PROJECT REPORT:

WHOOPING CRANE MIGRATION STOPOVER HABITAT
Assessment Tool for Wind Energy and Power Line Development

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(Photo of Whooping Crane by Mike Parr, ABC)

Photo of Whooping Cranes by Brian Small

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Summary

This report provides information produced by the International Crane Foundation working with American Bird Conservancy to identify potential areas of conflict between Whooping Cranes and wind power production and its distribution infrastructure in the Central Flyway of the United States (USA).

Both the International Crane Foundation and American Bird Conservancy are concerned with any impacts to the endangered Whooping Crane, including those associated with rapidly expanding renewable energy development.

In 2016, the two organizations partnered to create a model to predict potential stopover locations for Whooping Cranes along the Central Flyway of the USA, from North Dakota to the Gulf Coast of Texas.

The model was created using the modelling tool Maximum Entropy (MaxEnt) and the U.S. Fish and Wildlife Service's (FWS') observations of Whooping Cranes in the study area since 2000 (n=961). The goal was to identify known and potential stopover locations of Whooping Cranes. Given the absence of openly available telemetry data from wild Whooping Cranes, a model that could take advantage of presence-only sightings was required. Although some areas identified in the model are widely known to be stopover locations, other areas may be unknown or of high potential for future use.

This study is similar to that by Pearce et al. (2015); however, we used the completed model to perform a simple overlay analysis of the modeled stopover locations with electrical transmission lines and wind turbines, both existing and proposed. For our spatial analysis of hazards on the ground, we created 500 meter (1,640 feet) buffers around electrical transmission lines and 800 meter (2,640 feet) buffers around wind turbines. These prescribed buffers are based on published literature (Morkill, 1991; Leddy, 1999; Larsen, 2000; Pearce-Higgins, 2009). However, we opted to be more cautious for the transmission line buffer and increased it from the literature's standard 250 meters to 500 meters. These buffers helped us identify areas where hazards may intersect with predicted stopover habitats, as cranes may be most at risk from collisions or electrocutions during ascent and descent.

Hazard Interactions in the 75% Model		
Interaction Type	**Total Area**	**Interpretation**
Existing Turbine vs. 75% likelihood model	2.7 km^2 (0.06%)	Only one area in the entire flyway was found where existing turbines intersect our model.
Planned Turbine vs. 75% likelihood model	22.7 km^2 (0.05%)	There are very few locations where the hazard buffers of planned turbines intersect the model.
Existing Electric vs. 75% likelihood model	620.9 km^2 (12.99%)	Nearly 13% of the model area is already effected by existing electric transmission lines.
Planned Electric vs. 75% likelihood model	29.0 km^2 (0.06%)	There are isolated locations where planned electric transmission lines will intersect the model.

Total area of the 75% model is 4,779 km^2

Sum of Area Identified by Stopover Models

Model	Stopover Habitat (km2)	Total Study Area (km2)	Percent Area
75%	4,779	2,557,153	0.187 %
65%	19,185	2,557,153	0.750 %

For the purpose of the overlay analysis, our team chose to focus on areas with a high likelihood to be a stopover point—that is, those that scored a minimum value of 75% from the model. In doing this, we hoped to identify the most important stopover areas for Whooping Cranes during migration.

Our analysis found that, at this time, the intersection of good stopover habitat and these hazards is limited across the Flyway. However, this could change rapidly with the current rapid expansion of wind turbines and their associated infrastructure, notably power lines and towers, across the Whooping Crane Migratory Corridor. The summary table below gives a general idea of the hazards across the entire study range. (See the tables at the end of the report for more detail).

Although there is limited information on the role of wind turbines as a threat to Whooping Cranes, there is substantial evidence of the threat to all species of cranes from electric transmission lines (Janss and Ferrer, 2002; Sundar and Choudhury, 2005; Stehn and Wassenich, 2006; Wright et al., 2009; Shaw et al., 2010). This is concerning given the large area of preferred stopover habitat that is impacted by existing transmission lines. Further, the current lack of documentation of direct mortality does not mean Whooping Cranes are safe from future wind turbine expansion, which was known to kill hundreds of thousands of birds annually at past build-out levels (Smallwood, 2013; Loss et al. 2013; Erickson et al., 2015), a number that likely increases with each turbine built.

The simple analysis described above highlights the uselfulness of the model as a rapid review tool. We hope others will find the model outputs helpful in identifying areas where focused conservation action can take place or where more in-depth review of development plans may be needed.

If planned expansion of wind turbines and transmission lines continues as anticipated, and the assumptions in this model prove to be correct in terms of crane avoidance of hazards and the size of buffers, then our results suggest that relatively small changes in planned turbine and transmission line location could potentially reduce the hazards to the point where it poses a relatively minor threat to cranes. This would hold true as long as crane stopover habitat remains constant and as predicted. The existing transmisson footprint does, however, indicate significant overlap and plans to mitigate this overlap through the use of line markers, as recommended by the Avian Power Line Interaction Committee (APLIC 2012) should be accelerated.

Whooping Cranes (*Grus americana*) are the rarest species of crane on earth, with less than 400 individuals living in the wild. The last wild flock of Whooping Cranes migrates from Wood-Buffalo National Park in northern Canada to Aransas National Wildlife Refuge on the Gulf Coast of Texas in the USA. Like many birds migrating through the Central Flyway of North America, Whooping Cranes face a multitude of threats, both natural and human-created (see Loss et al. 2016).

Our team used habitat niche modeling and sighting data to identify the critical locations Whooping Cranes may use as stopover sites during migration. Identifying these critical locations allows the International Crane Foundation, American Bird Conservancy and other bird conservation organizations to focus on key areas for protection and evaluate the suitability of energy infrastructure proposed in those locations, including the potential for cumulative impact from multiple developments in the same region.

Stopover Habitat Modelling Methods

Our project team reviewed several methods to model the locations of high-quality stopover sites for Whooping Cranes. We gathered historical sighting data from the U.S. Fish and Wildlife Service (FWS). These observations are based on presence-only observations of the birds. As the Service's data were our primary source of information on Whooping Crane locations in the Migratory Corridor, we focused on developing modeling tools that would allow us to use these data for the purposes stated in our goals. Useful citations for the use and interpretation of MaxEnt include Elith et al. (2011) and Phillips et al. (2004, 2006).

By far, the most widely accepted tool given the limitation of presence-only data is Maximum Entropy Modeling (MaxEnt). MaxEnt is used heavily in ecological research for species habitat modeling.

As input variables for the MaxEnt model, we gathered broad scale bioclimatic data from the WorldClim Version 2 data (http://worldclim.org/version2) which has a spatial resolution of 30 arc seconds (~1 km^2). Additionally, we gathered and derived additional input layers using the National Land Cover Dataset (NLCD) for the contiguous United States. See Table 1 for a complete list of the data layers used in this analysis and Table 2 for the sources of data used.

All input data were resampled to match the spatial resolution of the projected version of the WorldClim dataset. Whooping Crane sightings were limited to those where the location precision was estimated to be no worse than 500 meters. Further, we limited the sightings records to those recorded since 2000. Finally, our focus for the study was to identify migration stopover locations. We therefore removed Whooping Crane sightings near the Gulf Coast as they represent wintering locations rather than migration locations.

Assumptions

As with any modeling process, we made assumptions about our input data and modeling techniques. Although we feel our process reflects a good model for Whooping Crane use across a large region and at a high spatial resolution (less than 1 km^2), the results are still dependent on the inherent assumptions in the model itself. The narrative below reflects the assumptions we made during the analysis:

1. Sightings from the USFWS database are a reasonable sample of Whooping Crane stopover locations throughout the flyway.

2. Whooping Cranes will continue to use similar landscapes in the future. The resolution of our model is fine enough to adequately predict critical areas of Whooping Crane use.

3. The areas used by Whooping Cranes are, for the most part, limited to wetlands near agricultural fields and used primarily as short stopover locations to rest and feed while migrating to or from their wintering or breeding areas.

Recommendations for Using the Layers

We created a binary raster layer showing grid cells with values greater than or equal to 75% from the MaxEnt output model. We created a second layer the same way with the broader criterion of 65%. Finally, we also included the raw model layer in a floating point value raster reflecting the modeled value for all grid cells.

The 75% and 65% models can both be easily used as a display layer in Google Earth Maps or similar map tools. To focus on only the most likely stopover locations, we recommend using the 75% model layer.

Intersecting the model layers with other data layers is a relatively straightforward task in any GIS software package. All data layers include metadata to help GIS professionals interpret the results.

Modelling Outputs

As with all outputs from MaxEnt, our model provides a value between 0 and 1 for each grid cell in the analysis area. The model values roughly correspond to the percent likelihood that a cell is a suitable habitat. For example, in our case, a value of 0.75 indicates that the model predicts a particular cell has a 75% chance of being ideal stopover habitat for Whooping Cranes. For our analysis, we focused on areas with a high (greater than 75%) chance of being good stopover locations. Although these areas have a high potential to be good stopover locations, this does not mean that Whooping Cranes will use those areas in the future or have used them in the past. Further, we provide data for the 65% model to provide a context to understand the more critical 75% model.

Tables 3-5 contain the identities of existing and proposed wind turbines and existing power lines that intersected with our 75% model and are thus predicted to be the highest risk for Whooping Cranes during their annual migration.

High potential stopover areas for Whooping Cranes represent only 0.187% of the entire study area (4,779 km2 out of 2,557,153 km2 in the study area). The extremely small area reflects both the real breadth of available space on the landscape for Whooping Cranes and the specialized nature and hence relative conservation importance of these areas.

TABLES

Table 1: Layers Used as Inputs to MaxEnt Model

WHCR sightings in central flyway 2000 – present from USFWS (with sufficient positional precision):

BIO1 = Annual Mean Temperature

BIO2 = Mean Diurnal Range (Mean of monthly (max temp - min temp))

BIO3 = Isothermality (BIO2/BIO7) (* 100)

BIO4 = Temperature Seasonality (standard deviation *100)

BIO5 = Max Temperature of Warmest Month

BIO6 = Min Temperature of Coldest Month

BIO7 = Temperature Annual Range (BIO5-BIO6)

BIO8 = Mean Temperature of Wettest Quarter

BIO9 = Mean Temperature of Driest Quarter

BIO10 = Mean Temperature of Warmest Quarter

BIO11 = Mean Temperature of Coldest Quarter

BIO13 = Precipitation of Wettest Month

BIO14 = Precipitation of Driest Month

BIO19 = Precipitation of Coldest Quarter

Below are based on the 30-meter NLCD 2011 data resampled to match the 952m study scale:

Ag_dist = average distance to agriculture for the resampled cell

Dev_sidt = average distance to high or medium density development for the resampled cell

Water_dit = average distance to open water for the resampled cell

Wet_dist = average distance to wetland for the resampled cell

NLCD = Majority NLCD value for the resampled cell

Table 2: Sources for Analysis Layers

Transmission Lines – Purchased through S&P Global Platts

Wind turbine data downloaded March 2017 from:
https://www.fws.gov/southwest/es/Energy_Wind_FAA.html

Table 3: Existing Turbines that Intersect 75% Model of WHCR Stopover Sites

ID	Latitude	Longitude
1	48.507328	-102.988711
2	48.491831	-102.998031
3	48.491997	-103.003739
4	48.494056	-103.009033
5	48.492075	-102.982436
6	48.492161	-102.986986
7	48.491561	-102.991636
8	48.493561	-102.990072

Table 4: Proposed Turbines that Intersect 75% Model of WHCR Stopover Sites

ID	Latitude	Longitude
1	28.976917	-95.329833
2	38.341842	-98.828575
3	40.296169	-98.488783
4	40.298214	-98.467008
5	40.286792	-98.493464
6	40.294136	-98.511906
7	40.286631	-98.486292
8	40.286797	-98.497814
9	40.286761	-98.502922
10	40.2982	-98.471539
11	40.297906	-98.475925
12	40.297522	-98.479947
13	40.295956	-98.493447
14	40.295528	-98.497781
15	40.295508	-98.502597
16	37.972772	-99.636844
17	37.982781	-99.635178
18	37.972697	-99.628294
19	37.972761	-99.632581
20	37.982803	-99.630661
21	37.982839	-99.635228
22	37.982817	-99.630967
23	37.972772	-99.636844
24	37.972761	-99.632581
25	37.972697	-99.628294
26	37.605561	-99.303819
27	40.296514	-98.525431
28	40.245433	-98.642242
29	40.245692	-98.638325
30	40.245739	-98.634194
31	40.246322	-98.591158
32	40.245989	-98.586592
33	40.245883	-98.581794
34	40.245872	-98.577158
35	40.245606	-98.572403
36	40.245414	-98.568483
37	40.2455	-98.564178
38	40.296467	-98.514664
39	40.295056	-98.511019
40	40.294944	-98.502731
41	40.294889	-98.498675
42	40.296586	-98.494372
43	40.296333	-98.489422
44	40.296236	-98.480006
45	40.283239	-98.503669
46	40.286114	-98.497544
47	40.288194	-98.489175
48	48.504725	-102.997581
49	48.505647	-102.992225
50	48.507153	-102.98775
51	48.491894	-102.951089
52	48.49455	-102.949603
53	48.496658	-102.946689
54	48.499528	-102.944744
55	48.485586	-102.926889
56	48.489986	-102.926911
57	48.491467	-102.922683
58	48.493322	-102.919289
59	48.472153	-102.918925
60	48.506894	-102.905208
61	48.507742	-102.900272
62	48.507933	-102.894144
63	48.475122	-102.932903
64	48.473442	-102.936461
65	48.473528	-102.941844
66	48.4644	-102.922803
67	48.465153	-102.916867
68	48.494781	-102.950008
69	48.499886	-102.948047
70	48.504817	-102.948311
71	48.507503	-102.945278
72	48.507522	-102.934444
73	48.507731	-102.939839
74	48.498175	-102.92415
75	48.499589	-102.919111
76	48.506553	-102.988364
77	48.455486	-102.922567
78	48.457392	-102.943592
79	48.462306	-102.941481

Table 4 (continued)		
80	48.490919	-102.985786
81	48.457697	-102.956794
84	48.456767	-102.916353
85	48.471175	-103.032003
86	48.456364	-103.007733
87	48.456597	-103.002592
88	48.461583	-103.000475
89	48.456678	-103.072906
90	48.453417	-103.077153
91	48.460569	-102.974478
92	40.254669	-98.648833
93	40.255436	-98.643881
94	40.257525	-98.639428
95	40.257656	-98.634725
96	40.246069	-98.711997
97	40.246269	-98.705944
98	40.245289	-98.700981
99	40.243725	-98.621722
100	40.244131	-98.616881
101	40.244225	-98.611422
102	40.24395	-98.592481
103	40.244597	-98.588114
104	40.244711	-98.583231
105	40.2448	-98.569689
106	40.246222	-98.5644
107	40.296428	-98.513858
108	40.294906	-98.509386
109	40.294878	-98.505269
110	40.294858	-98.498681
111	40.296578	-98.494372
112	40.296567	-98.48955
113	40.286161	-98.495628
114	40.288194	-98.489175
115	40.296514	-98.479925
116	40.293814	-98.513878

Table 5 – Built Power Line Projects that Intersect 75% Model of WHCR Stopover Sites

Company	Line_Distance_km	Longitude	Latitude
Basin Electric Power Coop	1.35	-101.31218	47.27822
Dawson County Public Power District	0.94	-100.37410	41.01947
Dawson County Public Power District	0.39	-100.16269	40.90313
Dawson County Public Power District	1.56	-99.53167	40.72867
Dawson County Public Power District	7.57	-99.93076	40.82536
Dawson County Public Power District	0.22	-100.76581	41.16405
Detroit Edison Co.	0.95	-100.94298	47.09175
Grand Island Utilities	1.46	-98.35550	40.86978
K B R Rural Public Power District	0.95	-100.02811	42.55716
Loup River Public Power District	2.53	-97.77215	41.41827
Lower Colorado River Authority	3.80	-97.60886	30.22450
MidWest Energy, Inc.	0.96	-98.69585	38.39053
MidWest Energy, Inc.	1.89	-98.62881	38.34471
Montana Dakota Utilities Co.	0.94	-101.77746	48.76381
Montana Dakota Utilities Co.	0.97	-102.32740	48.81720
Montana Dakota Utilities Co.	1.44	-102.23016	48.79442
Morenci Water & Electric Co.	1.90	-102.89981	48.40243
Nebraska Public Power District	0.31	-101.69014	41.11927
Nebraska Public Power District	11.38	-98.30997	40.86279
Nebraska Public Power District	1.92	-98.52046	40.81516
Nebraska Public Power District	1.88	-98.47429	40.85519
Nebraska Public Power District	0.94	-98.34504	40.53034
Nebraska Public Power District	2.21	-97.97275	41.08222
Nebraska Public Power District	1.11	-97.91933	41.10672
Nebraska Public Power District	0.96	-98.70858	40.52413
Nebraska Public Power District	0.61	-97.90548	41.11306

Nebraska Public Power District	0.22	-98.83923	41.11044
Nebraska Public Power District	1.08	-97.81824	41.17594
Nebraska Public Power District	0.81	-97.79297	41.19278
Nebraska Public Power District	0.04	-97.77912	41.20721
Nebraska Public Power District	1.28	-97.76311	41.22384
Nebraska Public Power District	0.96	-99.48466	40.39368
Nebraska Public Power District	0.85	-99.70175	40.75273
Nebraska Public Power District	2.26	-99.70211	40.71158
Nebraska Public Power District	0.94	-99.70019	40.60858
Nebraska Public Power District	0.68	-99.54504	40.41518
Nebraska Public Power District	0.96	-99.43938	40.39380
Nebraska Public Power District	0.48	-99.36300	40.39437
Nebraska Public Power District	0.13	-98.64904	40.61958
Nebraska Public Power District	1.42	-99.74524	40.67750
Nebraska Public Power District	0.84	-99.34641	40.56881
Nebraska Public Power District	0.64	-99.38007	40.58217
Nebraska Public Power District	0.56	-99.67877	40.54914
Nebraska Public Power District	1.92	-99.76069	40.58303
Nebraska Public Power District	0.97	-100.66291	41.08073
Nebraska Public Power District	0.22	-100.64438	41.09188
Nebraska Public Power District	0.96	-97.57785	40.75473
Nebraska Public Power District	2.67	-99.72718	40.69185
Nebraska Public Power District	0.65	-99.82252	40.63722
Nebraska Public Power District	0.15	-99.81938	40.62690
Nebraska Public Power District	0.94	-99.81048	40.59681

Nebraska Public Power District	0.12	-98.95900	40.39417
Nebraska Public Power District	0.96	-98.82814	40.39393
Nebraska Public Power District	4.83	-99.73122	40.71990
Nebraska Public Power District	2.89	-99.76809	40.68404
Nebraska Public Power District	0.55	-99.35761	40.39417
Nebraska Public Power District	2.89	-99.96742	40.72777
Nebraska Public Power District	0.23	-99.81874	40.69390
Nebraska Public Power District	1.39	-97.72194	41.25567
Nebraska Public Power District	0.67	-97.70342	41.26977
Nebraska Public Power District	0.40	-97.69100	41.27742
Nebraska Public Power District	0.07	-97.67817	41.28520
Nebraska Public Power District	6.50	-99.11617	40.67633
Nebraska Public Power District	0.90	-98.73515	41.49520
Nebraska Public Power District	0.96	-99.04692	40.48116
Nebraska Public Power District	5.53	-98.90094	40.67760
Oncor Electric Delivery Co.	0.67	-101.52923	32.25452
Oncor Electric Delivery Co.	0.94	-96.96323	31.57882
Oncor Electric Delivery Co.	0.12	-98.53374	33.84620
Oncor Electric Delivery Co.	0.48	-101.64368	32.20751
Otter Tail Power Co.	0.26	-101.31929	47.28191
Otter Tail Power Co.	1.28	-101.31277	47.27787
PSC of Oklahoma	0.95	-99.36498	34.68268
PSC of Oklahoma	0.95	-99.36498	34.68268
South Central Public Power District	0.19	-98.42479	40.32127
Southern Public Power District	0.94	-98.26397	40.92297
Southern Public Power District	0.94	-98.13147	40.84872
Southern Public Power District	0.94	-98.26393	40.94849
South Texas Electric Coop, Inc.	1.09	-95.38696	28.97426

South Texas Electric Coop, Inc.	0.07	-96.52141	29.00470
Twin Valleys Public Power District	1.89	-99.34927	40.30791
Unknown	2.10	-97.92622	41.13072
Unknown	1.22	-97.95333	41.10651
Unknown	3.49	-102.91709	48.39266
Unknown	0.97	-98.51780	43.14916
Unknown	0.95	-100.81085	41.12462
Unknown	2.72	-100.72073	41.11404
Unknown	1.63	-99.38061	40.66292
Unknown	0.44	-100.73965	41.14290
Unknown	1.04	-97.80295	41.40341
Unknown	0.08	-100.16791	40.91288
Unknown	0.50	-97.66419	41.30910
Unknown	1.23	-97.68433	41.29808
Unknown	0.87	-97.73757	41.26218
Unknown	1.61	-97.76046	41.24527
Unknown	0.22	-97.80926	41.20034
Unknown	0.73	-97.83199	41.18730
Unknown	0.50	-99.80960	40.70285
Unknown	1.48	-101.19008	47.24785
Unknown	1.89	-102.69017	48.22642
Unknown	0.41	-99.36917	40.43337
Unknown	0.94	-98.37369	40.56382
Unknown	0.64	-100.78221	41.11858
Unknown	0.86	-101.33642	47.28355
Unknown	0.05	-98.65612	42.80953
Unknown	0.11	-99.73291	40.73934
Unknown	0.12	-99.81726	40.59248
Unknown	1.12	-101.15603	41.09406
Unknown	0.28	-101.18772	47.28498
Unknown	0.69	-101.31834	47.28585
Unknown	0.27	-95.35118	28.97432
Unknown	0.98	-95.33704	28.96382
Unknown	0.87	-98.09010	40.38996
Westar Energy	1.92	-98.47739	37.95212
Westar Energy	0.96	-98.45004	37.95238
Westar Energy	2.14	-98.57289	37.88154
Westar Energy	0.96	-98.51582	37.95608

Westar Energy	0.96	-98.66878	37.94902
Westar Energy	1.47	-98.81914	37.94981
Westar Energy	0.94	-98.61949	37.95826
Westar Energy	1.92	-98.56508	37.95652
Westar Energy	1.93	-98.71717	38.52034
Westar Energy Inc.	1.05	-98.85083	38.37801
Westar Energy Inc.	3.77	-98.78713	38.00130
Westar Energy Inc.	3.77	-98.78749	38.12877
Westar Energy Inc.	0.94	-98.78780	38.18400
Westar Energy Inc.	2.06	-98.80754	38.30677
Westar Energy Inc.	0.92	-98.81983	38.32726
Westar Energy Inc.	0.11	-98.82234	38.33145
Westar Energy Inc.	1.03	-98.84022	38.36126
Westar Energy Inc.	0.94	-98.78740	38.09902
Western Farmers Electric Coop	0.94	-98.01020	36.70357
Western Farmers Electric Coop	1.00	-99.31978	36.85094
Western Farmers Electric Coop	1.89	-98.48607	36.82644
Western Farmers Electric Coop	1.38	-98.02819	36.73072
Western Farmers Electric Coop	0.94	-98.02827	36.80527
WestPlains Energy (KS)	1.15	-98.77717	38.38912
WestPlains Energy (KS)	0.74	-98.77994	38.40422
WestPlains Energy (KS)	0.96	-98.77305	38.39427
WestPlains Energy (KS)	1.35	-98.77095	38.39124

Table 6 – Planned Electric Projects that Intersect 75% Model of WHCR Stopover Sites

Company	Line_Distance_km	Longitude	Latitude
Basin Electric Power Coop	3.07	-102.95696	48.40508
Basin Electric Power Coop	1.14	-103.71523	48.10575
Basin Electric Power Coop	1.09	-103.68166	48.07299
Central Illinois Light Co.	0.33	-99.26744	35.07256
Clean Line Energy Partners	0.95	-99.23966	38.18140
Clean Line Energy Partners	0.94	-98.86113	38.53923
Clean Line Energy Partners	0.94	-98.90017	38.41934
Clean Line Energy Partners	0.94	-98.90004	38.43634
Electric Energy, Inc.	3.80	-102.95121	48.40512
ITC Holdings Corp.	1.18	-101.22877	47.07358
Oklahoma Gas & Electric Co. (OG&E)	1.36	-99.30382	36.82130
Oklahoma Gas & Electric Co. (OG&E)	1.36	-99.30382	36.82130
Oncor Electric Delivery Co.	2.88	-97.60417	30.22351
Southwest Power Pool, Inc.	1.42	-101.70378	41.12190
Unknown	5.82	-100.58672	41.06171
Unknown	0.96	-99.32515	40.61479
Unknown	2.06	-100.53981	41.04960

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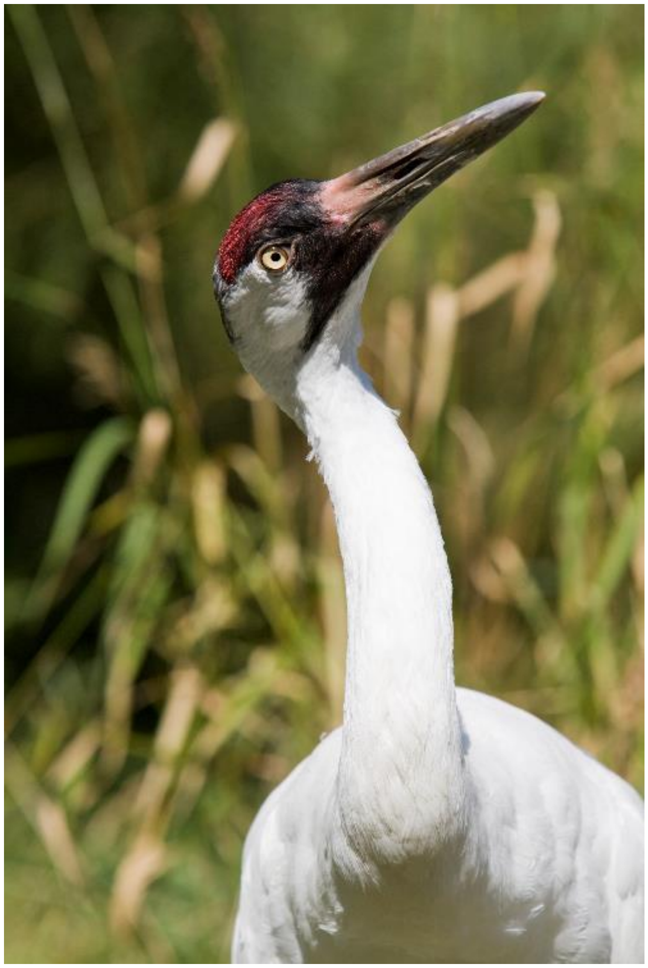

Photo of Whooping Crane by Tom Grey