



## Assessing Size and Condition of Windbreaks in Coronado Crossing RC & D with Remote Sensing

### **Background**

This project developed an object based remote sensing methodology to describe size, condition and ecological value of windbreaks. The project is funded through a USDA Forest Service, State and Private Forestry, Competitive Grant (2008). The study area is in southwestern Kansas in the Coronado Crossing RC & D and includes Hodgeman, Ford, Clark, Gray, Meade, Seward and Haskell counties.

### **Data Sources**

National Agriculture Imagery Program (NAIP)

4 band color aerial imagery tiled by county in 1-meter resolution (2008 images)

Color Infra Red imagery tiled by county in 1 meter resolution (2006 images)

### **Object –Based Classification—Identifying the Windbreaks**

The first step segmented images into areas with similar spectral, shape, and textural properties. Images were then grouped into vectors or objects that were later used as the basis for image classification. Classification of images into different Land Use Land Cover (LULC) classes was done using 6 different LULC classes including crops, tree stands, riparian, windbreaks, manicured landscapes, and ditches.

### **Land Use/Land Cover Classes By Counties:**

Cover Type	Number of Training Sites in different counties							Total
	FO	GY	CA	HG	HS	ME	SW	
<b>Crops</b>	35	52	50	50	50	50	50	<b>337</b>
<b>Ditches</b>	15	22	38	25	25	25	25	<b>175</b>
<b>Manicured Landscapes</b>	6	10	10	5	5	5	5	<b>46</b>
<b>Riparian</b>	20	18	83	85	20	75	50	<b>351</b>
<b>Tree Stands</b>	50	63	75	50	30	50	30	<b>348</b>
<b>Windbreaks</b>	45	35	65	65	10	50	10	<b>280</b>
<b>Total samples</b>	<b>171</b>	<b>200</b>	<b>321</b>	<b>280</b>	<b>140</b>	<b>255</b>	<b>170</b>	<b>1537</b>



Windbreaks were then separated from non-windbreak features using ArcGIS.

<b>Classification Error Matrix for All 7 Counties</b>				
	<b>Non windbreaks</b>	<b>Windbreaks</b>	<b>Row Total</b>	<b>User Accuracy</b>
<b>Non Windbreaks</b>	1115	63	1178	94.65%
<b>Windbreaks</b>	36	119	155	76.77%
<b>Total</b>	<b>1151</b>	<b>182</b>	1333	
<b>Producer Accuracy</b>	96.87%	65.38%	<b>Overall Accuracy</b>	<b>92.57%</b>
			<b>kappa</b>	66.4%

Area and number of windbreaks were also determined by county.

	<b>Counties</b>							<b>Totals</b>
	FO	GY	CA	HG	HS	ME	SW	
<b>Number</b>	355	196	166	109	22	239	29	<b>1116</b>
<b>Acres</b>	1012	223	729	141	27	440	26	<b>2597</b>
<b>Hectares</b>	410	90	295	57	11	178	9	<b>1051</b>
1 hectare is approximately 2.48 acres								

### **Assigning Windbreak Conditions**

Condition was assigned using criteria developed by the Great Plains Initiative and adopted by NRCS in Kansas Forestry Technical Note No. K-10. This condition criteria is used to determine if a windbreak is a resource concern for the Environmental Quality Incentives Program for windbreak renovation conservation practices.

**Good Condition** - Meets at least 7 of the attributes listed (one needs to be less than 25% mortality)

**Fair Condition** - Has 5 – 6 of the attributes listed (one needs to be less than 25% mortality)

**Poor Condition** - Has less than 5 of the attributes listed and /or more than 25% mortality

#### **Windbreak Condition Attributes :**

- Less than 25% of the trees are dead
- Continuous barrier, no gaps (missing trees)
- 50% density or greater
- No smooth bromegrass or fescue sod present
- Majority of the tree crowns healthy < 25% of the trees showing insect, disease or herbicide damage
- None to very little livestock activity in the planting
- Tree regeneration is present
- Trees are expected to live another 20 years

Remote Sensing was then used to assign condition classes windbreaks using brightness value, texture analysis and vegetation index listed below.

**Brightness Value (Average green reflectance value ), band 2**

Low BV = Lower reflectance = Good WB condition

High BV = High reflectance = Poor WB condition

**Texture Analysis**

High textural value = Coarser feature = Poor WB condition

Lower textural value = Finer feature = Good WB condition

**Normalized Difference Vegetation Index (NDVI)**

NDVI value ranges from 0.0 to 1.0

High NDVI = Good Vegetation Health = Good WB condition

Lower NDVI = Poor Vegetation Health = Poor WB condition

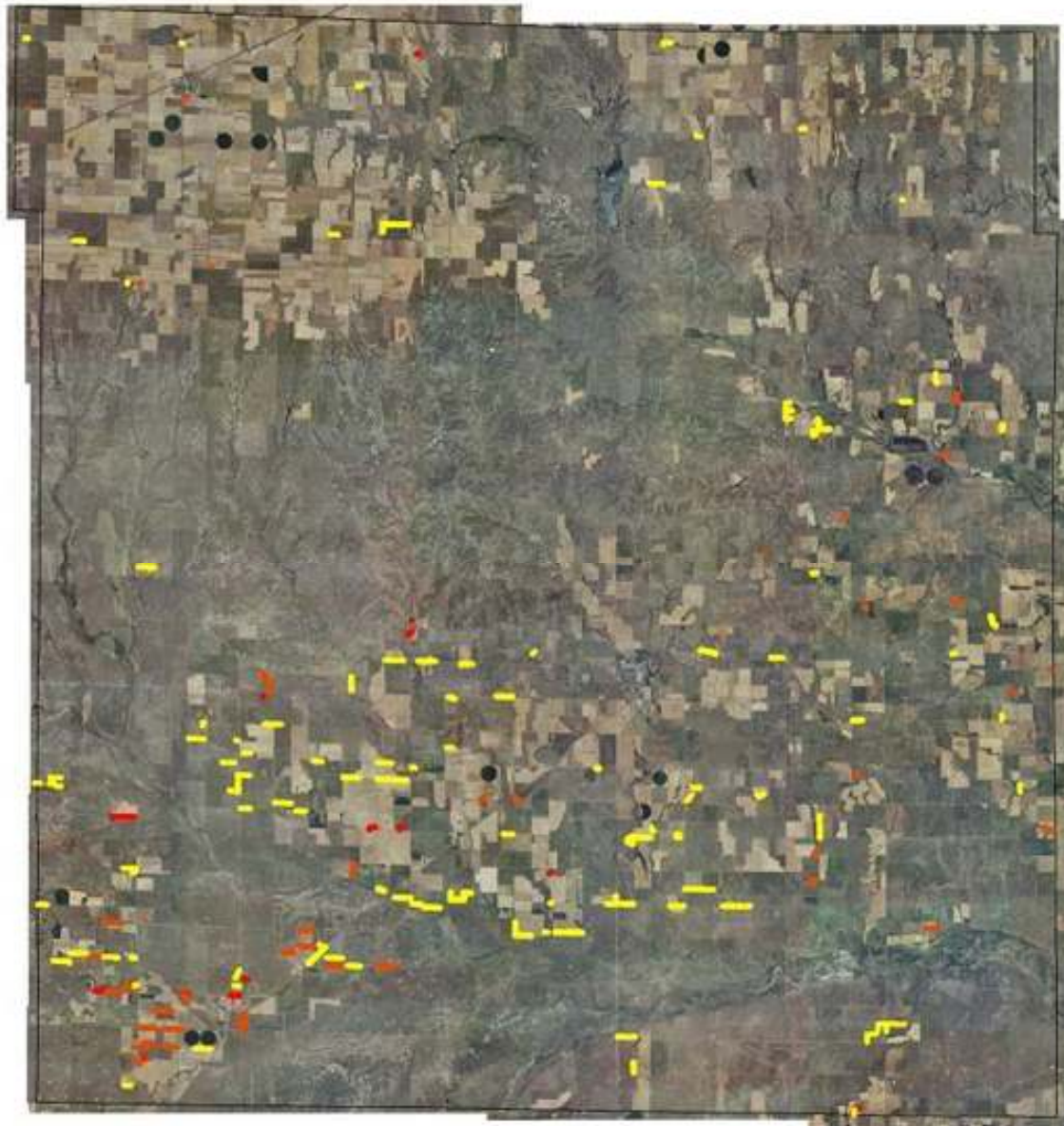
Finally 12% of the windbreaks in the study were “ground-truthed” using the windbreak condition criteria to determine accuracy between remote sensing classification and “on-site” observations.

County	Condition classes								
	Good			Fair			Poor		
	No	Acres	Hectares	No	Acres	Hectares	No	Acres	Hectares
Gray	77	117.291	47.4660	41	34.77	14.07	78	70.490	28.526
Haskell	15	12.511	5.0630	7	14.404	5.829	0	0	0
Seward	20	17.442	7.058	7	5.903	2.389	2	2.824	1.142
Clark	14	37.414	15.141	43	168.754	68.2926	109	522.647	211.508
Ford	110	313.1	126.7	185	528.6	213.9	60	170.2	68.9
Hodge- man	40	45.6791	18.4856	21	19.121	7.7380	48	75.737	30.650
Meade	79	124.045	50.199	54	101.0848	40.9076	106	215.321	87.1776
<b>Total</b>	<b>355</b>	<b>667.4821</b>	<b>270.1126</b>	<b>358</b>	<b>872.6368</b>	<b>353.1262</b>	<b>403</b>	<b>1057.219</b>	<b>427.9036</b>

**Summary**

This project estimated a total of 1,116 windbreaks in the 7 county Coronado Crossing RC and D area that cover 2,597 acres. 27% of the windbreaks were found in good condition, 33% fair and 40% poor.

For each county the project has identified geospatial locations of windbreaks based upon their condition as shown in the Clark County map below. A final product will be the creation of a landowner layer which will enable the Kansas Forest Service to pro-actively contact landowners whose windbreaks qualify as a resource concern under EQIP for windbreak renovation.

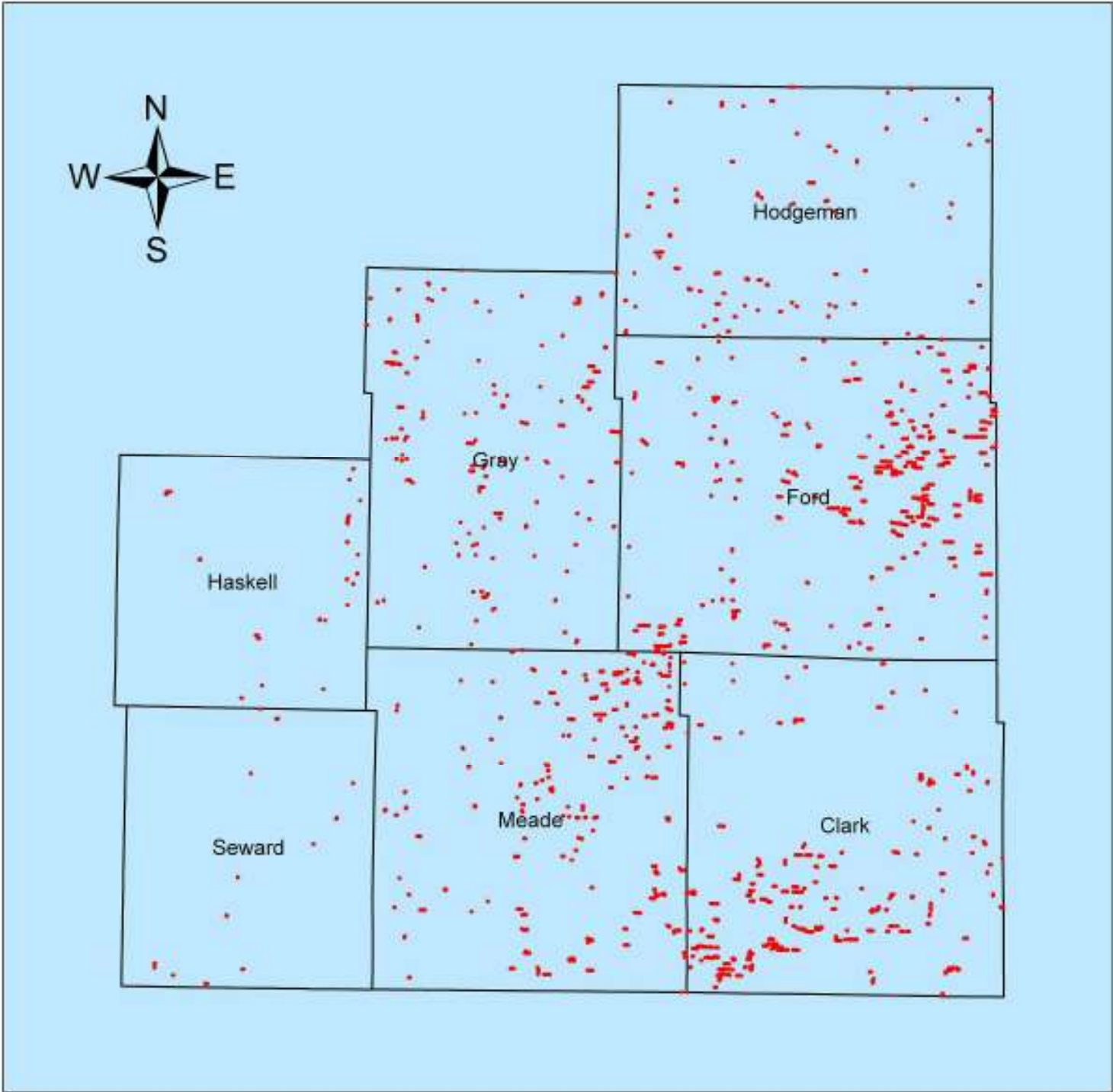




-  Poor Condition
  -  Fair Condition
  -  Good Condition
  -  County Boundary
- NAIP Image**

**Clark County  
Condition Assessment**



# Windbreaks Locations in Seven Counties, Kansas



 Windbreaks  
 Counties Boundary

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Created by: Kabita Ghimire  
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20  
Miles