### Real- or Near-Real Time Monitoring of Military Training Land Sustainability

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## **Army Environmental Regulations**

- "...establish procedures to achieve optimum, sustainable use of training lands by implementing a uniform land management program that includes inventorying and monitoring land conditions..." AR 350-4
- "Maximize the capability, availability, and accessibility of ranges and training lands to support doctrinal requirements, mobilization, and deployment under normal and surge conditions".

AR 350-19

### **ITAM Program Structure**



Range and Training Land Assessment "Identify and Monitor Problems"

Land Rehabilitation and Maintenance "Fix Problems"

Sustainable Range Awareness "Educate Soldiers"

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**Training Requirements Integration** "Inform Future Training"

### **Fort Riley RTLA Objectives**

- To continuously monitor, assess, and identify trends in key indicators of military training land sustainability over appropriate time scales.
- To rapidly analyze data and to ensure information is available when needed by land managers.
- To maximize project effectiveness by employing proven methods to collect relevant data, while utilizing new "enterprise-friendly" approaches for data processing, analysis, visualization, and reporting.

## Fort Riley RTLA Concept





### **RTLA Components**

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### Surface Greenness

![](_page_7_Figure_1.jpeg)

- Collect and analyze time-series vegetation index data derived from satellite spectral measurements to monitor seasonal vegetation development.
- Identify normal and "extreme" vegetation conditions.
- Evaluate current vs. long-term average conditions.

**MODIS – NDVI (2010)** 

![](_page_8_Figure_1.jpeg)

![](_page_8_Figure_3.jpeg)

Prepared by the Geographic Information Systems Spatial Analysis Laboratory (GISSAL), Kansas State University for the Fort Revy (TAM Program NDV) data acquired from the MODIS TERRA sensor and is a maximum value composite for the indicated 16 day period.

![](_page_8_Picture_6.jpeg)

![](_page_9_Picture_0.jpeg)

Change in Greenness by Sequential MODIS NDVI 16 Day Composite Period Fort Riley ITAM 2010 10JUN-25JUN 1:150,000

![](_page_9_Figure_2.jpeg)

ms Spatial Analysis Laboratory (GESAL), Kansais State University for the Fort Recy ITAM Program view composite for the indicated 16 day period. Change in NEVI calculated to subtractive the

![](_page_9_Figure_4.jpeg)

### **MODIS – Change in Greenness**

![](_page_10_Figure_1.jpeg)

### **Phenological Development**

### Phenological Development (2001-Current)

![](_page_11_Figure_2.jpeg)

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### **MODIS - Deviation from Normal**

Change in MODIS NDVI 16 Day Composite Greenness vs. Long-Term Average Fort Riley ITAM 2010 10JUN-25JUN (Long-Term Average = 2001-2009) 1:150,000

![](_page_12_Figure_2.jpeg)

Prepared by the Geographic Information Systems Spatial Analysis Laboratory (GSSAL), Kansas State University for the Fort Recy ITAM Program NOVI data accume tricm the MODE TERRA sensor. Chance in NOVI calculated by lubitations the long-term average from the current 16 day composite main

Change in MODIS NDVI 16 Day Composite Greenness vs. Long-Term Average Fort Riley ITAM 2010 26JUN-11JUL (Long-Term Average = 2001-2009) 1:150,000

![](_page_12_Figure_5.jpeg)

Prepared by the Geographic Information Systems Spatial Analysis Laboratory (GSSAL), Kansas State University for the Fort Recy ITAM Program IDVI data acquired from the MODIS TERRA sensor. Change in NDVI calculated by subfracting the long-term average from the current 16 day composite image

### **Current vs. Normal Phenology**

![](_page_13_Figure_1.jpeg)

## **Aboveground Biomass**

![](_page_14_Figure_1.jpeg)

- Correlate satellite-derived NDVI with field data to spatially estimate peak, or near-peak, vegetation biomass across the installation.
- Frequency = Annual

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Identify areas of low vegetation production.

### **Estimated Aboveground Biomass**

![](_page_15_Figure_1.jpeg)

Relationship, based on linear regression, between satellite-derived NDVI values and field estimates of aboveground vegetation biomass for the period 27 JUN – 13 JUL 10 at Fort Riley, Kansas.

![](_page_15_Figure_3.jpeg)

Properd by the Geographic Information Systems Spatial Analysis Laboratory (GISSAL), Karaas Statu University for the Fort Ray (FAM Program Factorial vegetation cover (Fc) wa - estimated union the following ensorable metaneous and a status and the Company and the Company and the LANDSATS 111 seriod

![](_page_16_Picture_0.jpeg)

### Fort Riley ITAM Information Portal Range and Training Land Assessment and Monitoring

![](_page_16_Picture_2.jpeg)

ITAM Points of Contact for Vegetation Data and Information

**Boilerplate Statements** 

# Conclusions

- Entrenches the concept of sustainability in the SRP mission statement and establishes the role of RTLA in monitoring sustainability criteria for the commander's training needs.
- Strengthens the RTLA role in LRAM project identification and evaluation.
- Establishes common set of quantitative sustainability indicators for air, biological, water, and soil resources, while allowing for installation-specific management tasks.

### Conclusions, cont'd

 Maximizes the use of technology to continuously monitor training lands providing commanders with near real-time access to sustainability status and trends.

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![](_page_19_Picture_3.jpeg)

![](_page_19_Picture_4.jpeg)

![](_page_19_Picture_5.jpeg)

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