a></td>
</tr>
<tr>
<td>Brent Ortego</td>
<td><a href="mailto:brent.ortego@tpwd.texas.gov">brent.ortego@tpwd.texas.gov</a></td>
</tr>
<tr>
<td>Daniel Kunz</td>
<td><a href="mailto:daniel.kunz@tpwd.texas.gov">daniel.kunz@tpwd.texas.gov</a></td>
</tr>
<tr>
<td>Randy Fugate</td>
<td><a href="mailto:randy.fugate@tpwd.texas.gov">randy.fugate@tpwd.texas.gov</a></td>
</tr>
<tr>
<td>Bart Ballard</td>
<td><a href="mailto:bart.ballard@tamuk.edu">bart.ballard@tamuk.edu</a></td>
</tr>
<tr>
<td>Diana Iriarte</td>
<td><a href="mailto:diana_riarte@fws.gov">diana_riarte@fws.gov</a></td>
</tr>
</tbody>
</table>
Lafayette, LA May 15, 2014

Jesus Franco
Sonia Najera
Mary Gustafson
James Cronin (on phone)

Jfranco@abcbirds.org
snajera@tnc.org
mgustafson@abcbirds.org
jcronin@usgs.gov

Jim Stefanov        NWRC       jestefan@usgs.gov
Chris Reid          LDWF       creid@wlf.la.gov
Larry Allain        NWRC       allainl@usgs.gov
Bill Vermillion     GCJV       william_vermillion@usgs.gov
Mark Parr           GCJV       mark_parr@fws.gov
Mike Brasher        GCJV       mbrasher@ducks.org
John Tirpak         GCPOLCC/FWS john_tirpak@fws.gov
Kristine Evans      GCPOLCC/MSU kristine@gri.msstate.edu
Steve DeMaso        GCJV       steve_demaso@fws.gov
Barry Wilson        GCJV       barry_wilson@fws.gov
### Appendix 2. Data layers available on the GCP LCC Conservation Planning Atlas

<table>
<thead>
<tr>
<th>Map Inputs</th>
<th>Data Layer</th>
<th>Extent</th>
<th>Brief Description</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disturbance Types for the Gulf Coast Prairie LCC</td>
<td>Disturbance Types for the Gulf Coast Prairie LCC</td>
<td>GCP LCC</td>
<td>Urban, crop, and other woody and herbaceous disturbance land cover types from the Ecological Systems maps</td>
<td>Missouri Resource Assessment Partnership</td>
</tr>
<tr>
<td>County Summaries of Ruderal Shrubland and Woodland</td>
<td>Ruderal Mixed and Juniper Shrubland and Woodland</td>
<td>GCP LCC in Oklahoma</td>
<td>Depiction of %ruderal land cover by county in Eastern Oklahoma</td>
<td>Missouri Resource Assessment Partnership</td>
</tr>
<tr>
<td>County Summaries of Ruderal Shrubland and Woodland</td>
<td>Ruderal Deciduous Shrubland and Woodland</td>
<td>GCP LCC in Oklahoma</td>
<td>Depiction of %ruderal land cover by county in Eastern Oklahoma</td>
<td>Missouri Resource Assessment Partnership</td>
</tr>
<tr>
<td>County Summaries of Ruderal Shrubland and Woodland</td>
<td>Riparian/Foodplain Deciduous Shrubland</td>
<td>GCP LCC in Oklahoma</td>
<td>Depiction of %ruderal land cover by county in Eastern Oklahoma</td>
<td>Missouri Resource Assessment Partnership</td>
</tr>
<tr>
<td>County Summaries of Ruderal Shrubland and Woodland</td>
<td>Shrubland and Woodland with Juniper - Not Clearly Ruderal</td>
<td>GCP LCC in Oklahoma</td>
<td>Depiction of %ruderal land cover by county in Eastern Oklahoma</td>
<td>Missouri Resource Assessment Partnership</td>
</tr>
<tr>
<td>Evergreen Change</td>
<td>Evergreen Change</td>
<td>Oklahoma: limited footprint</td>
<td>Increase and decrease in evergreen (juniper) cover from 1987 to 2015 based on analysis of 30 m resolution satellite imagery</td>
<td>Missouri Resource Assessment Partnership</td>
</tr>
<tr>
<td>Oklahoma Ruderal Types</td>
<td>Oklahoma Ruderal Types</td>
<td>Eastern Oklahoma</td>
<td>Woody land cover types on prairie or bottomland soils</td>
<td>Missouri Resource Assessment Partnership</td>
</tr>
<tr>
<td>Prairie Landscapes Ranks</td>
<td>Prairie Landscapes Historic Types</td>
<td>GCP LCC</td>
<td>Patches of &gt;=70% grassland cover within a 1 sq km neighborhood; patches smaller than 25 ha were eliminated from this data layer</td>
<td>Missouri Resource Assessment Partnership</td>
</tr>
<tr>
<td>Prairie Landscapes Ranks</td>
<td>Prairie Landscape Rank by NS land condition</td>
<td>GCP LCC</td>
<td>Patches of &gt;=70% grassland cover within a 1 sq km neighborhood; patches smaller than 25 ha were eliminated from this data layer</td>
<td>Missouri Resource Assessment Partnership</td>
</tr>
<tr>
<td>Prairie Landscapes Ranks</td>
<td>Prairie Landscapes Rank by road density</td>
<td>GCP LCC</td>
<td>Patches of &gt;=70% grassland cover within a 1 sq km neighborhood; patches smaller than 25 ha were eliminated from this data layer</td>
<td>Missouri Resource Assessment Partnership</td>
</tr>
<tr>
<td>Prairie Landscapes Ranks</td>
<td>Prairie Landscapes Rank by size</td>
<td>GCP LCC</td>
<td>Patches of &gt;=70% grassland cover within a 1 sq km neighborhood; patches smaller than 25 ha were eliminated from this data layer</td>
<td>Missouri Resource Assessment Partnership</td>
</tr>
<tr>
<td>Map Inputs</td>
<td>Data Layer</td>
<td>Extent</td>
<td>Brief Description</td>
<td>Source</td>
</tr>
<tr>
<td>---------------------------------------------------------------------------</td>
<td>------------------------------------------------</td>
<td>------------------------------------------------------------</td>
<td>-----------------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------</td>
</tr>
<tr>
<td>Landfire EVC for the GCP LCC</td>
<td>Landfire EVC for the GCP LCC</td>
<td>GCP LCC</td>
<td>Landfire Existing Vegetation Cover data (us_130evc) clipped to the Gulf Coast Prairie LCC</td>
<td>Wildland Fire Science, Earth Resources Observation and Science Center, U.S. Geological Survey</td>
</tr>
<tr>
<td>Austin &amp; Colorado Counties in Texas - Digital Elevation Models (DEM) and Digital Surface Models (DSM)</td>
<td>Austin Colorado TX 2011 10m dem</td>
<td>Texas study area: Austin/Colorado Counties</td>
<td>Fine-resolution digital elevation model (DEM) from LiDAR</td>
<td>Missouri Resource Assessment Partnership</td>
</tr>
<tr>
<td>Austin &amp; Colorado Counties in Texas - Digital Elevation Models (DEM) and Digital Surface Models (DSM)</td>
<td>Austin Colorado TX 2011 10m dsm</td>
<td>Texas study area: Austin/Colorado Counties</td>
<td>Fine-resolution digital surface model (DSM) from LiDAR</td>
<td>Missouri Resource Assessment Partnership</td>
</tr>
<tr>
<td>Austin &amp; Colorado Counties in Texas - Digital Elevation Models (DEM) and Digital Surface Models (DSM)</td>
<td>Austin Colorado TX 2011 10m ndsm</td>
<td>Texas study area: Austin/Colorado Counties</td>
<td>Fine-resolution digital vegetation height (nDSM) from LiDAR</td>
<td>Missouri Resource Assessment Partnership</td>
</tr>
<tr>
<td>Austin &amp; Colorado Counties in Texas - Digital Elevation Models (DEM) and Digital Surface Models (DSM)</td>
<td>Austin Colorado TX 2011 5m dem sub</td>
<td>Texas study area: Austin/Colorado Counties</td>
<td>Fine-resolution digital elevation model (DEM) from LiDAR</td>
<td>Missouri Resource Assessment Partnership</td>
</tr>
<tr>
<td>Austin &amp; Colorado Counties in Texas - Digital Elevation Models (DEM) and Digital Surface Models (DSM)</td>
<td>Austin Colorado TX 2011 5m dsm sub</td>
<td>Texas study area: Austin/Colorado Counties</td>
<td>Fine-resolution digital surface model (DSM) from LiDAR</td>
<td>Missouri Resource Assessment Partnership</td>
</tr>
<tr>
<td>Austin &amp; Colorado Counties in Texas - Digital Elevation Models (DEM) and Digital Surface Models (DSM)</td>
<td>Austin Colorado TX 2011 5m ndsm sub</td>
<td>Texas study area: Austin/Colorado Counties</td>
<td>Fine-resolution digital vegetation height (nDSM) from LiDAR</td>
<td>Missouri Resource Assessment Partnership</td>
</tr>
<tr>
<td>Wilson &amp; Karnes Counties in Texas - Digital Elevation Models (DEM) and Digital Surface Models (DSM)</td>
<td>Wilson Karnes TX 2013 10m dem</td>
<td>Texas study area: Wilson/Karnes Counties</td>
<td>Fine-resolution digital elevation model (DEM) from LiDAR</td>
<td>Missouri Resource Assessment Partnership</td>
</tr>
<tr>
<td>Wilson &amp; Karnes Counties in Texas - Digital Elevation Models (DEM) and Digital Surface Models (DSM)</td>
<td>Wilson Karnes TX 2013 10m dsm veg</td>
<td>Texas study area: Wilson/Karnes Counties</td>
<td>Fine-resolution digital surface model (DSM) from LiDAR</td>
<td>Missouri Resource Assessment Partnership</td>
</tr>
<tr>
<td>Wilson &amp; Karnes Counties in Texas - Digital Elevation Models (DEM) and Digital Surface Models (DSM)</td>
<td>Wilson Karnes TX 2013 10m ndsm veg</td>
<td>Texas study area: Wilson/Karnes Counties</td>
<td>Fine-resolution digital vegetation height (nDSM) from LiDAR</td>
<td>Missouri Resource Assessment Partnership</td>
</tr>
<tr>
<td>Wilson &amp; Karnes Counties in Texas - Digital Elevation Models (DEM) and Digital Surface Models (DSM)</td>
<td>Wilson Karnes TX 2013 30m forest canopy cover sub</td>
<td>Texas study area: Wilson/Karnes Counties</td>
<td>Estimate of tree cover created from a 1 meter nDSM</td>
<td>Missouri Resource Assessment Partnership</td>
</tr>
<tr>
<td>Map Inputs</td>
<td>Data Layer</td>
<td>Extent</td>
<td>Brief Description</td>
<td>Source</td>
</tr>
<tr>
<td>------------</td>
<td>------------</td>
<td>--------</td>
<td>------------------</td>
<td>--------</td>
</tr>
<tr>
<td>Wilson &amp; Karnes Counties in Texas - Digital Elevation Models (DEM) and Digital Surface Models (DSM)</td>
<td>Wilson Karnes TX 2013 30m herbaceous canopy cover sub</td>
<td>Texas study area: Wilson/Karnes Counties</td>
<td>Estimate of herbaceous cover created from a 1 meter nDSM</td>
<td>Missouri Resource Assessment Partnership</td>
</tr>
<tr>
<td>Wilson &amp; Karnes Counties in Texas - Digital Elevation Models (DEM) and Digital Surface Models (DSM)</td>
<td>Wilson Karnes TX 2013 30m shrub canopy cover sub</td>
<td>Texas study area: Wilson/Karnes Counties</td>
<td>Estimate of shrub cover created from a 1 meter nDSM</td>
<td>Missouri Resource Assessment Partnership</td>
</tr>
<tr>
<td>Wilson &amp; Karnes Counties in Texas - Digital Elevation Models (DEM) and Digital Surface Models (DSM)</td>
<td>Wilson Karnes TX 2013 5m dem sub</td>
<td>Texas study area: Wilson/Karnes Counties</td>
<td>Fine-resolution digital elevation model (DEM) from LiDAR</td>
<td>Missouri Resource Assessment Partnership</td>
</tr>
<tr>
<td>Wilson &amp; Karnes Counties in Texas - Digital Elevation Models (DEM) and Digital Surface Models (DSM)</td>
<td>Wilson Karnes TX 2013 5m dsm veg sub</td>
<td>Texas study area: Wilson/Karnes Counties</td>
<td>Fine-resolution digital surface model (DSM) from LiDAR</td>
<td>Missouri Resource Assessment Partnership</td>
</tr>
<tr>
<td>Wilson &amp; Karnes Counties in Texas - Digital Elevation Models (DEM) and Digital Surface Models (DSM)</td>
<td>Wilson Karnes TX 2013 5m forest canopy cover sub</td>
<td>Texas study area: Wilson/Karnes Counties</td>
<td>Estimate of tree cover created from a 1 meter nDSM</td>
<td>Missouri Resource Assessment Partnership</td>
</tr>
<tr>
<td>Wilson &amp; Karnes Counties in Texas - Digital Elevation Models (DEM) and Digital Surface Models (DSM)</td>
<td>Wilson Karnes TX 2013 5m herbaceous canopy cover sub</td>
<td>Texas study area: Wilson/Karnes Counties</td>
<td>Estimate of herbaceous cover created from a 1 meter nDSM</td>
<td>Missouri Resource Assessment Partnership</td>
</tr>
<tr>
<td>Wilson &amp; Karnes Counties in Texas - Digital Elevation Models (DEM) and Digital Surface Models (DSM)</td>
<td>Wilson Karnes TX 2013 5m ndsm veg sub</td>
<td>Texas study area: Wilson/Karnes Counties</td>
<td>Fine-resolution digital vegetation height (nDSM) from LiDAR</td>
<td>Missouri Resource Assessment Partnership</td>
</tr>
<tr>
<td>Wilson &amp; Karnes Counties in Texas - Digital Elevation Models (DEM) and Digital Surface Models (DSM)</td>
<td>Wilson Karnes TX 2013 5m shrub canopy cover sub</td>
<td>Texas study area: Wilson/Karnes Counties</td>
<td>Estimate of shrub cover created from a 1 meter nDSM</td>
<td>Missouri Resource Assessment Partnership</td>
</tr>
<tr>
<td>Oklahoma Ecological Systems Mapping - Phase 1</td>
<td>Oklahoma Ecological Systems map</td>
<td>Eastern Oklahoma</td>
<td>Current vegetation developed from 30 m resolution satellite data, 10 m image objects from NAIP photos, and modeling with abiotic data</td>
<td>Oklahoma Department of Wildlife Conservation and Missouri Resource Assessment Partnership</td>
</tr>
<tr>
<td>US Counties</td>
<td>US Counties</td>
<td>USA</td>
<td>This dataset represents US counties and county equivalents from the 2009 TIGER/Line shapefile series</td>
<td>U.S. Department of Commerce, U.S. Census Bureau, Geography Division</td>
</tr>
<tr>
<td>TNC Lands and Waters</td>
<td>TNC Lands and Waters</td>
<td>USA</td>
<td>A spatial dataset of lands and waters that The Nature Conservancy has a legal interest in (such as a conservation easement or fee-simple ownership).</td>
<td>The Nature Conservancy</td>
</tr>
<tr>
<td>Map Inputs</td>
<td>Data Layer</td>
<td>Extent</td>
<td>Brief Description</td>
<td>Source</td>
</tr>
<tr>
<td>---------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------</td>
<td>--------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Texas Ecological Systems Map</td>
<td>Texas Ecological Systems map</td>
<td>Texas</td>
<td>Current vegetation developed from 30 m resolution satellite data, 10 m image objects from NAIP photos, and modeling with abiotic data</td>
<td>Texas Parks &amp; Wildlife Department and Missouri Resource Assessment Partnership</td>
</tr>
<tr>
<td>National Conservation Easement Database (webservice)</td>
<td>National Conservation Easement Database (webservice)</td>
<td>USA</td>
<td>The National Conservation Easement Database (NCED) is a collaborative venture to compile easement records (both spatial and tabular) from land trusts and public agencies throughout the United States in a single, up-to-date, sustainable, GIS compatible, online source.</td>
<td>Ducks Unlimited</td>
</tr>
</tbody>
</table>
Appendix 3: Detailed information workflow

This workflow was not fully realized because of lack of data and resources but expresses a more complete approach to addressing the desired DST functionality.
Appendix 4: GCP LCC Dynamic DSS Pilot – Tester feedback forms

Name: Rebecca Chester
Phone: (979) 234-3021 x230
Organization: Attwater Prairie Chicken NWR
Email: rebecca_chester@fws.gov
Position: Biologist

1. Was the DST easy to install on your agency’s system/your computer? (very easy, somewhat easy, somewhat difficult, could not be installed)
   a. If not please note difficulties and if they were resolved:
      I’d say it was somewhat difficult to install because of download time and issues. Then I wasn't sure if it had downloaded/installed properly at the beginning. Also, it seemed there was no way to check that all things were there like a "read me" or metadata file might contain.

2. Was the initial orientation web meetings sufficient for you to use the system? (completely, partially, not at all)
   a. If not, did you receive follow up support and was that sufficient?
      The web meetings were partially sufficient to use the tool and data. It would have helped greatly if the second one had recorded. Also, maybe more time spent on the different toc windows or explanation of what each layer was and how to view/interpret it. Lots going on for people new to the tool and data although you and patrick may know it like the back of your hand.

3. Is the system capable of providing useful functions and information for the “reactive” decision making (examining a proposed action on an applicant’s parcel for whether it is a good use of conservation funds/effort) (definitely, potentially, partially, not at all; please focus on the software functionality and then describe shortfalls because of data limitations under item “a” below)
   a. If your answer is “somewhat,” “potentially,” or “partially,” please describe what would be needed to answer “definitely”
      The reactive decision making is a part of it I didn't spend much time playing with since I was trying to figure out how the data used was effecting the ratings of certain areas. From what I gleaned in your site explorer demo about all the land use characteristics and facts about certain parcels, I would say it could potentially be helpful
   b. If your answer is “not at all” please describe why not

4. Is the system capable of providing useful functions and information for the “proactive” decision making (examining a broad area within the project boundary to proactively identify parcels/areas that would provide potentially high conservation benefits) (definitely, potentially, partially, not at all; please focus on the software functionality and then describe shortfalls because of data limitations under item “a” below)
a. If your answer is “somewhat,” “potentially,” or “partially,” please describe what would be needed to answer “definitely”

I think it is potentially useful if the right data exists and is used in the tool. So much of grassland habitat hinges on really good veg data that it is still in the potential category until that data becomes available. It might be possible in some applications to use good available layers for roads, urbanization/city limits, commercial zoning, parcel size and land use to eliminate from consideration or highlight good possible areas that could then be looked at more closely (on the ground veg assessment).

b. If your answer is “not at all” please describe why not

5. What is your concluding recommendation about the DST:
   a. The DST should be propagated to partners now
   b. The DST shows promise but needs additional development in the following areas (please describe, can include software functionality and data development for example):
      The tool is potentially useful, but the lack of good veg data really does hamper the ability for others, many much less familiar with spatial data (and caveats that come with it), to be able to comfortably make decisions based on the outcomes of the tool. With some more development, thought and explanation of how things were scored, which translates into the final map representations, it could be distributed to partners. Maybe developing a way to get better veg data needs to be the priority for the group moving forward– I think the tool is about ready- just needs good input.
   c. The DST isn’t useful and should not be propagated or further developed at this time (please describe reasons for this finding):

6. If you answered “a” or “b” above, please describe further who you think should use the DST (which agencies, what kind or positions in the agencies):
   All land management agencies could benefit- public and private. Biology, realty, planning are departments that could benefit from it.

7. If you answered “a” or “b” above, please describe further what specific applications the DST should be used for (can name specific program decisions or describe general type of applications):

   No specific projects come to mind, but could be applied to any spatially definable habitat if
   data exists on what "good" habitat is or critical habitat, or restoration potential habitat.

Additional comments:
Grassland Decision Support Tool Project

Name: Jon Hayes  
Phone: 979-249-7617  
Organization: OPJV/TPWD  
Email: jon.hayes@tpwd.texas.gov  
Position Conservation Delivery Specialist

8. Was the DST easy to install on your agency’s system/your computer? (very easy, somewhat easy, somewhat difficult, could not be installed)
   a. If not please note difficulties and if they were resolved: Arcgis difficulties on my end have not been resolved at this time.

9. Was the initial orientation web meetings sufficient for you to use the system? (completely, partially, not at all)
   a. If not, did you receive follow up support and was that sufficient? Web meetings were well done and thorough, but no amount of demo is going to get me comfortable with a system until I get to play around with it.

10. Is the system capable of providing useful functions and information for the “reactive” decision making (examining a proposed action on an applicant’s parcel for whether it is a good use of conservation funds/effort) (definitely, potentially, partially, not at all; please focus on the software functionality and then describe shortfalls because of data limitations under item “a” below)
    a. If your answer is “somewhat,” “potentially,” or “partially,” please describe what would be needed to answer “definitely”
    b. If your answer is “not at all” please describe why not

11. Is the system capable of providing useful functions and information for the “proactive” decision making (examining a broad area within the project boundary to proactively identify parcels/areas that would provide potentially high conservation benefits) (definitely, potentially, partially, not at all; please focus on the software functionality and then describe shortfalls because of data limitations under item “a” below)
    a. If your answer is “somewhat,” “potentially,” or “partially,” please describe what would be needed to answer “definitely”
    b. If your answer is “not at all” please describe why not

12. What is your concluding recommendation about the DST:
    a. The DST should be propagated to partners now
    b. The DST shows promise but needs additional development in the following areas (please describe, can include software functionality and data development for example):
    c. The DST isn’t useful and should not be propagated or further developed at this time (please describe reasons for this finding):

13. If you answered “a” or “b” above, please describe further who you think should use the DST (which agencies, what kind or positions in the agencies): I think it could be useful to many organizations that work in this geography but only if it was presented in the proper context and done so with some concrete examples. Keeping in mind my limited GIS capacity and expertise, I would be interested in working with you guys on
a simple demo using an example from our GRIP program to demonstrate the reactive and then exploring how we could use the proactive to show how to guide delivery of funds in the right areas. Needs to be moved from the conceptual to the applied for folks down here I think.

14. If you answered “a” or “b” above, please describe further what specific applications the DST should be used for (can name specific program decisions or describe general type of applications): **We’ll use it for GRIP project evaluation and potentially using the landscape planning features in the future to optimize program delivery.**

Additional comments: **Good product given gaps in data. The tool begins to fill holes in the adaptive management process that we’re trying to build. With additional data there is a huge potential for what we’re going to be able to do with tools like this in the future. Thanks.**

Name: William (Bill) Vermillion                                   Phone: _337-266-8813_
Organization: USFWS, Gulf Coast Joint Venture                   Email: _william_vermillion@fws.gov_
Position _Bird Conservation Specialist_

15. Was the DST easy to install on your agency’s system/your computer? (very easy, somewhat easy, somewhat difficult, could not be installed) **Somewhat easy.**
   a. If not please note difficulties and if they were resolved:

16. Was the initial orientation web meetings sufficient for you to use the system? (completely, partially, not at all) **Partially**
   a. If not, did you receive follow up support and was that sufficient? **I did receive good follow-up support but it was still like drinking from a firehose, and I needed to put more time into using the software.**

17. Is the system capable of providing useful functions and information for the “reactive” decision making (examining a proposed action on an applicant’s parcel for whether it is a good use of conservation funds/effort) (definitely, potentially, partially, not at all; please focus on the software functionality and then describe shortfalls because of data limitations under item “a” below)
   a. If your answer is “somewhat,” “potentially,” or “partially,” please describe what would be needed to answer “definitely” **Potentially. Users need a fairly detailed understanding of system underpinnings to be able to utilize it effectively, which should result from familiarity and perhaps more explicit information specific to the project regarding layers, functions, etc.**
   b. If your answer is “not at all” please describe why not

18. Is the system capable of providing useful functions and information for the “proactive” decision making (examining a broad area within the project boundary to proactively
identify parcels/areas that would provide potentially high conservation benefits) (definitely, potentially, partially, not at all; please focus on the software functionality and then describe shortfalls because of data limitations under item “a” below)

a. If your answer is “somewhat,” “potentially,” or “partially,” please describe what would be needed to answer “definitely” Potentially. See 3 above.
b. If your answer is “not at all” please describe why not

19. What is your concluding recommendation about the DST:
   a. The DST should be propagated to partners now
   b. The DST shows promise but needs additional development in the following areas (please describe, can include software functionality and data development for example): Yes. See notes from September 3 webinar regarding suggested changes.
   c. The DST isn’t useful and should not be propagated or further developed at this time (please describe reasons for this finding):

20. If you answered “a” or “b” above, please describe further who you think should use the DST (which agencies, what kind or positions in the agencies): Biologists and conservation planners with federal and state fish and wildlife conservation agencies, other non-government conservation agencies, NRCS biologists.

21. If you answered “a” or “b” above, please describe further what specific applications the DST should be used for (can name specific program decisions or describe general type of applications): as a preliminary step in identifying important areas for conservation actions, to be validated with on-the-ground observations.

Additional comments:

Name: Mike Morrow
Organization: USFWS/Attwater PC NWR
Position: Wildlife Biologist
Phone: 979-234-3021, x227
Email: mike_morrow@fws.gov

22. Was the DST easy to install on your agency’s system/your computer? (very easy, somewhat easy, somewhat difficult, could not be installed) : I did not install, please see Rebecca Chester’s evaluation.
   a. If not please note difficulties and if they were resolved
   b. Was the initial orientation web meetings sufficient for you to use the system? (completely, partially, not at all)
   c. If not, did you receive follow up support and was that sufficient?

23. Is the system capable of providing useful functions and information for the “reactive” decision making (examining a proposed action on an applicant’s parcel for whether it is
a good use of conservation funds/effort) (definitely, potentially, partially, not at all; please focus on the software functionality and then describe shortfalls because of data limitations under item “a” below) **Definitely**

a. If your answer is “somewhat,” “potentially,” or “partially,” please describe what would be needed to answer “definitely”

b. If your answer is “not at all” please describe why not

24. Is the system capable of providing useful functions and information for the “proactive” decision making (examining a broad area within the project boundary to proactively identify parcels/areas that would provide potentially high conservation benefits) (definitely, potentially, partially, not at all; please focus on the software functionality and then describe shortfalls because of data limitations under item “a” below) **Definitely**

a. If your answer is “somewhat,” “potentially,” or “partially,” please describe what would be needed to answer “definitely”

b. If your answer is “not at all” please describe why not

25. What is your concluding recommendation about the DST:

a. The DST should be propagated to partners now

b. The DST shows promise but needs additional development in the following areas (please describe, can include software functionality and data development for example): **While I think this tool demonstrates tremendous potential, right now it is crippled by the lack of data which accurately reflects grass on the ground, and possibly by overly aggressive algorithms which limit identification of grassland parcels. Perhaps too much weight was give to the Fire Departure layer, or perhaps that dataset was developed at too coarse of resolution to be used at the relatively fine scale demonstrated. Our refuge has a very active fire program, and yet I believe the entire 10,500 acres is depicted as severe or moderate departure from normal.**

c. The DST isn’t useful and should not be propagated or further developed at this time (please describe reasons for this finding):

26. If you answered “a” or “b” above, please describe further who you think should use the DST (which agencies, what kind or positions in the agencies): **This tool has tremendous potential to conservation managers and planners, but is of limited use as it exists now without refining the data and algorithms used to identify and display grassland coverages. While I understand your contract was to develop the tool with the best available data, other end users may not. It is misleading to identify the tool as a “Grassland” Decision Support Tool, when apparently datasets are not available which can be used to identify grasslands with any degree of accuracy. The previous statement assumes that readily available data were included in the tool, and that there are not problems with how the algorithms calculate grassland quality.**

27. If you answered “a” or “b” above, please describe further what specific applications the DST should be used for (can name specific program decisions or describe general type of
Additional comments: I apologize if I put you on the defensive with my comments. That was not the intent. I thought you might be interested in knowing how the tool functions relative to known grassland parcels of several thousand acres in size. If not, then I am sorry for interjecting.