



We have developed a satellite-based golf course monitoring tool that automatically monitors the vegetation health of the turf.

## HOW?

The satellites we use "see" colors outside the range visible to the human eye. Since a healthy plant primarily reflects the infrared range (i.e., outside the range of human vision), we can use the satellite to detect when a plant is diseased or dry much earlier than would be possible with our eyes. Furthermore, even the smallest changes in vegetation health can be detected.

## WHY SATELLITES?

A big advantage compared to e.g. a drone is that with the satellite you get automated images and data of the past years are available. This makes it possible to get a complete overview of the condition of the vegetation and the water saturation of the entire golf course, to detect changes and to precisely control measures.

## POTENTIAL BENEFITS:

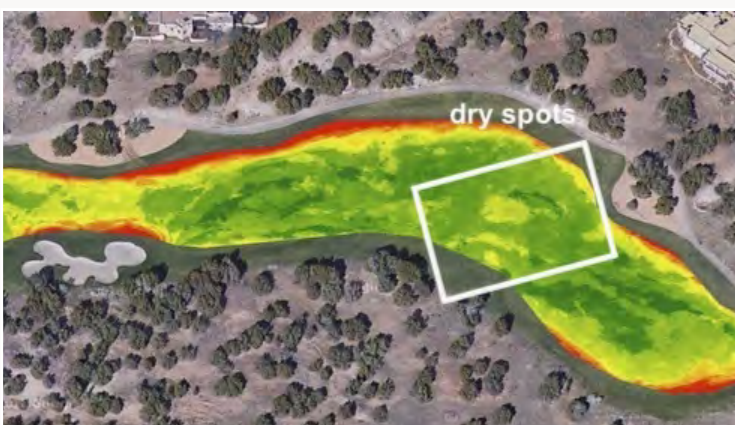
1. Optimize irrigation
2. Improve the use of fertilizers
3. Support in communication with members, owners and authorities
4. Saving of resources (water, labor, etc.)

# Monitoring the health of your lawn

Figures 1 and 2 show an overview of the condition of the vegetation (especially the token stress in the summer of 2021) of fairways 2 and 9 of the Saint Leon Red golf course. There is a tendency for overwatering in the dark areas.



Las Campanas (New Mexico) had dry spots on the #7 Sun Rise Course fairway in 2020 and installed an additional sprinkler in 2021 that clearly overwatered. In 2021, you could even see the sprinkler circle. This was not visible to the greenkeeper that year with the naked eye.



# 20%

Water Savings

# 25%

Labor Savings

# 15%

Reduction of  
fertilizer



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## WHAT IS GREENWAY?

Greenway is a product of the German startup Karuna Technology UG, invented in 2021. The Team behind Greenway consists of international experts in Earth Observation, Data Science, Geoscience and IT Management.

## REFERENCES:

In Germany and the USA, we count some of the best golf courses among our customers. Our research projects are supported by the USGA Mike Davis Research Programs and our scientific director is Professor Bernd Leinauer of New Mexico State University. We work closely with the Golf Management Association of Germany and the USGA.

## OUTLOOK:

Currently we are in the final testing phase to perform soil moisture measurements via satellite. For this purpose we receive manual measurement data from about 20 golf courses worldwide to train our machine learning program. The radar data allows us to capture measurement points every 3m. With this system we are able to capture about 20,000 measurement points on an 18 hole golf course per flyover, which is a worldwide unique measurement density. The recordings are provided fully automated.

