

# RECLAMATION

*Managing Water in the West*

## Comparison of SWFL Habitat between Areas Occupied by Tamarisk Beetle and Unoccupied Habitat



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Bureau of Reclamation

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# Background

- **Tamarisk beetles introduced to the Virgin River in 2006 at St. George, Utah**
- **Widespread defoliation noted in 2008, progressed downriver**
- **Cooperative effort to understand impacts**
  - Bureau of Reclamation
  - Utah Division of Wildlife Resources
  - SWCA Environmental Consultants

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# Objective

- Quantify *Diorhabda* beetle defoliation metrics related to Southwestern Willow Flycatcher nesting habitat and examine the nature and strength of potential correlations with nesting success.

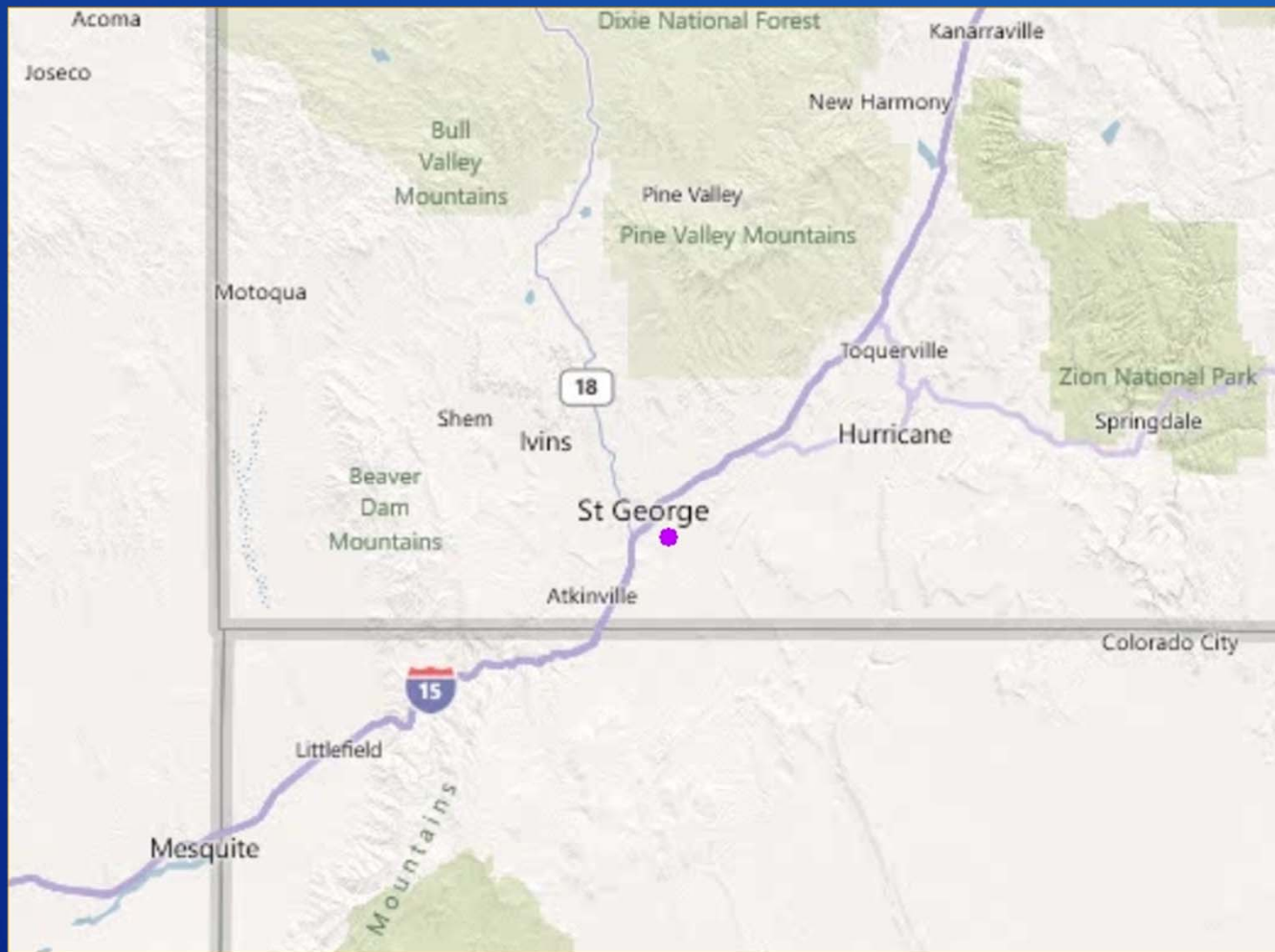
# Basic Design

- **Collect ground data and satellite imagery: defoliated and non-defoliated saltcedar stands.**
- **Determine relationship between vegetation data and satellite imagery.**
- **Extrapolate ground data to flycatcher nesting sites via satellite imagery relationships.**
- **Ascertain associations between extrapolated ground data and nesting data.**

# Ground Data

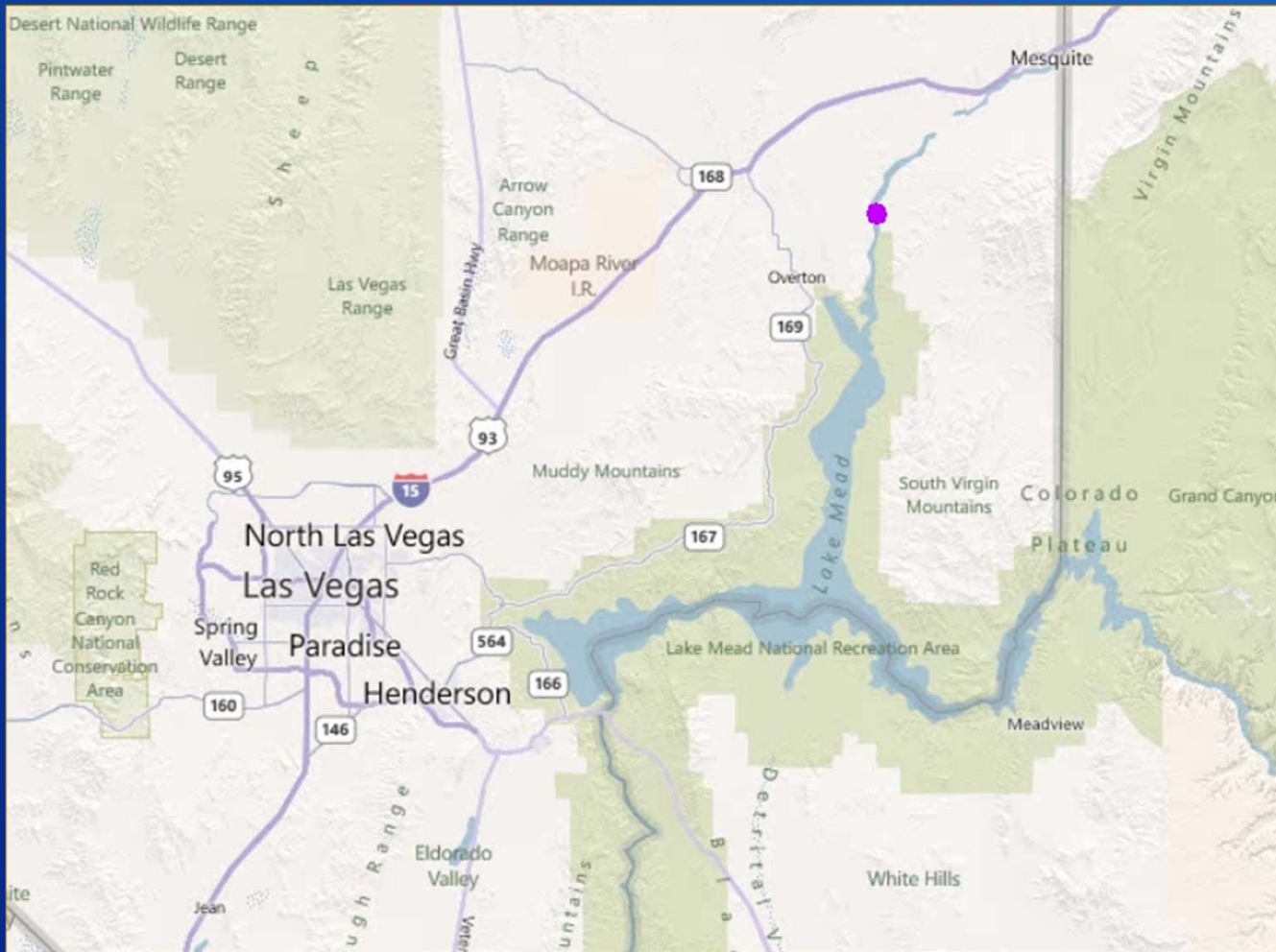
- **Two sites on the Virgin River:**
  - St. George (defoliated)
  - Mormon Mesa (non-defoliated)
- **25 monitoring locations at each site**
- **Data collected approximately every 2 weeks**
  - April through September of 2010 and 2011

# St. George



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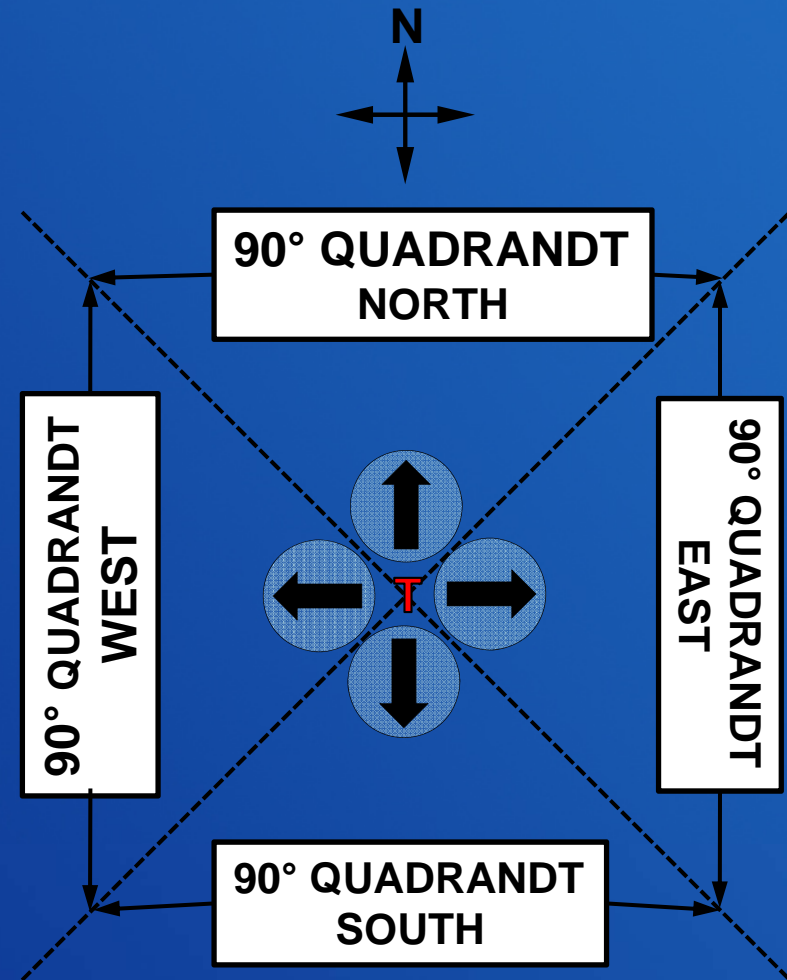
# Mormon Mesa



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# Monitoring Points

- Points at in center of LANDSAT-oriented grid pixels (centroid points)
- Examined vegetation density/composition of all centroid points at a distance of 25-55 meters of all previous know nesting locations



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# Data

## Vegetation

- Foliar density
- Foliage color
- Leafless stems
- Photographs

## Microclimate

- Temperature
- Humidity

## Beetles

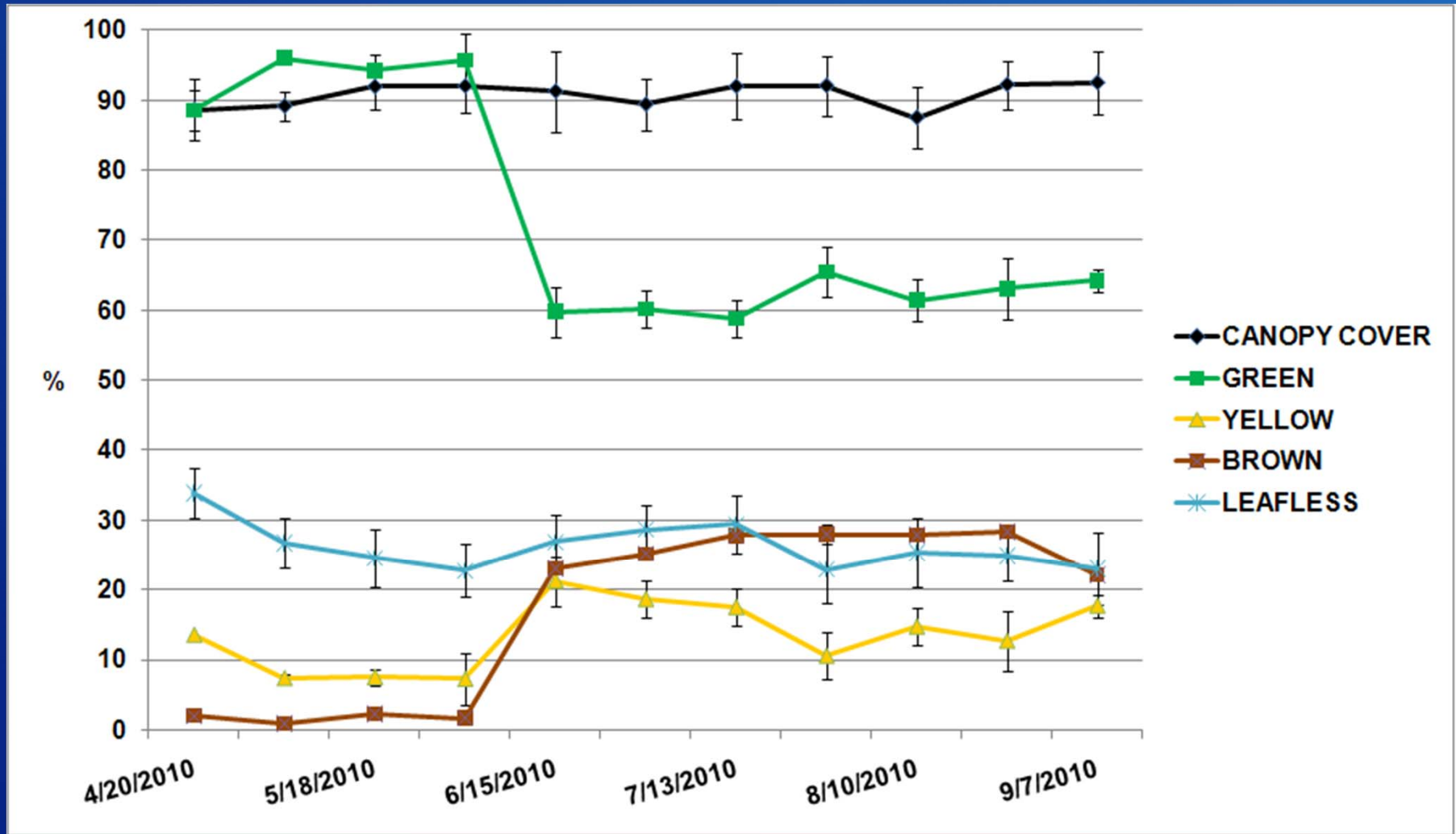
- Categorical population size by life stage:
  - Egg
  - Larvae
  - Adult

## Imagery

- LANDSAT
- QuickBird

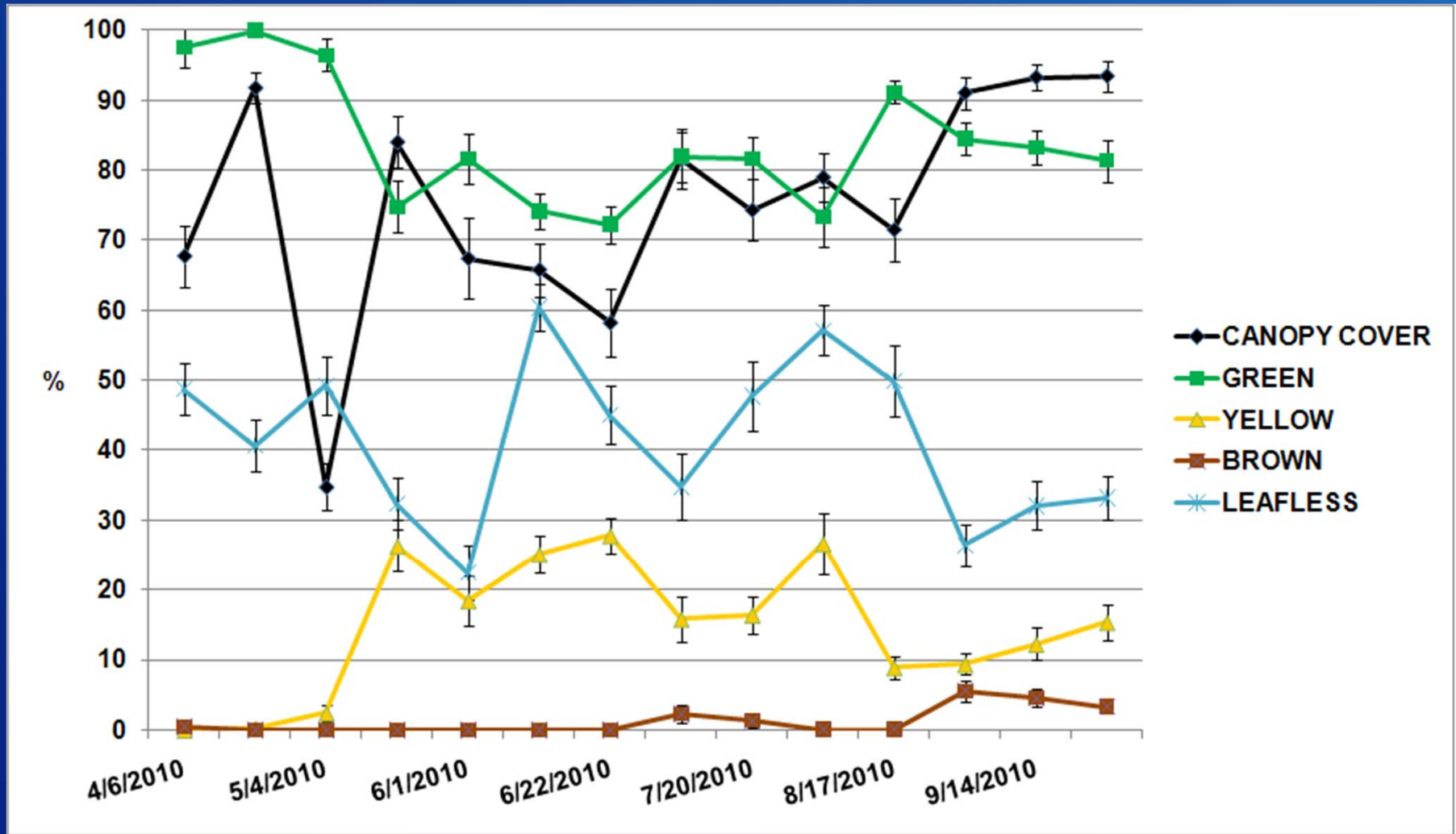
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# St. George Vegetation, 2010



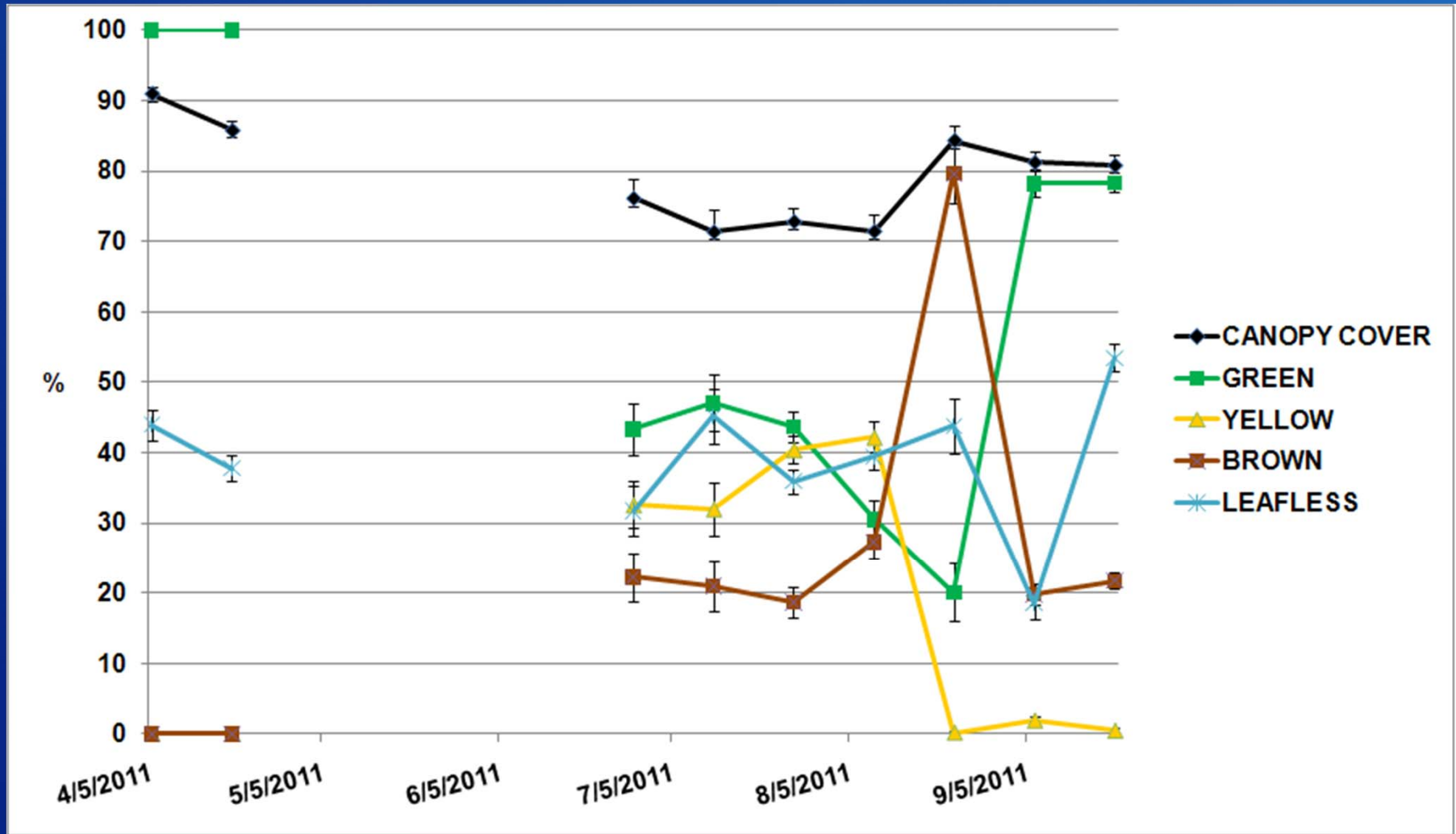
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# Mormon Mesa Vegetation, 2010



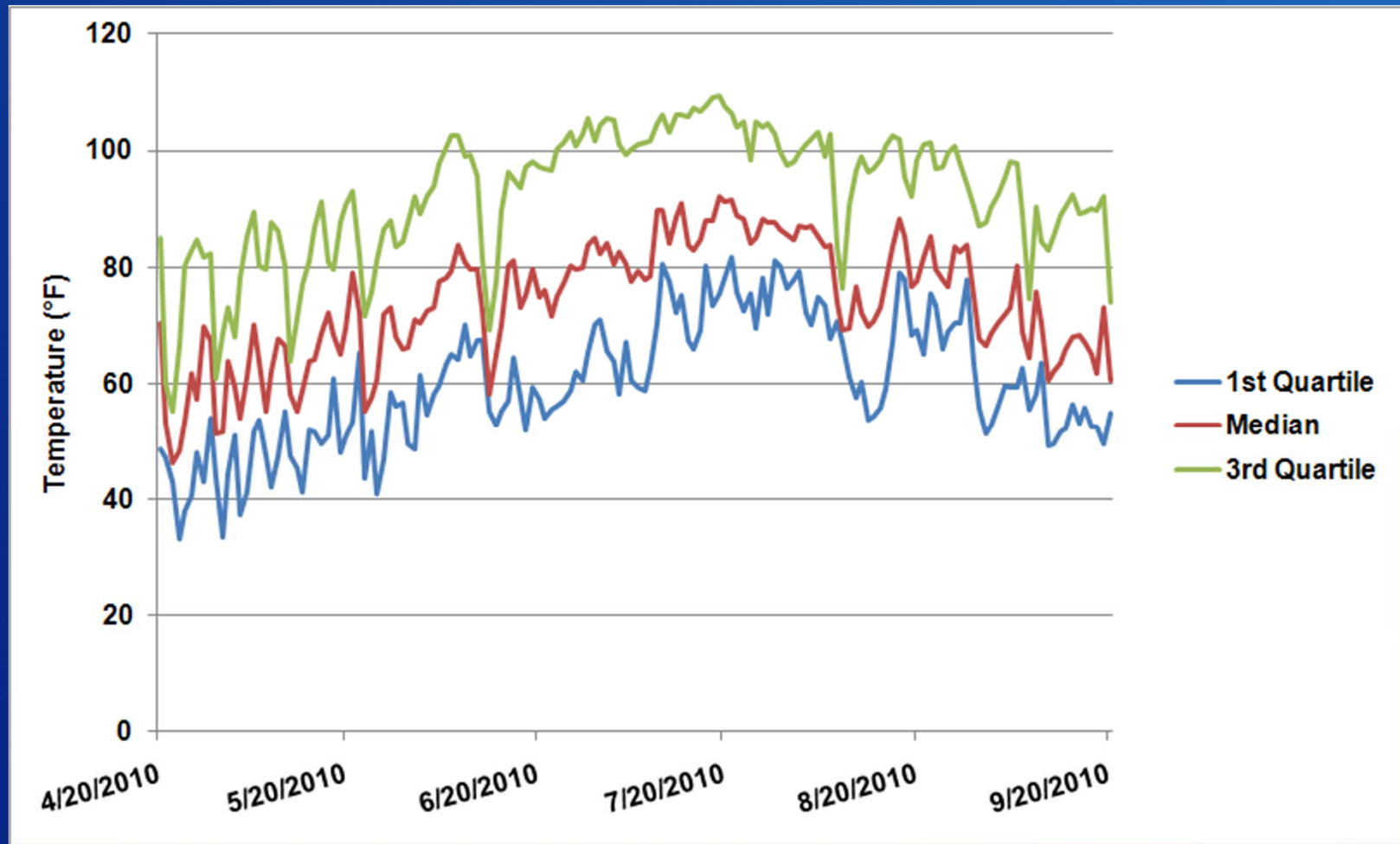
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# Mormon Mesa Vegetation, 2011



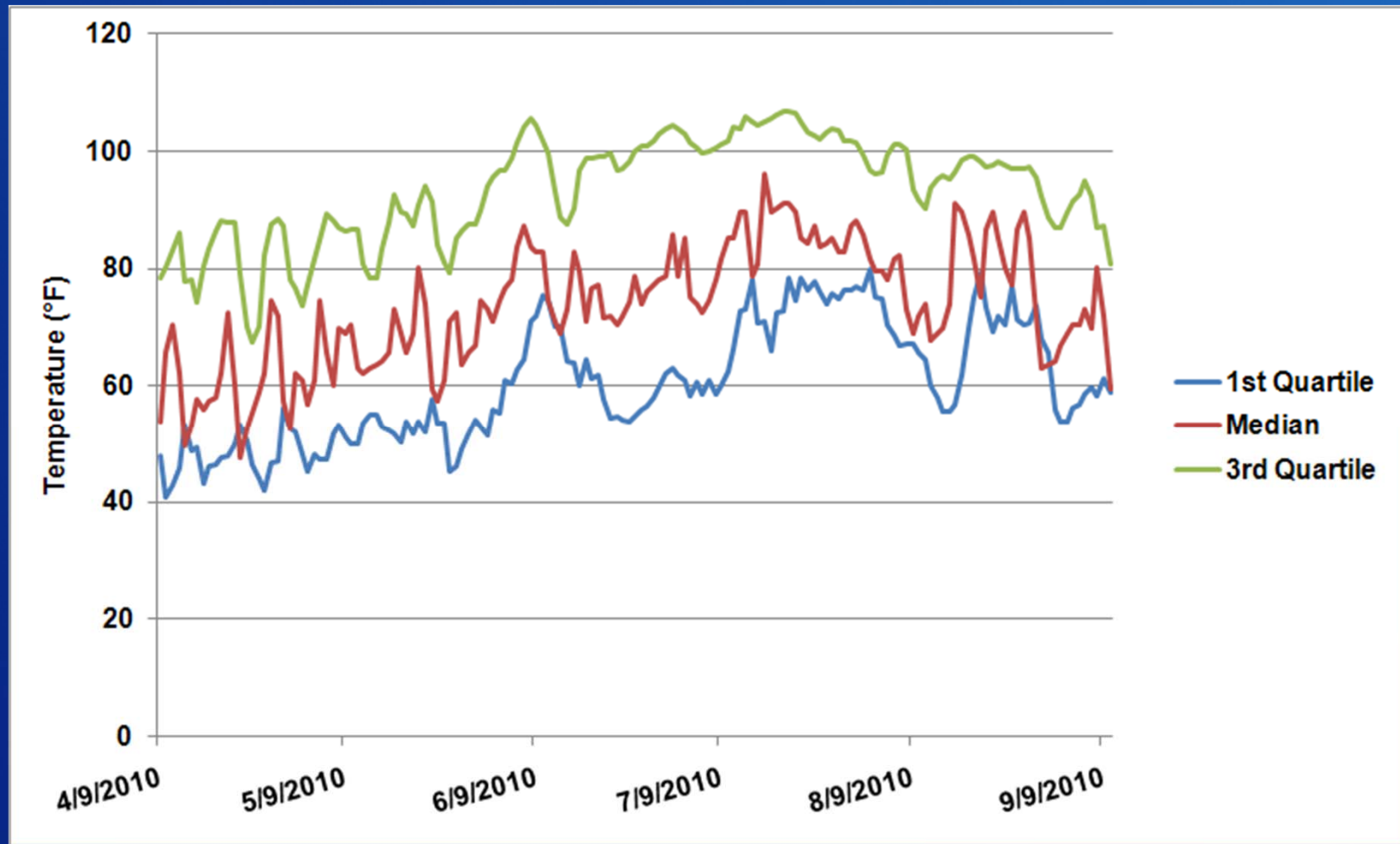
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# Microclimate Temperature St. George, 2010



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# Microclimate Temperature Mormon Mesa, 2010



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# Pairwise Correlations: NDVI and Ground Variables St. George, 2010

Variable	by Variable	Correlation	Count	Lower 95%	Upper 95%	Signif Prob
Canopy Cover	NDVI_Center	0.0797	197	-0.0608	0.217	0.2658
Canopy Cover	NDVI_Bilinear	0.1389	197	-0.0009	0.2734	0.0516
Green	NDVI_Center	0.1994	198	0.0617	0.3297	0.0048*
Green	NDVI_Bilinear	0.2087	198	0.0713	0.3383	0.0032*
Yellow	NDVI_Center	-0.2071	198	-0.3369	-0.0697	0.0034*
Yellow	NDVI_Bilinear	-0.215	198	-0.3441	-0.0779	0.0024*
Brown	NDVI_Center	-0.1504	198	-0.2839	-0.0112	0.0344*
Brown	NDVI_Bilinear	-0.1578	198	-0.2908	-0.0188	0.0264*
Leafless	NDVI_Center	-0.2929	198	-0.4153	-0.1599	<.0001*
Leafless	NDVI_Bilinear	-0.3273	198	-0.4464	-0.1968	<.0001*
Adult	NDVI_Center	0.0068	198	-0.1328	0.1461	0.9243
Adult	NDVI_Bilinear	0.0117	198	-0.1279	0.1509	0.8699
Larvae	NDVI_Center	-0.0634	198	-0.2011	0.0767	0.3746
Larvae	NDVI_Bilinear	-0.0748	198	-0.212	0.0653	0.2948
Egg	NDVI_Center	-0.0626	198	-0.2003	0.0776	0.3812
Egg	NDVI_Bilinear	-0.0064	198	-0.1457	0.1331	0.9284

# Pairwise Correlations: NDVI and Ground Variables St. George, 2010

Variable	by Variable	Correlation	Count	Lower 95%	Upper 95%	Signif Prob
Adult	Canopy Cover	-0.0744	197	-0.212	0.0661	0.2988
Adult	Green	0.1421	198	0.0027	0.276	0.0459*
Adult	Yellow	-0.0482	198	-0.1864	0.0919	0.5001
Adult	Brown	-0.172	198	-0.3041	-0.0333	0.0154*
Adult	Leafless	0.0814	198	-0.0587	0.2184	0.2543
Larvae	Canopy Cover	-0.129	197	-0.2641	0.011	0.0707
Larvae	Green	-0.5918	198	-0.6755	-0.4931	<.0001*
Larvae	Yellow	0.4388	198	0.3189	0.5449	<.0001*
Larvae	Brown	0.5681	198	0.4655	0.6556	<.0001*
Larvae	Leafless	0.1727	198	0.0341	0.3048	0.0150*
Egg	Canopy Cover	0.0413	197	-0.0991	0.18	0.5647
Egg	Green	0.1947	198	0.0568	0.3253	0.0060*
Egg	Yellow	-0.1085	198	-0.2443	0.0314	0.128
Egg	Brown	-0.1995	198	-0.3298	-0.0618	0.0048*
Egg	Leafless	0.0186	198	-0.1211	0.1577	0.7945

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