

Applicability of Various Spatially Resolved Multispectral Imagery to Identifying Invasive Species

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Project Goals

The overall goals of this project is to research and develop means of applying GIS and remote sensing technologies to aid ... management invasive plants species and rangeland health

As part of these goals:

- awareness and education
- inventory, mapping, and monitoring
- assessments and adaptive planning
- research and technology (ISDA, 1999).

Study Plants



Leafy Spurge (*Euphorbia esula*)

- fast growing perennial forb
- >10% cover → grazing loss
- >80% cover → cannot graze
- \$150M loss annually



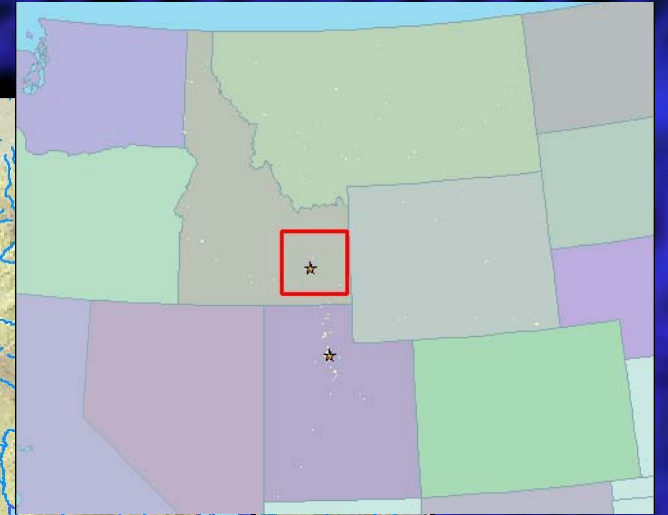
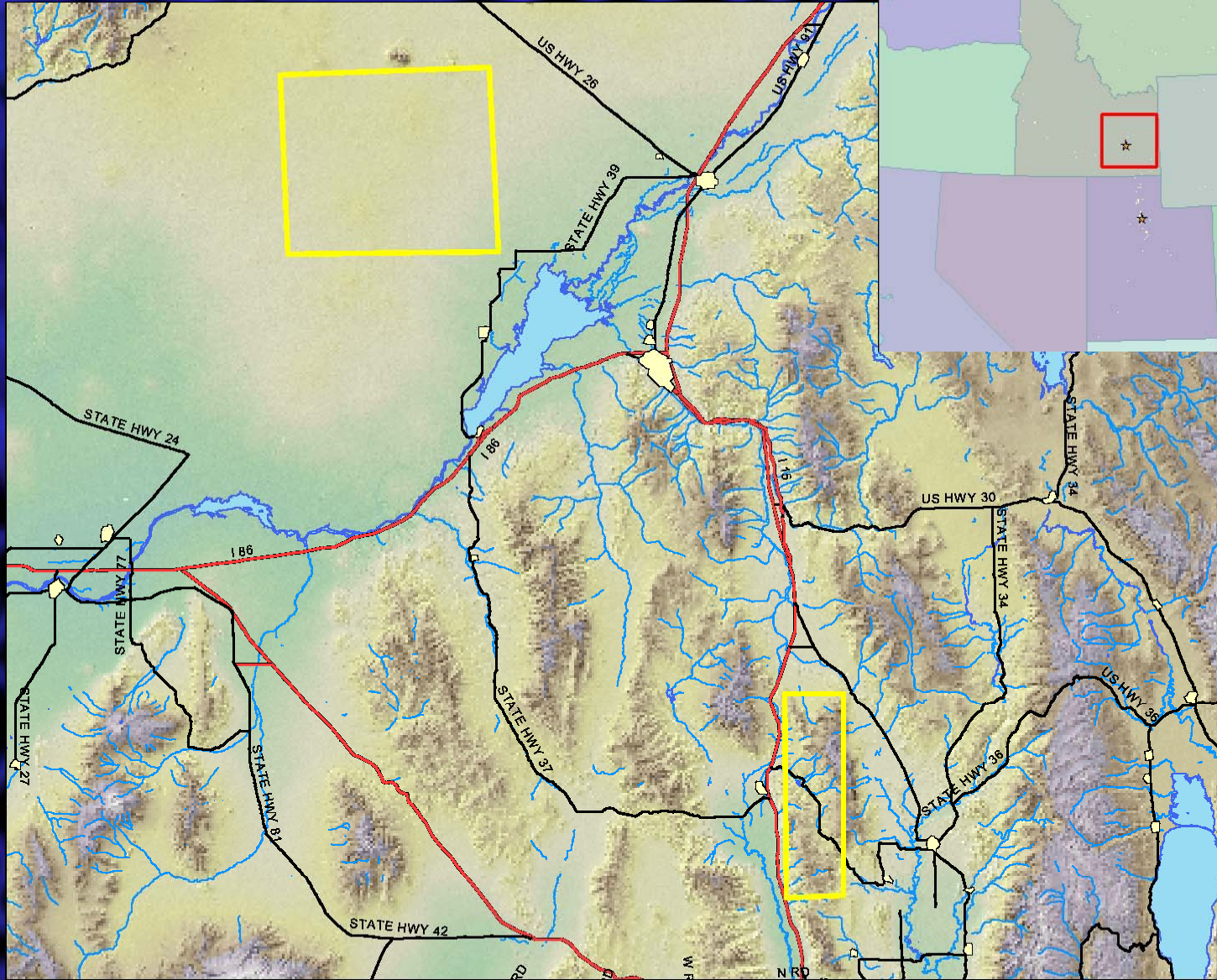
Study Plants



Cheatgrass (*Bromus tectorum*)

- weedy annual grass
- forage early for limited time—then harmful
- highly invasive—fire tolerant/propagating

Study Areas



Study Methods

Training Sites Collected with GPS

- Percent Grass Cover
- Percent Weed Cover
- Percent Dominant Shrub
- Percent Litter & Duff
- Collect Photographs
- AUM Clipping
- Sage diameter



Study Methods

Relational Database

- Organize data
- Relate points to
 - Grazing
 - Fire
 - Soil data
 - Control info

The screenshot displays the ArcMap interface with the following data tables:

FID	Shape	POINT_ID	DATE	DOMINANT_W	PCT_DOMINA	PCT_SHRUB	DOMINANT_S	MEAN S
4	Point	3	7/16/02	Lealy Spurge	51-75%	1-5%	Serviceberry	low (1-50cm)
5	Point	4	7/16/02	Lealy Spurge	76-95%	1-5%	Serviceberry	medium (51-100)
6	Point	5	7/16/02	Lealy Spurge	76-95%	6-15%	Serviceberry	medium (51-100)
7	Point	6	7/16/02	Lealy Spurge	51-75%	16-25%	Serviceberry	medium (51-100)
8	Point	7	7/16/02	Lealy Spurge	76-95%	0%	none	none
9	Point	8	7/16/02	Lealy Spurge	36-50%	0%	none	none

OID	POINT_ID	LAST_GRAZE	GRAZE_ANIM
0	102B	1995	-999
1	102C	1995	-999
2	104B	1995	CATTLE
3	108A	1995	-999
4	108C	1995	-999
5	109A	1995	-999
6	109B	1995	-999
7	109C	1995	-999
8	110B	1995	-999
9	110C	1995	-999
10	111A	1995	-999

OID	POINT_ID	SAGE_DIAM	SAGE_AGE
0	102B	17	16
1	102B	17	16
2	102B	30	23
3	102B	32	25
4	102C	17	16
5	102C	41	30
6	102C	43	31
7	102C	61	41
8	109A	44	31
9	21C	32	25
10	21C	36	27
11	22C	44	31

Study Methods

Supervised Classification:

- Identity and locations known
- These become our training sites

Classification Strategies

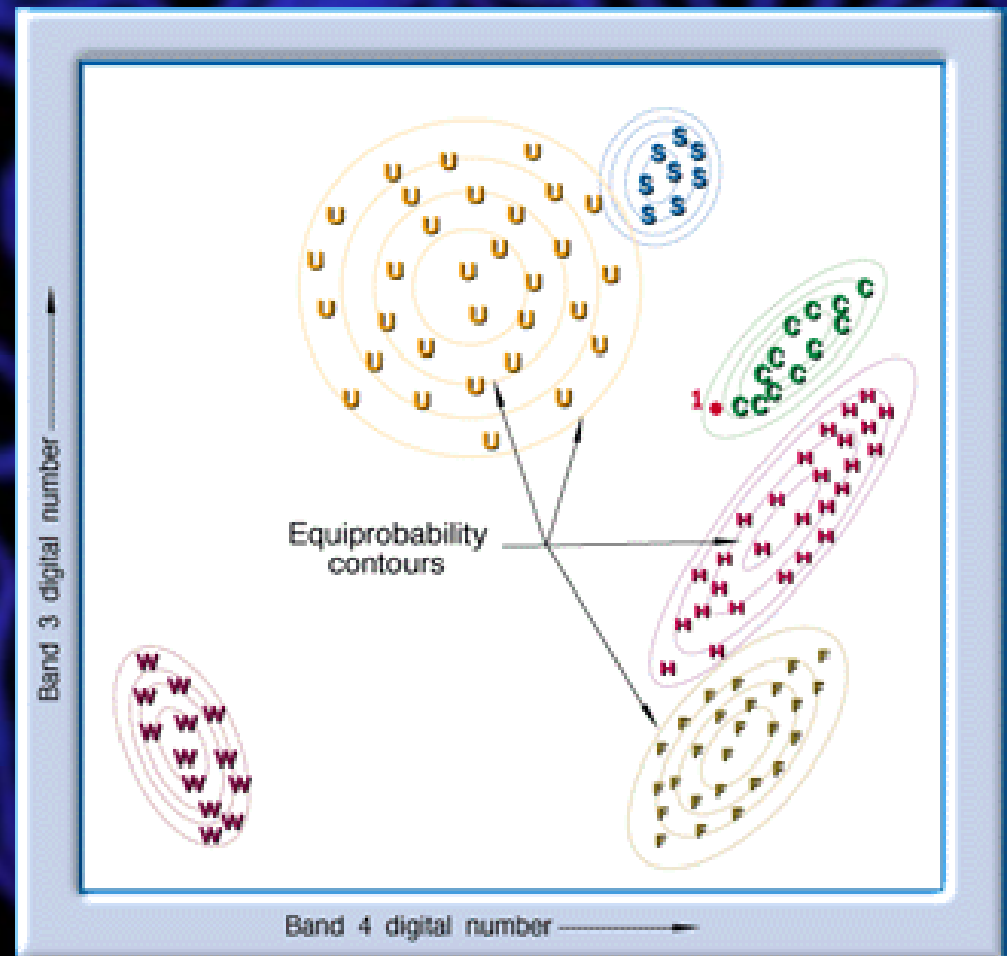
- Spectral Angle Mapping
- Minimum distance to means
- Maximum likelihood
- Fuzzy Logic

Study Methods

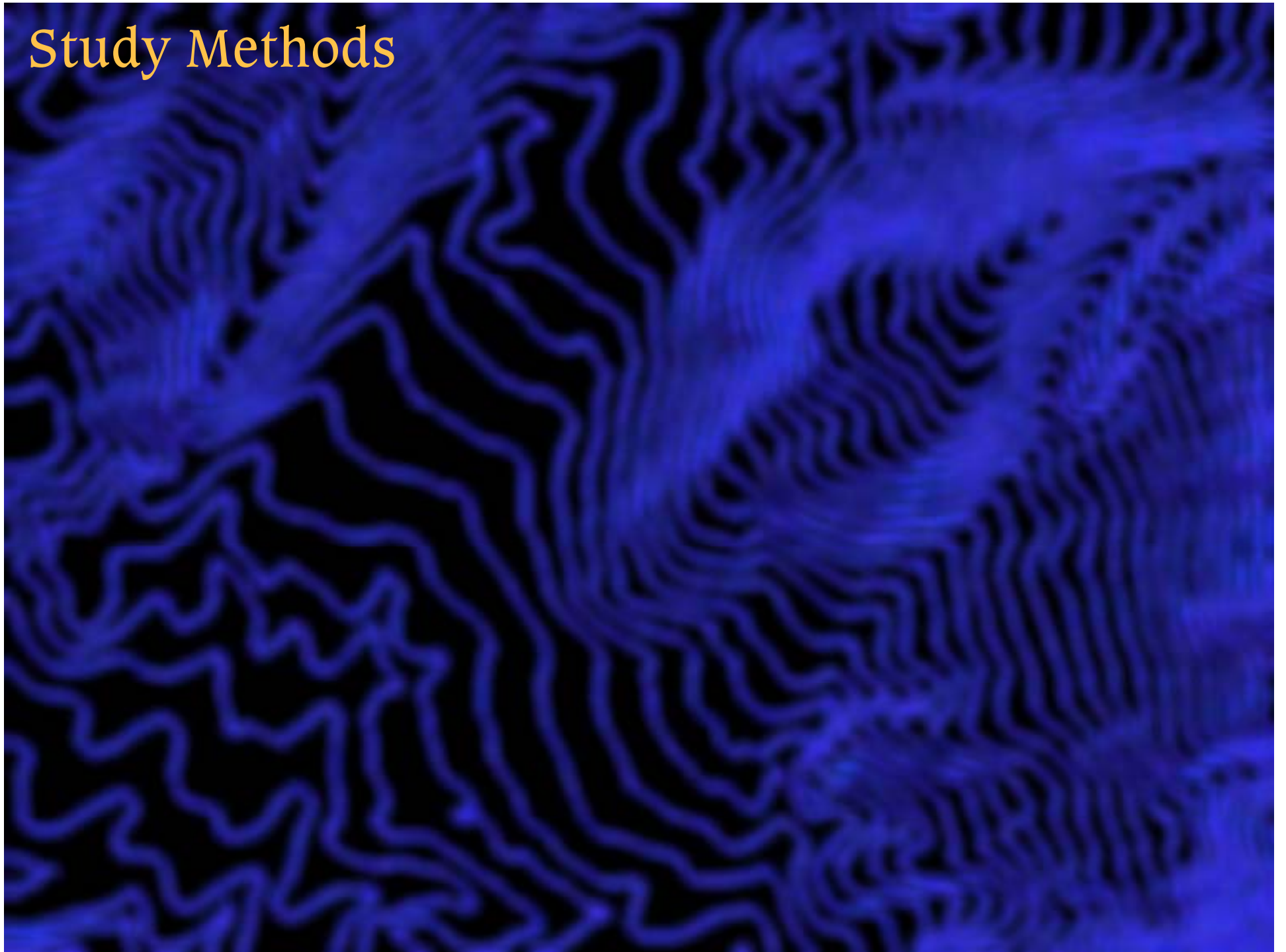
Soft (Fuzzy) Classifiers

- Allows one pixel to be a member of several classes
- Opposed to hard (crisp)—largest single representative group ‘wins’
- Utilizing combinations of techniques

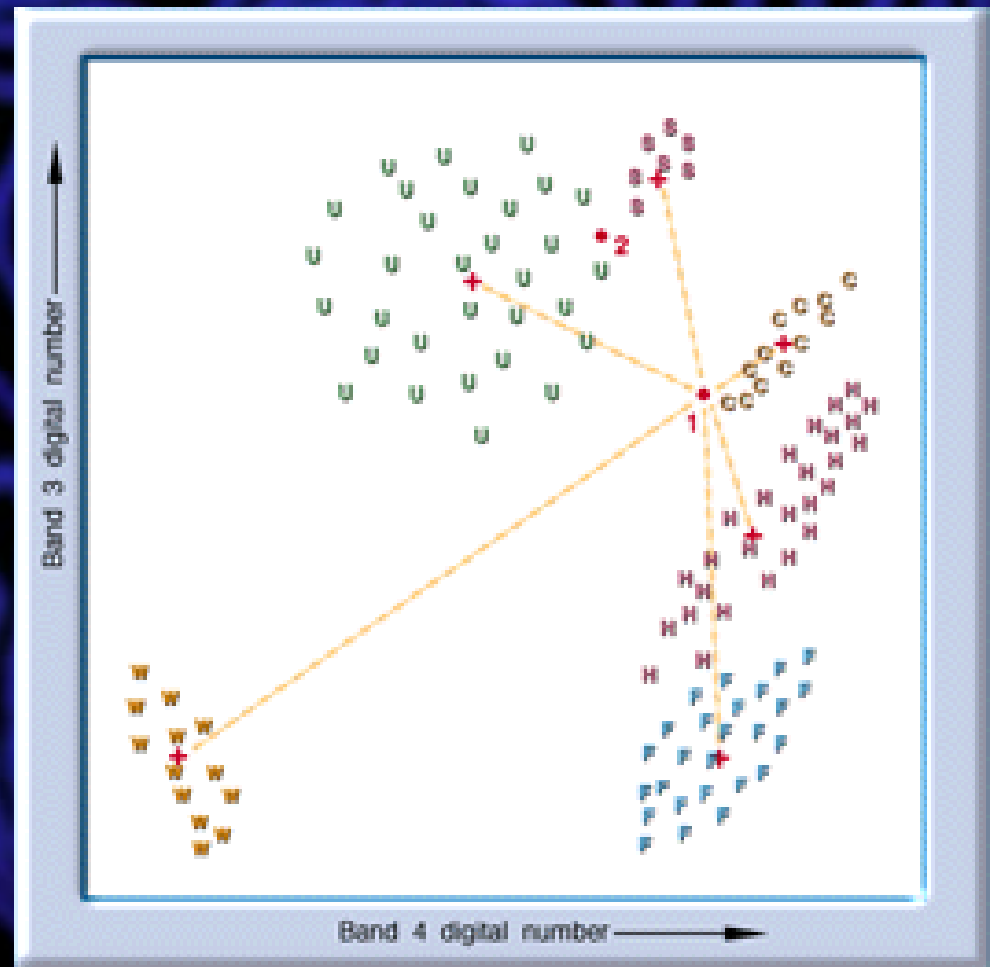
Study Methods



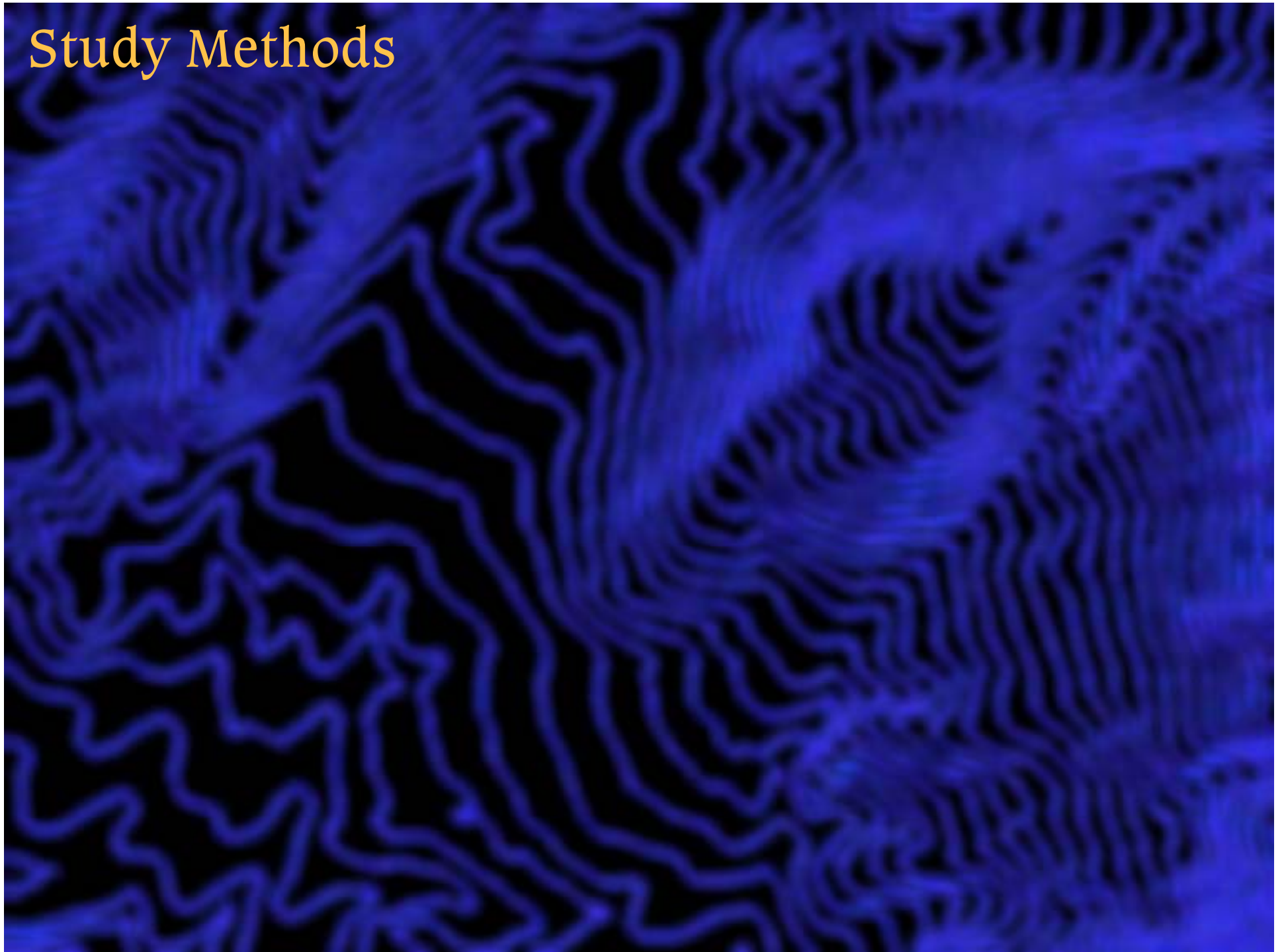
Study Methods



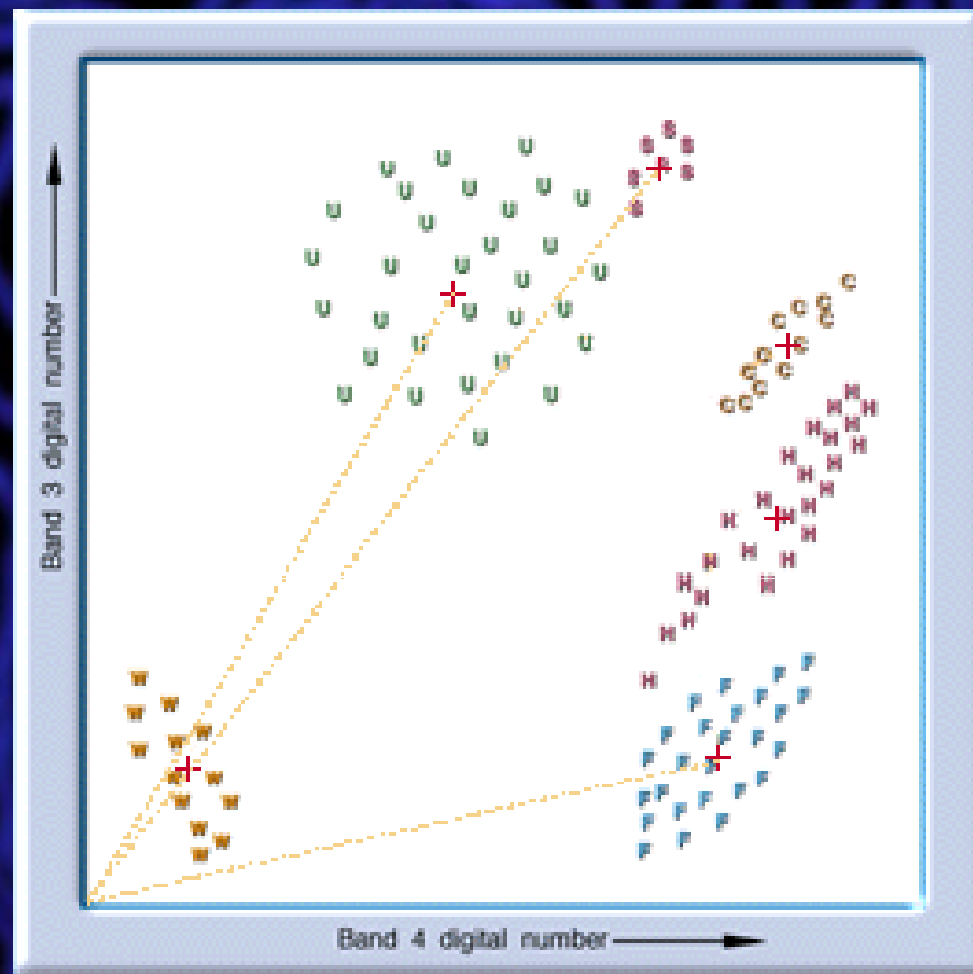
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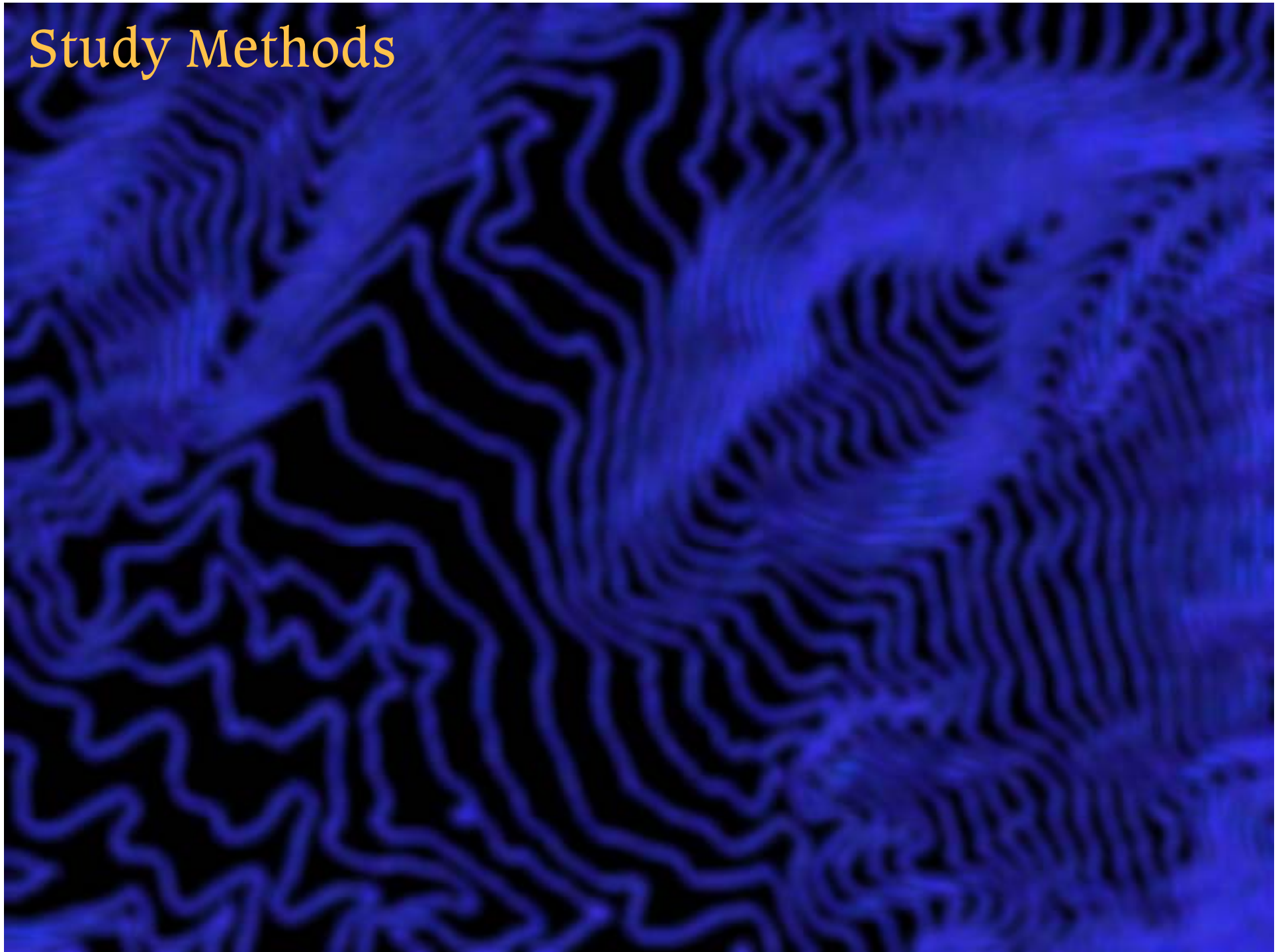
Study Methods



Study Methods



Study Methods



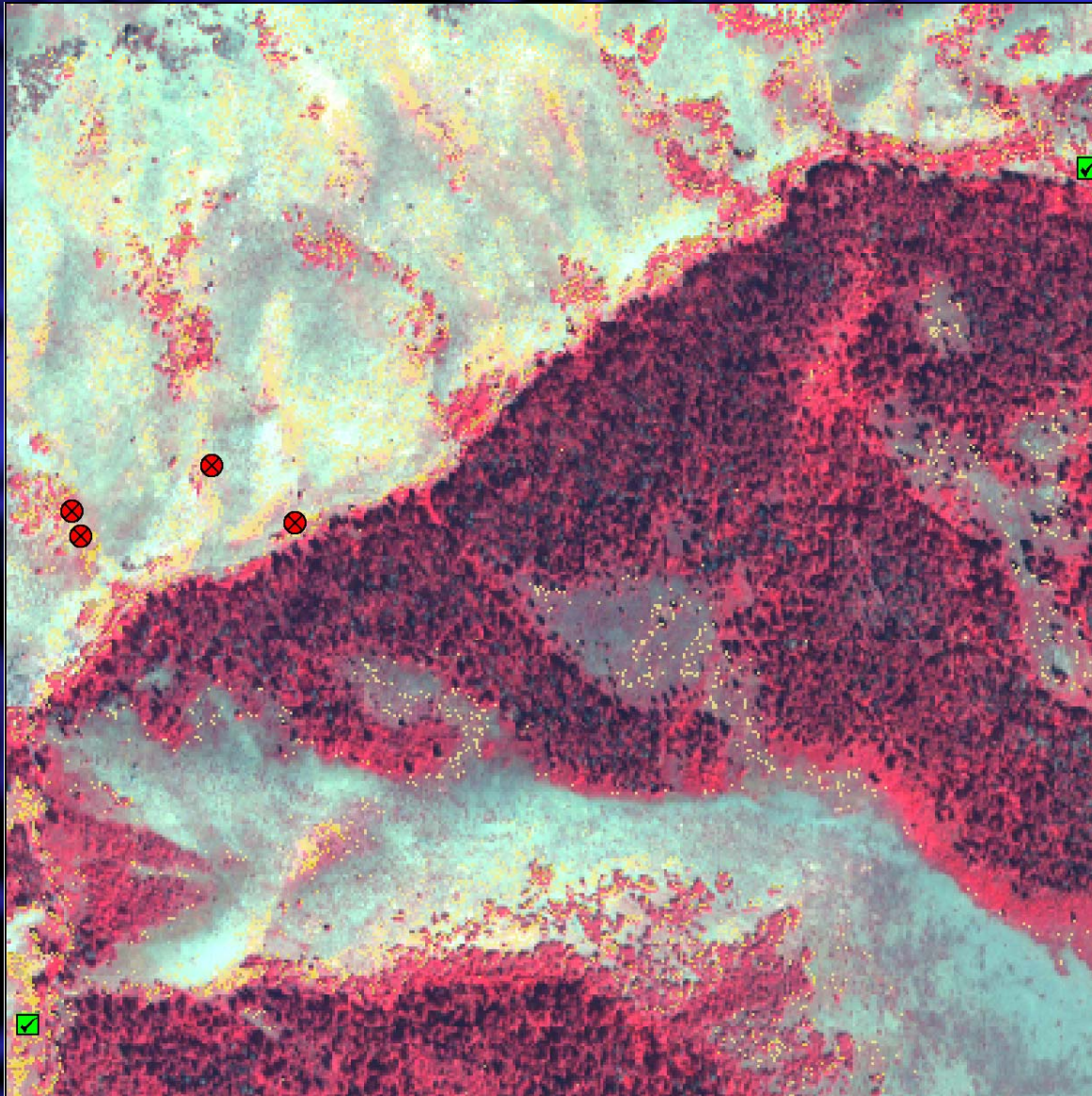
Challenges

- Georectification
- Control measures
 - Chemical
 - Biological
- Lack of original samples
- Late season imagery

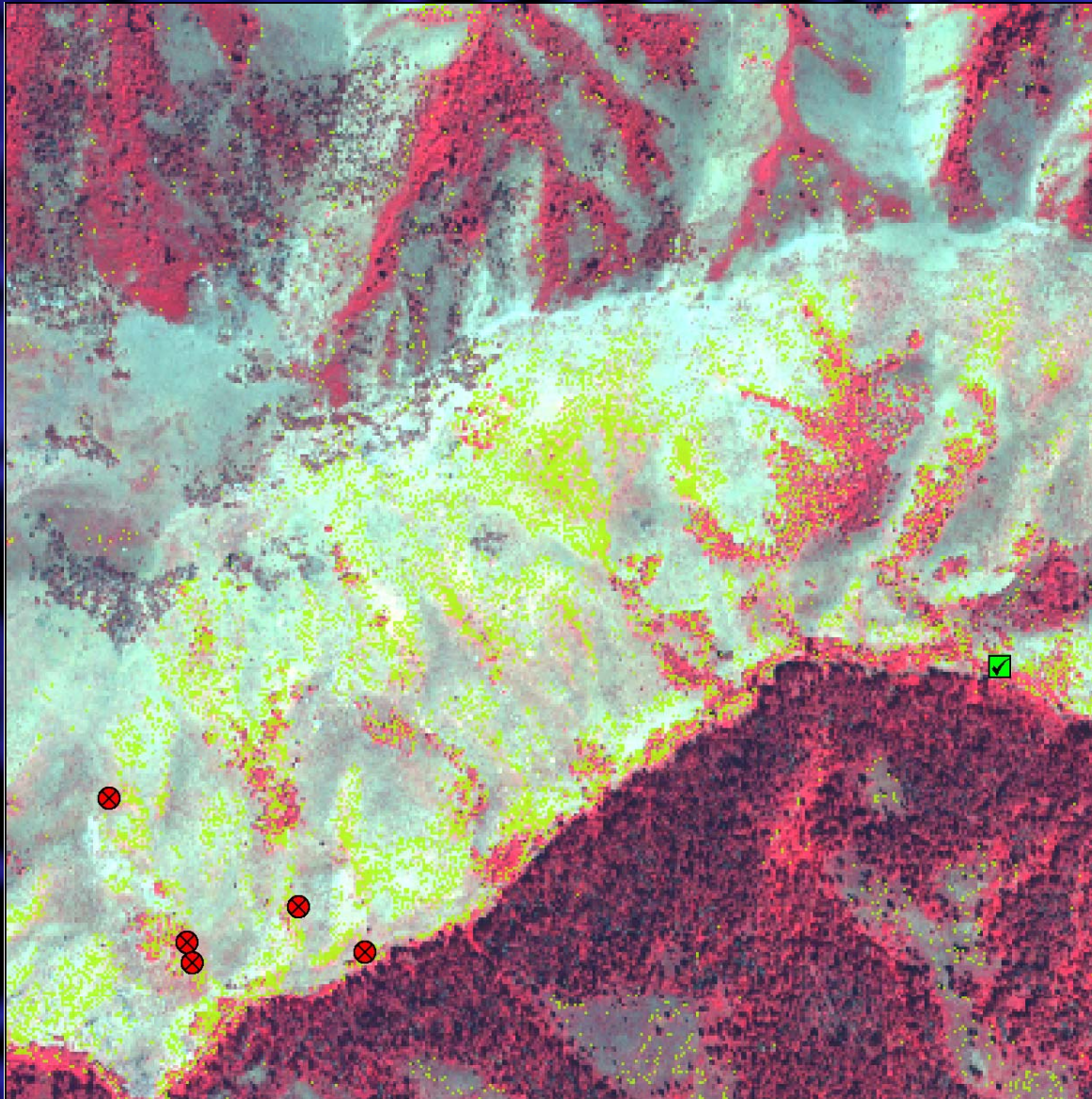
Preliminary Results



Preliminary Results



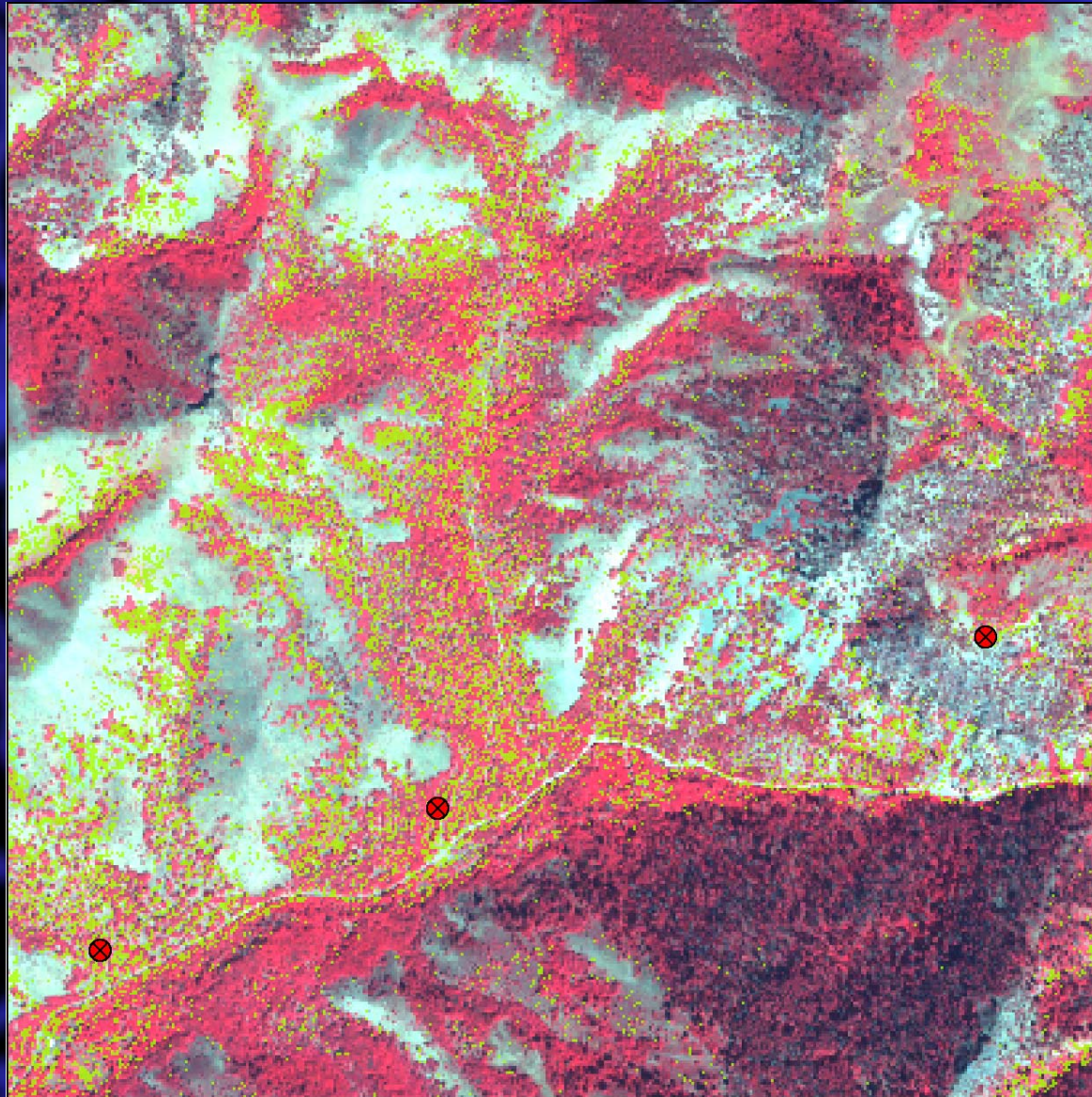
Preliminary Results



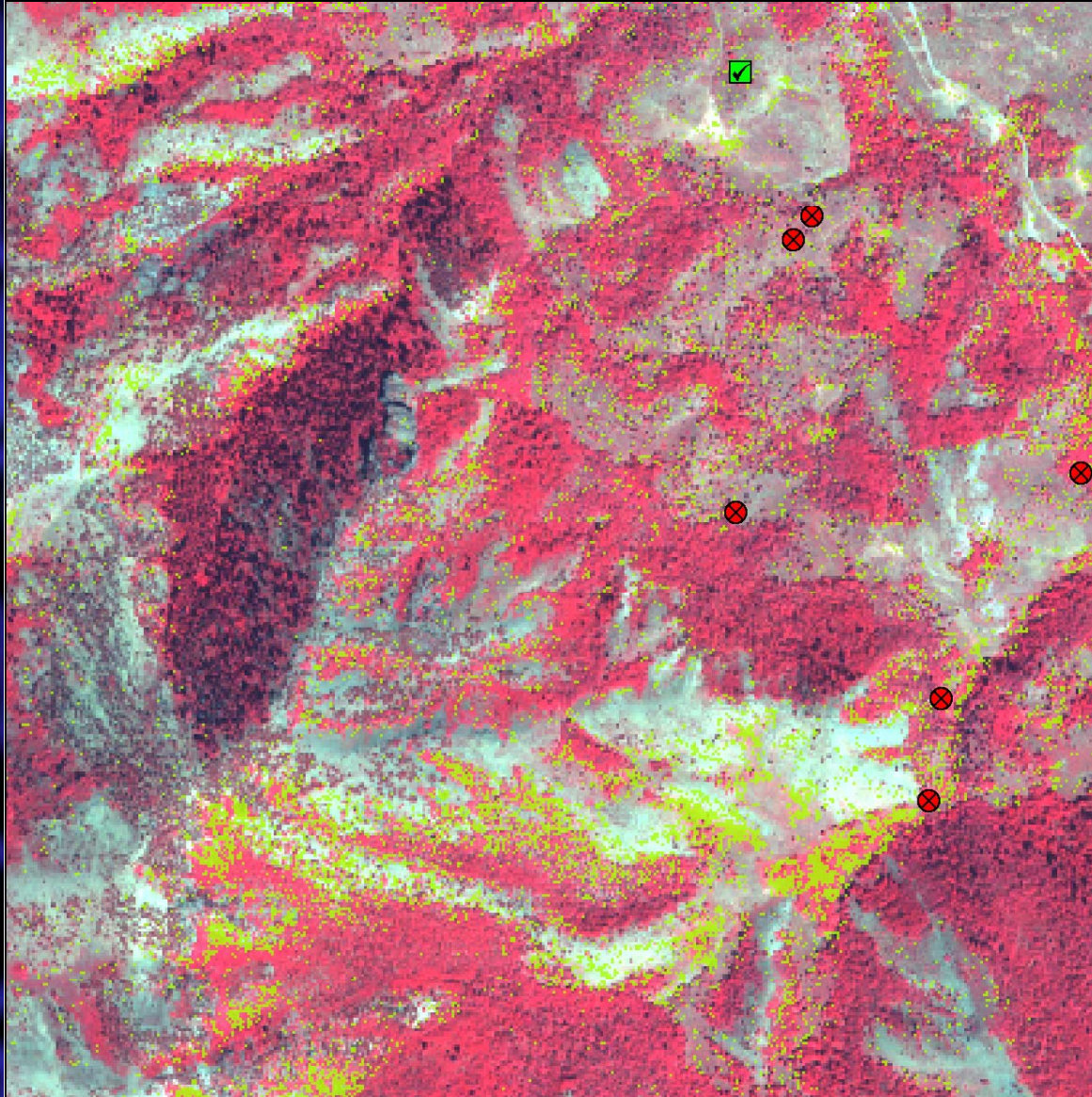
Preliminary Results



Preliminary Results



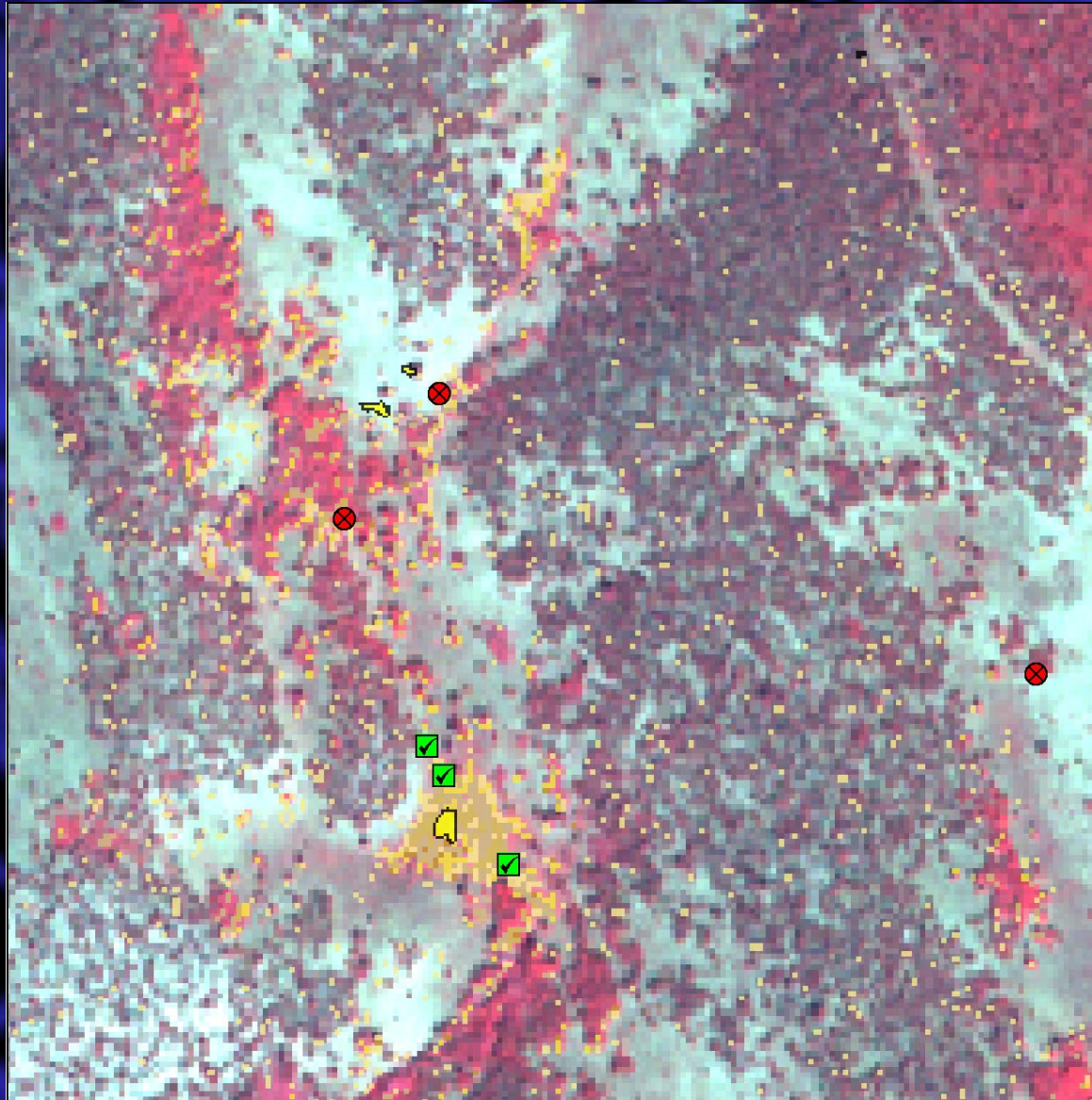
Preliminary Results



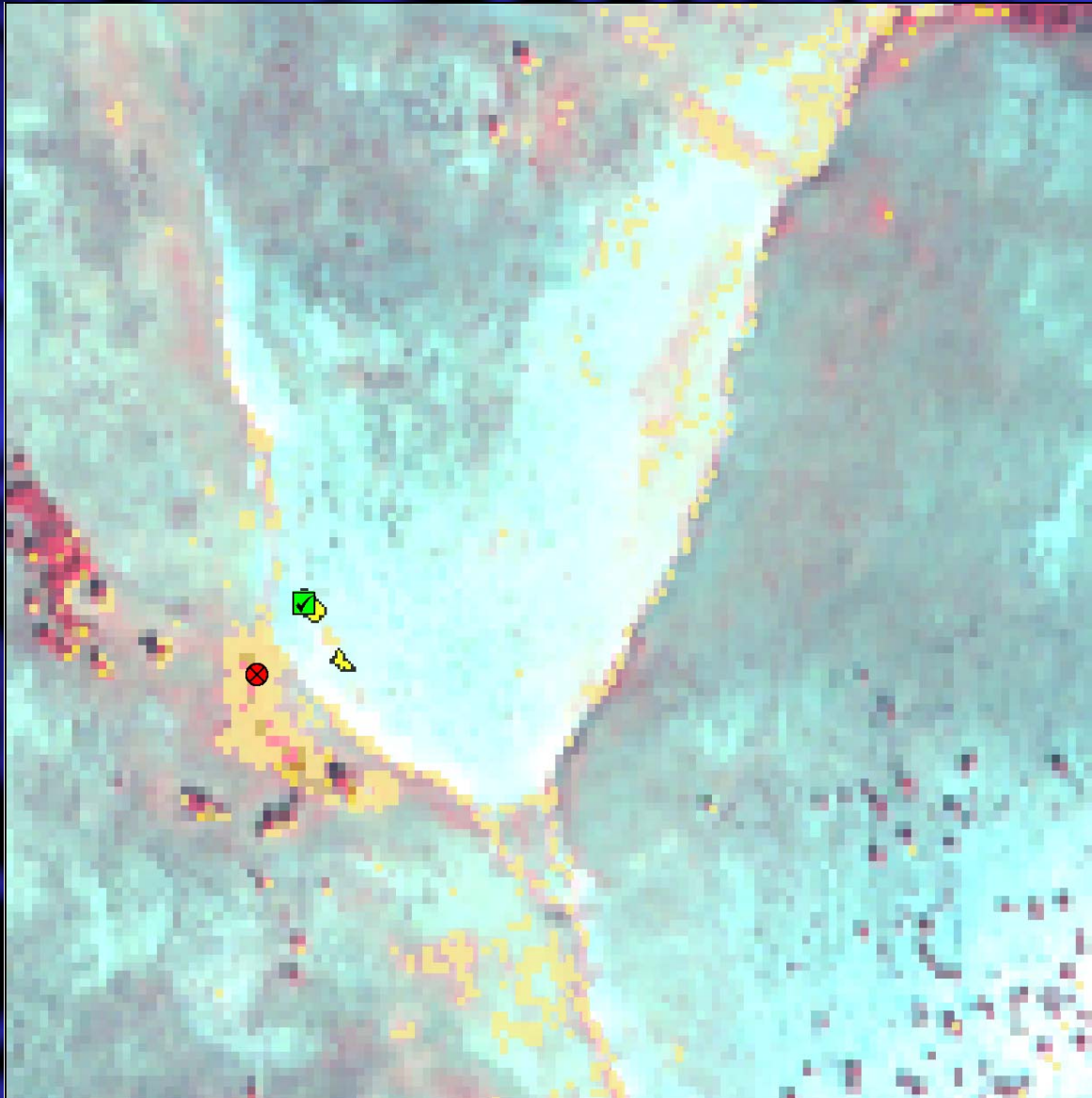
Preliminary Results



Preliminary Results



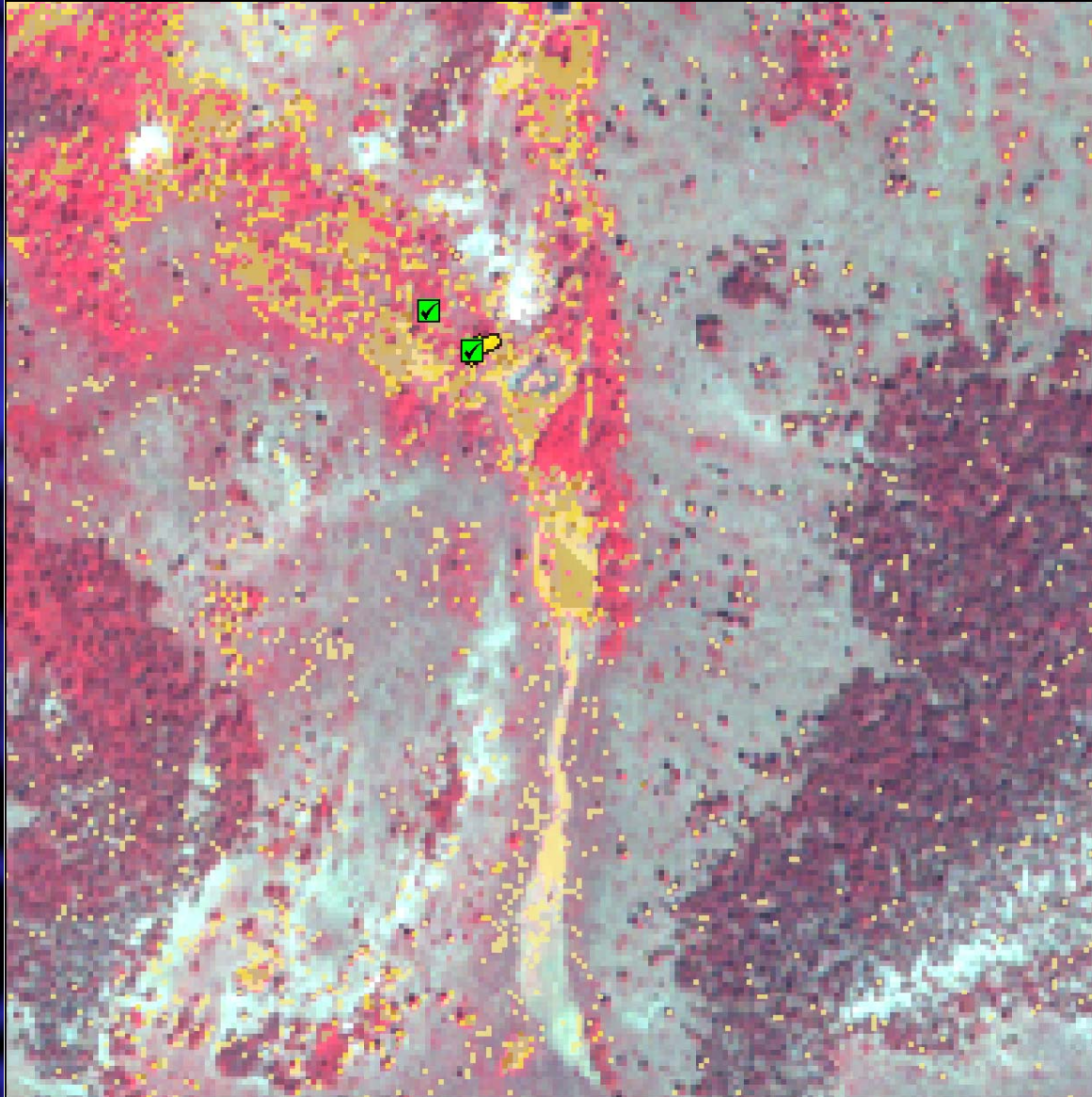
Preliminary Results



Preliminary Results



Preliminary Results



Rangeland Health Indicators

“Adapt various indicators of rangeland health to evaluation through the application of geotechnologies”

We will evaluate the following indicators:

- Bare ground
- Proportion of functional/structural groups
- Plant decadence
- Litter amount
- Invasive plants (*B. tectorum*)

Project Timeline

- Collection of additional and more detailed training data—Summer 2003
- Public Outreach—Fall 2003
- Refine model—2003-2004
- Public Outreach—Fall 2004
- Final models delivered 2005

Questions

- Questions
- Comments
- Suggestions

Thanks to NASA, this research and
public outreach are possible

