MVPRestore

MRRMaid Toolbox

The Boise State University Mesic Resource Restoration Monitoring Aid (MRRMaid) program, led by Dr. Jodi Brandt, and supported by NASA's Ecological Conservation Program, has designed a new web app as part of its toolbox of satellite-based monitoring tools for beaver rewilding. The MVPRestore app is specifically designed so that end users, such as Trout Unlimited, can apply their mesic vegetation persistence (MVP) products at their restoration sites and measure the impact of restoration activities on mesic ecosystem condition.

In this one-hour webinar, Dr. Brandt and post-doctoral fellow Dr. Emily Iskin, provided an overview of the MRRMaid project and toolbox highlighting the use and impact of its tools for two restoration case studies in the Intermountain West of the United States. Mr. Juan Camilo Rojas Lucero, PhD student, showcased the new MVPRestore web application and featured a demo in Google Earth Engine to show participants how to use the web app for areas of interest using NASA Landsat satellite imagery. The webinar also featured the participation from Dr. Louis Jochem, Director of Geographic Information Science at Trout Unlimited, who shared his perspective on the value of the MMRMaid Toolbox for ongoing monitoring of restoration projects.

Overall, participants got to see how to visualize persistence of vegetation before and after a restoration project, distinguish between mesic and non-mesic vegetation, and derive maps and plots of mesic ecosystem change over time. Participants also had the opportunity to provide their feedback to the MMRMaid Team and share their perspective on how the tools can be potentially scaled in terms of geography, breadth of users and/or thematic area during a discussion period at the end of the webinar. Here we document the Q&A for this webinar.

Questions & Answers Session

Question 1: It's great to see that you are leveraging most of the Landsat archive. I assume that you don't have access to pre 1984 data because of limitations regarding Landsat four data in Earth engine holdings?

Answer 1: Yeah. That's right. There's a lot of great data sources out there that one can use, and that people are using, but we really are dedicated to using open-source imagery, especially on Google Earth Engine. All the code is freely available on Google Earth Engine and the Google Earth Engine app that we just showed you. So yes, we only use data that is freely available through Earth Engine.

Question 2: What are the pros and cons of using Google Earth engine apps for hosting and MVPRestore and how many developers helped contribute?

Answer 2:   The pros are that it's free, anybody can access it, and we're doing the analysis in Earth Engine. So, it provides this kind of seamless transition from analysis to product delivery. Earth Engine does have some limitations. Often our end users have asked us for functionalities that Earth Engine just doesn't provide. For example, you cannot through Earth Engine upload a shapefile of your study area. You must go to that site and make your polygon, which is a con for many end users who have shapefiles of their study area, and they would just love to upload and do the analysis with their uploaded shapefile, but they must draw it.

As for your other question, we have this amazing group of people. It was just our team and especially Nawaraj Shrestha, Nick Kolarik and Juan Camilo, who are using Google Earth Engine and developed these apps. We didn't have any developers, and it was all self-learning with resources available online. We're not developers, we're scientists, but they're just fantastic and smart and they did it all. You do need to know or be familiar with JavaScript, which is the main programing language used to develop the Google Engine application.

Question 3: What's the plan for maintaining the functioning of the tool and its input data sets over the long term?

Answer 3: That is a fantastic question. We just got additional funding from NASA for a sustainability plan. For right now, this is all available on Earth Engine, but we're transitioning over to a broader website called https://www.climateengine.org/. In the future, all these data sets are going to be available through https://www.climateengine.org/. They have a different license for Earth Engine, so there will be a lot more functionality. In terms of the analysis, Louis who was on the video, he's long term at Trout Unlimited with our end users, and Trout Unlimited has committed to running the code and updating the code in future years. Yes, data should be available in the future into perpetuity, as long as people are interested in having it, but it will be available on Climate Engine in the future and not through our Google Earth Engine apps.

Question 4: What is Nawaraj's contact information for asking about implementing this tool in other areas?

Answer 4: Nawaraj's faculty page! https://snr.unl.edu/aboutus/who/people/faculty-member.aspx?pid=2491

Question 5: Could you please tell me more about how the app detects mesic vegetation? What indices does it use?

Answer 5: Basically, we are using two spectral indices. One of them provides information about soil moisture and the other one provides information about phenological behavior. Refer to MVPRestore User Guide (https://drive.google.com/file/d/1ZKqn-fttXWk5IdVysjyPtuDXxb0Mtz4_/view?usp=sharing) for more information.

Question 6: What other users have you been working with (besides Trout Unlimited)? What has been the request that you have gotten in terms of scaling this tool to other areas?

Answer 6: I just got an email the other day that asked me if they could use MVPRestore in Paraguay. Up to now, we've just been focused on the sagebrush biome, because that's where we have our partners and that's where we know the best. There are two things for this methodology that would need to be adapted for Paraguay. The first is that Paraguay is in the southern hemisphere. We use the growing season here, so we would have to identify what are the appropriate months of the growing season time period in Paraguay and adjust the months that are being analyzed. The second thing that we would need to adjust would be the thresholds for the two indices, the moisture index and the vegetation index. Those things are all adjustable within the app, but, for example, we don't have the knowledge about Paraguay at this point to adjust those. It would be up to the user to go in and use their local knowledge to adjust the months and the indices and zoom-in on places that they know and adjust those to get the appropriate results. Theoretically, these methods should work in any semi-arid region, but so far, we've been focused on the sagebrush biome. We would have to just work with people with the local knowledge to apply them in other semi-arid regions.

Question 7: Can you share a little bit about your engagement with Louis and how that engagement with Trout Unlimited began? How did those conversations come about?

Answer 7: Louis was a PhD student in this lab, before working with Trout Unlimited. So, there was already a PhD and postdoc personal connection there. Additionally, both Trout Unlimited and The Nature Conservancy, who we have been working with a lot closely as well, have been funded through cooperative agreements with the Bureau of Land Management, who is doing lots of process-based river restoration in the western United States. There is a large appetite for ways to look at pre-restoration history. A valuable piece of these tools is being able to look back on time and being able to compare different restoration sites within a restoration program or between different programs or different states. Trout Unlimited has a bit more of a fish conservation focus so we are using it with that in mind—of what fish need to be successful. The Nature Conservancy is taking a more beaver focused restoration program. The beauty of this tool is that it doesn't discriminate beyond what is mesic, what's in the riparian area or the river corridor and what isn't. You can use it for whatever species you're interested in, sage grouse, frogs, beaver, etc.; that has brought people in to use this tool.

Question 8: Has the tool been paired with bio-acoustic monitors on the group to correlate change with birds?

Answer 8: We would love to do that! Just going back to our capabilities as a group we are not bird ecologists, so we would love to partner with people who have on the ground bird data or know how to collect eDNA or bird data from bio acoustic monitoring. This is really the next step for us to start to link these long-term time series to actual biological outcomes. We are always looking for partners with expertise that have data. We would love to work with them and collaborate on this type of work.