OPERATION DESERT TORTOISE
A Framework for Restoration to Support Agassiz's Desert Tortoise Recovery in the Western Mojave Desert

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INTRODUCTION

The Agassiz's Desert Tortoise (*Gopherus agassizii*) (desert tortoise), a federally threatened species endemic to the Mojave and Sonoran deserts, is emblematic of the widespread impact humans have on desert ecosystems. Though significant emphasis has been placed on species' recovery, populations of the desert tortoise continue to decline across much of their home range. According to the USFWS (2015), in the Western Mojave Desert, an area that continues to see extensive human impact, desert tortoise populations declined an average of 51% between 2004 and 2014. Much of this decline can be directly attributed to habitat degradation, which is the single biggest threat to the species' continued vitality. Therefore, successful strategies for habitat restoration and protection from future threats are vital to species recovery.
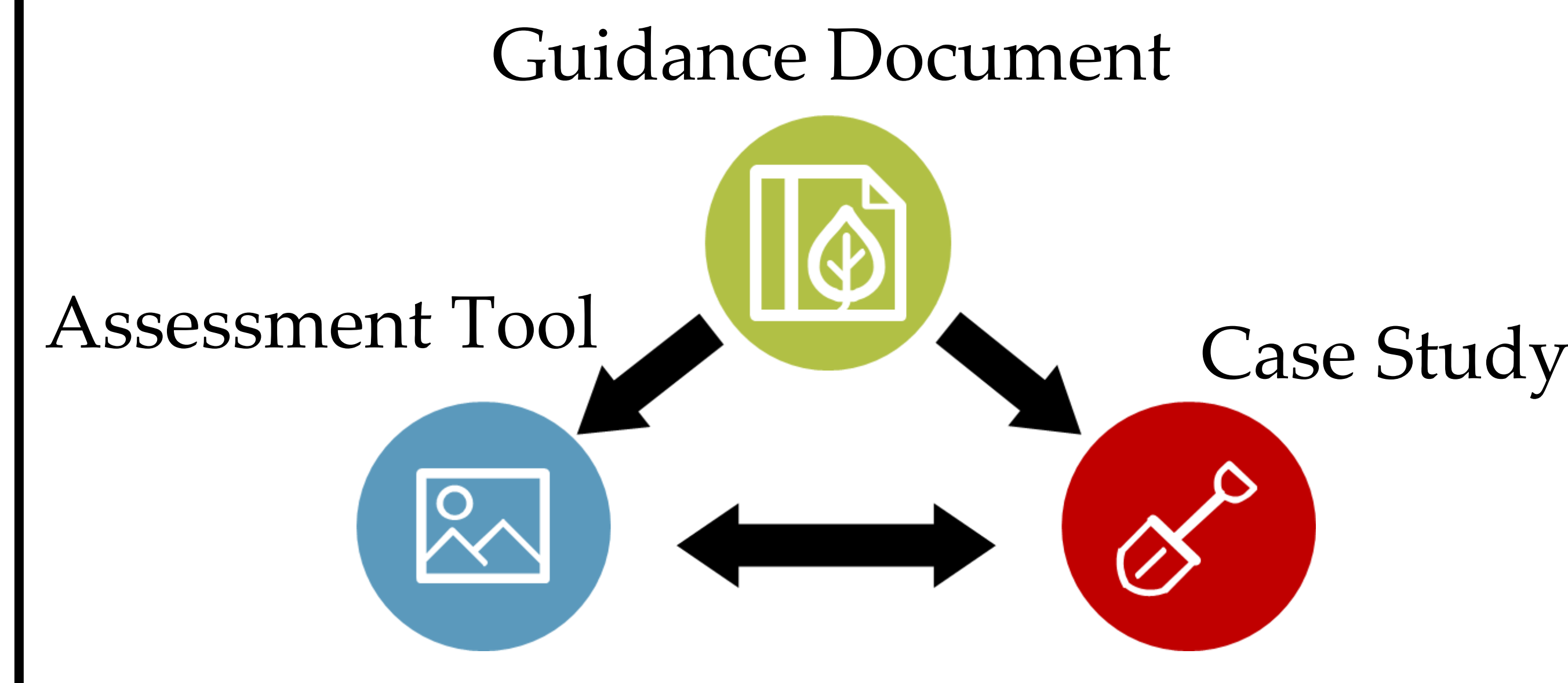
Pictured below are examples of threats that contribute to habitat loss and degradation and consequently lead to declining desert tortoise populations.

| Off-road vehicles | Invasive plants | Predation | Declining populations |

Photo: Desert Tortoise Preserve Committee
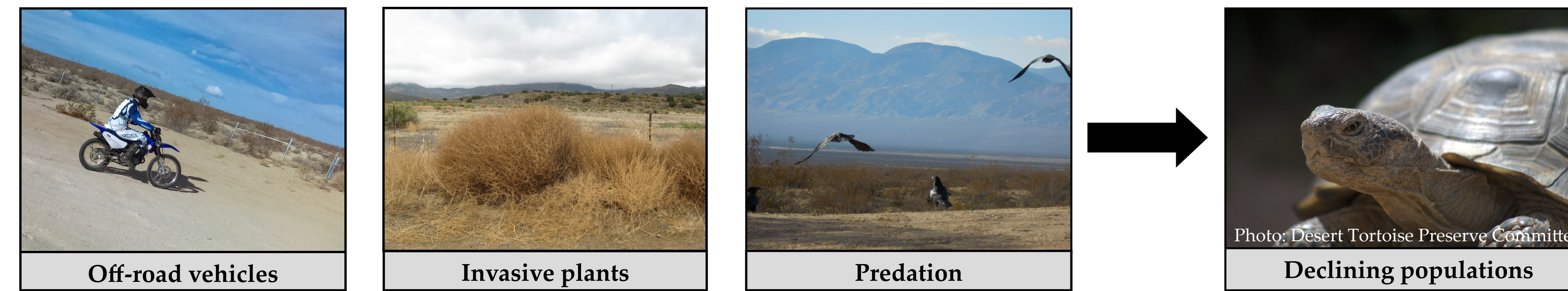
The following **research questions** provide land managers with a framework that streamlines and guides habitat restoration efforts:

- **HOW CAN HABITAT RESTORATION BE DONE STRATEGICALLY?**
- **HOW CAN MANAGERS EVALUATE AN AREA'S POTENTIAL FOR RESTORATION?**
- **HOW CAN STRATEGIC HABITAT RESTORATION BE APPLIED TO ON-THE-GROUND RESTORATION?**

FRAMEWORK

Guidance Document

Assessment Tool   Case Study

GUIDANCE DOCUMENT

Building off established principles of ecological restoration, the guidance document details how strategic restoration can be applied to desert tortoise habitat. The document defines the four categories which encompass the most important aspects of strategic restoration and establishes a methodology for implementing strategic restoration with the desert tortoise in mind.

Categories for Strategic Habitat Restoration:

- Form
- Function
- Stability
- Feasibility

Method for Strategic Habitat Restoration:

Set Ecologically-Based Goals
↓
Plan Actions
↓
Manage Outcomes

ASSESSMENT TOOL

The Assessment Tool is a decision support tool that allows land managers to evaluate potential restoration sites for desert tortoise habitat based on habitat characteristics that can be evaluated as "Poor", "Fair", "Good" or "Unknown".

Feature	Poor Site	Fair Site	Good Site	Assessment
Threats				
Proximity to Roads	Site is within 400m of roadways with high traffic volume (>100 vehicles per road).	Site is 400 - 800m from roadways. Roadways near site have intermediate traffic volume (30 - 100 vehicles per day).	Site is at least 800m from roadways. Roadways near site have low traffic volume (<30 vehicles per day).	**Poor**

Figure 1. Example of the Excel interface for the Assessment Tool. The restoration site was assessed as "Poor" because Mojave Randsburg Road crosses through the parcels as seen in Figure 4.

Once all characteristics have been assessed, the Assessment Tool generates a visual representation of the present conditions onsite. Using this visualization, managers can see which characteristics provide good desert tortoise habitat and which may benefit from restoration.
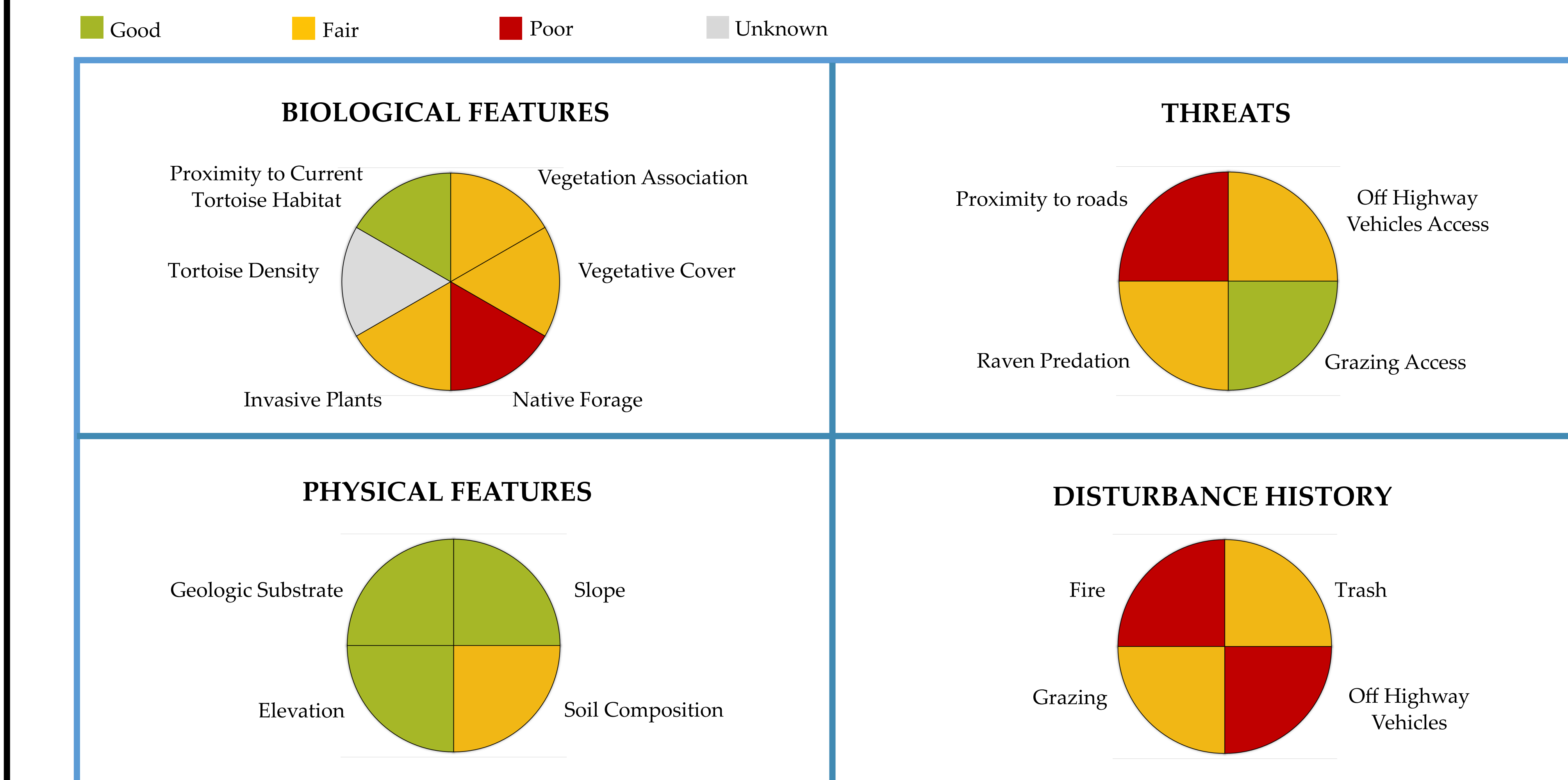
■ Good   ■ Fair   ■ Poor   ■ Unknown

BIOLOGICAL FEATURES
Proximity to Current Tortoise Habitat — Vegetation Association — Vegetative Cover — Native Forage — Invasive Plants — Tortoise Density

THREATS
Proximity to roads — Off Highway Vehicles Access — Grazing Access — Raven Predation

PHYSICAL FEATURES
Geologic Substrate — Slope — Soil Composition — Elevation

DISTURBANCE HISTORY
Fire — Trash — Off Highway Vehicles — Grazing

Figure 2. Tool outputs are displayed in four categories which serve as a visual representation of the conditions of the area assessed.

CASE STUDY

The Restoration Plan (Plan) is a site-specific restoration plan for three contiguous parcels within the Eastern Expansion Area of the Desert Tortoise Research Natural Area. The Plan encompasses a variety of restoration actions based on the best management practices available for desert tortoise recovery and habitat restoration. The ultimate purpose of the Plan is to improve and restore degraded or disturbed habitat to meet the cover, forage and soil needs of the desert tortoise.

Examples of Restoration Actions:

- Invasive plant species removal will occur in all buffer zones to enable better native plant reestablishment.
- Road camouflage techniques will be used to disguise old off-road vehicle trails and promote native vegetation recovery.
- 1550 native plants will be planted across six plots, revegetating 28 acres of bare ground.
- Fencing will prevent desert tortoises from being run over and will keep off-road vehicles from disturbing the restoration area.

Russian Thistle (*Salsola tragus*)

RESTORATION AREA

Legend
□ Plots
Buffer Zone
Restoration Site
EEA Fence
Mojave Randsburg Road

Figure 3. Identified restoration site in the Eastern Expansion Area of the Desert Tortoise Research Natural Area with examples of habitat restoration meant to aid in the recovery of desert tortoises.

Total acres targeted for restoration: 173.5 acres

RECOMMENDATIONS

Implementation of this framework can ensure land managers and other decision makers have a tool to use for deciding when, where, and how to effectively allocate limited resources. The impact that this project can have on recovering desert tortoise populations will be determined by how this framework is used in the planning of other restoration projects. Establishing new partnerships will be important for securing funding, connecting with a diverse network of stakeholders, and increasing the effectiveness of restoration for the desert tortoise across the Western Mojave Desert. Careful monitoring of the case study will not only lead to increased success in the implementation of that specific restoration plan, but will also provide valuable insight as to the how this framework can be best adapted to future restoration efforts.

ACKNOWLEDGEMENTS

Photo: Desert Tortoise Preserve Committee