THE IMMIGRATION IMPACT

Assessing the environmental impact of illegal immigration in the
Sonoran Desert National Monument.

A research project for GPH 496, Fall 2010.
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U.S. DEPARTMENT OF THE INTERIOR
Bureau of Land Management

Sonoran Desert
NATIONAL MONUMENT

SONORAN DESERT NATIONAL MONUMENT

The Sonoran Desert National Monument is a magnificent example of untrampled Sonoran desert landscape. The area encompasses a functioning desert ecosystem with an extraordinary array of biological, scientific, and historic resources. The most biologically diverse of the North American deserts, the monument consists of distinct mountain ranges separated by wide valleys, and includes large saguaro cactus forest communities that provide excellent habitat for a wide range of wildlife species.

KEY MONUMENT FACTS AND FIGURES

- 487,000 acres
- Established in 2001
- Most biologically diverse desert in North America
- Home to three congressionally designated wilderness areas
- Distinct mountain ranges separated by large valleys
- Abundant saguaro cactus forests
- Critical habitat for desert tortoise
- 200 species of birds, 59 species nest in Vekol Valley

WHAT'S AT STAKE

Sonoran Pronghorn | Cactus | Desert tortoise

THE DAMAGE

Abandoned cars | Soil damage | Trash

Sonoran Desert National Monument

Phoenix

Map area

SOURCES: Sonoran Desert National Monument, Bureau of Land Management, US Forest Service, Logos courtesy of respective agency.

Gila Bend

Peters Corner

SAND TANK MOUNTAINS

JAVELINA MTN

VEKOL VALLEY

TABLE TOP WILDERNESS

TABLE TOP VALLEY

VAIVA HILLS

THE STUDY AREA
The area of the Sonoran Desert National Monument below Interstate 8 was chosen as our study area because it is more accessible to human migration and smuggling.

RESEARCH QUESTIONS

Immigration activities have real environmental impacts on the desert environments of Arizona. Despite this, no inventory has been completed to define the extent of the degradation. Our project attacks this issue by presenting two research questions to assess and catalog the impact in the Sonoran Desert National Monument.

The questions we pose are:

1. Where are the environmentally sensitive areas?
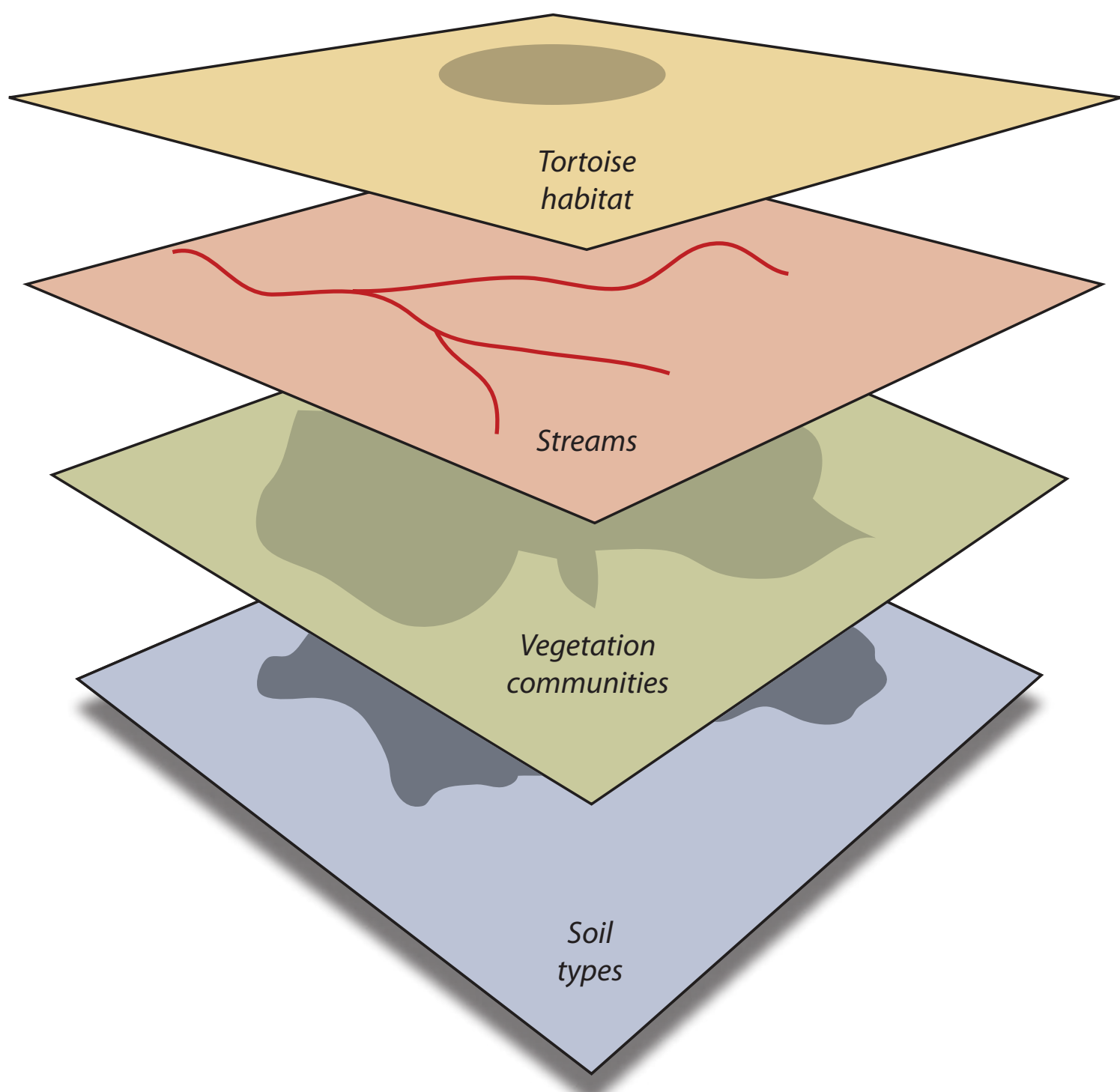2. How do we catalog and classify the damage?

METHODS AND RESULTS
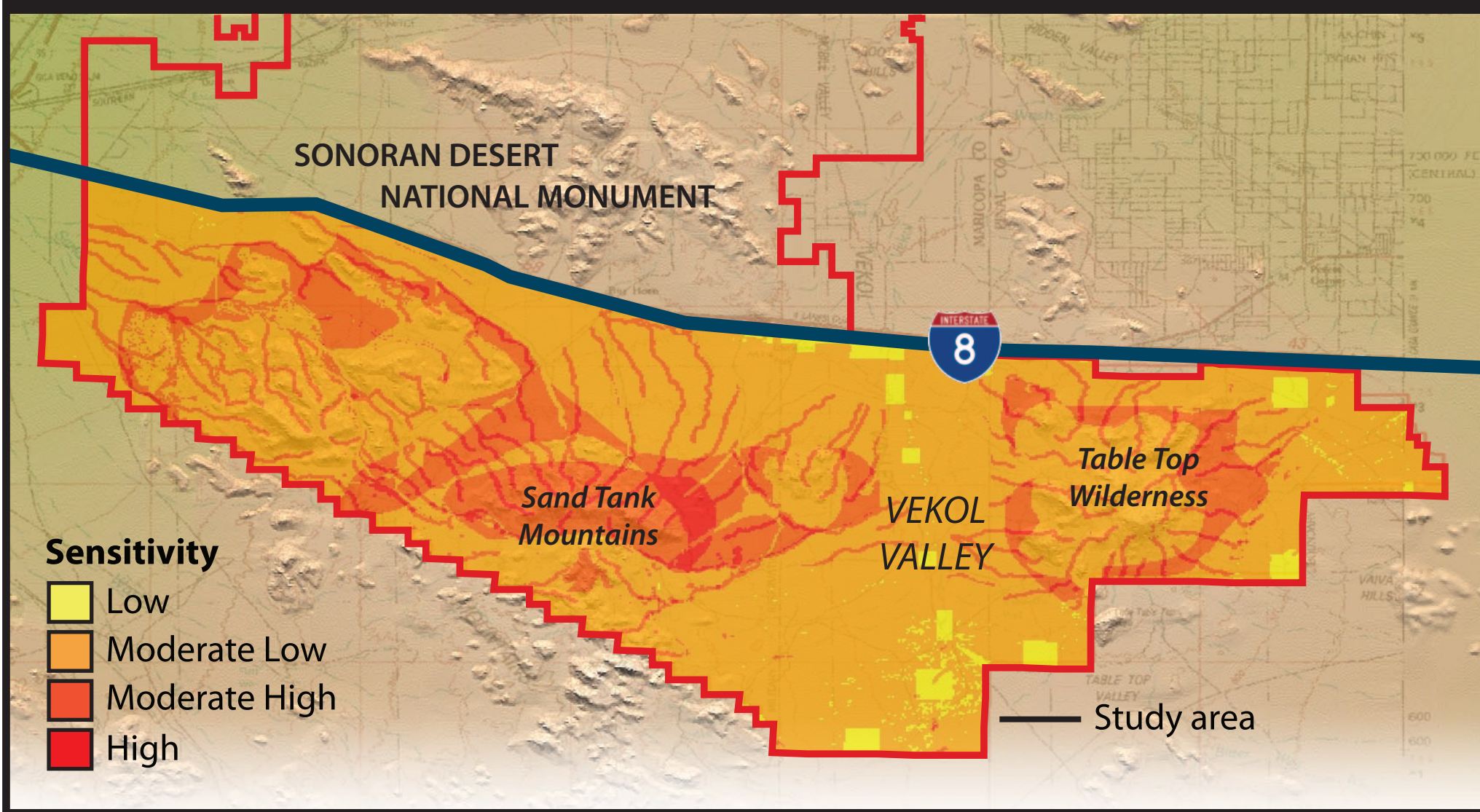
WHERE ARE THE ENVIRONMENTALLY SENSITIVE AREAS?

An additive raster GIS method was used to find the environmentally sensitive land within the study area. The results of the analysis were visualized in a map *(see right)* that highlighted the areas most sensitive to damage. The map revealed that areas most sensitive to damage were found near or around washes and mountainous areas, including the Sand Tank Mountains and Table Top Mountains.

① SELECT KEY LAYERS
Geographic data layers that represented the most important environmental areas were collected and entered into a GIS program.

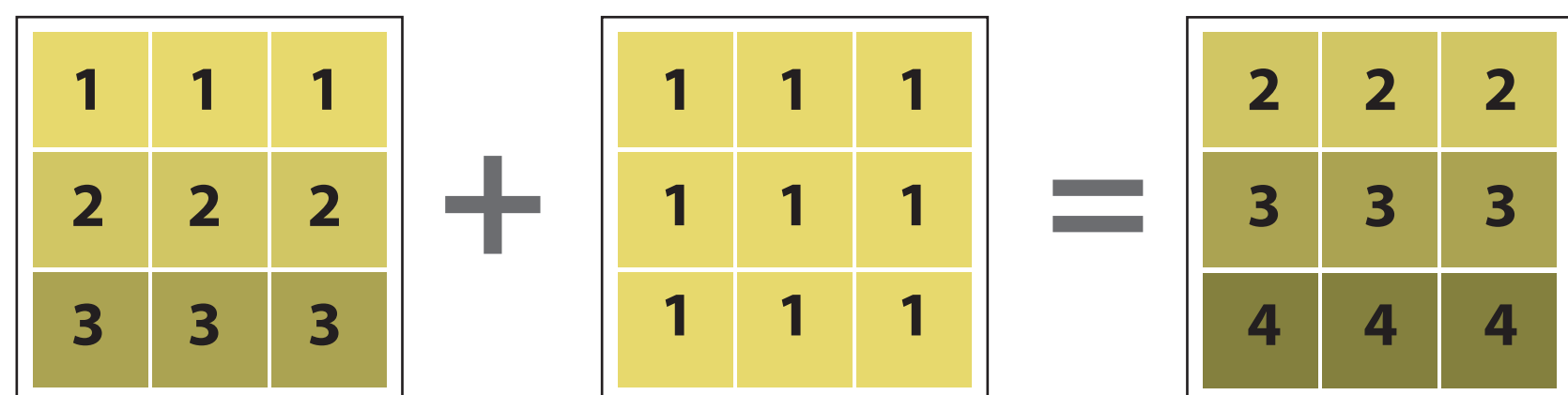Tortoise habitat

Streams

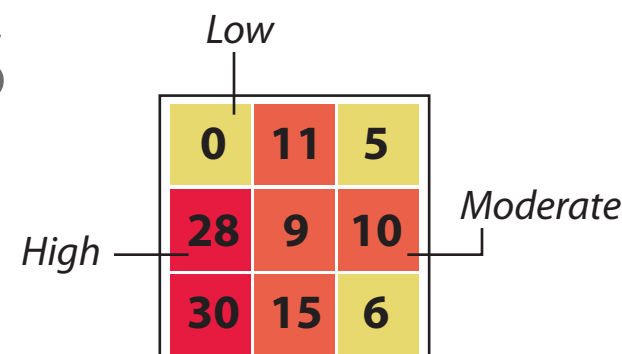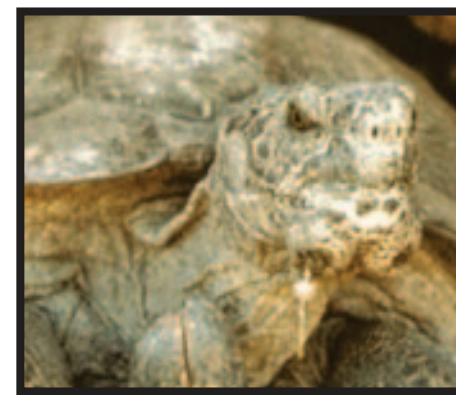Vegetation communities

Soil types

② RASTER ADDITION
Each of the vector layers are rasterized. The pixels of the raster layers are then added together to create a cumulative layer.

1	1	1
2	2	2
3	3	3

+

1	1	1
1	1	1
1	1	1

=

2	2	2
3	3	3
4	4	4

③ CLASSIFY, DISPLAY RESULTS
The results of the raster calculation are collected on a final layer. That layer is classified for high, medium, and low sensitivity.

Low

0	11	5
28	9	10
30	15	6

High — Moderate

ENVIRONMENTAL SENSITIVITY INDEX

SONORAN DESERT NATIONAL MONUMENT

Sand Tank Mountains

VEKOL VALLEY

Table Top Wilderness

Sensitivity
- Low
- Moderate Low
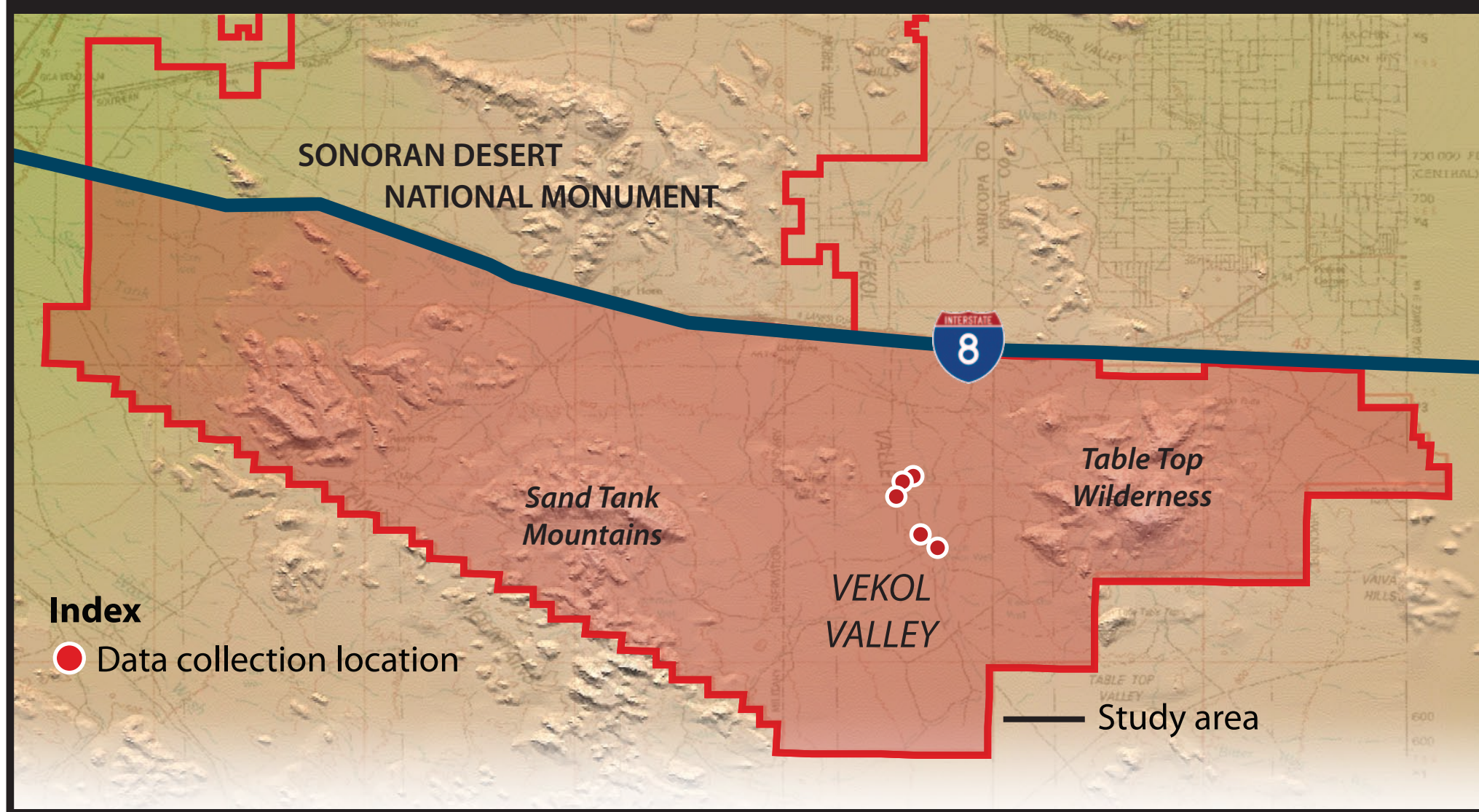- Moderate High
- High

— Study area

HOW DO WE CATALOG AND CLASSIFY THE DAMAGE?

An on-the-ground index based on observation was created to identify and catalog the details of current and future environmental impacts. Using a data dictionary and GPS technology a successful test of the index was carried out *(see right)*. Further research would allow an implementation of the index fully. It would also allow for a complete statistical analysis of the data.

① DEFINE INDEX
A range of observable environmental variables were created and entered into a GPS as a data dictionary. The index contained entries for trash, vegetation, soil, vehicle tracks, etc.

ON-THE-GROUND INDEX

SONORAN DESERT NATIONAL MONUMENT

Sand Tank Mountains

VEKOL VALLEY

Table Top Wilderness

Index
- Data collection location

— Study area

INDEX	0	1	2	3	4	5
Trash						
Amount	None	Sandwich bag	Lunch bag	Small trash	Trash bag	Multiple trash bags
Types	None	Biodegradable	Small	Medium	Large	Extra large

② COLLECT DATA
Non-random sites were selected as a pilot study of the index. Using the GPS loaded with the data dictionary, readings of the variables were taken at several locations.

Trimble Juno

③ CLASSIFY, DISPLAY RESULTS
For safety reasons, only five points were taken and mapped. The pilot study confirms that spatial analysis and statistical methods could be used on the data points.

FUTURE USES

This project provides two methods to measure and study the impact of immigration in the Sonoran Desert National Monument. These were designed as an extendable set of tools that researchers and policy writers can use for a variety of subjects and areas.

EXAMPLE USES
- Studies in other border areas.
- Human impact research.
- Off-site analysis

POTENTIAL USERS: