

The outreach deliverables that were not included in the August 2016 version of the final report include:

Item	Status
Ecosystem services monitoring handbook	Complete (see attached). Will be updated to include more qualitative measures based on 2016-2017 field data.
The management database	Version 1 almost complete. All data input sections complete for stakeholder use. Database team finalizing sign-in permissions/ accounts to store individual data. During summer of 2017, database team will greatly improve management practices and data sections to increase functionality of database for statistical analysis. Data will be inputted into database early fall 2017. Anticipated public launch November 2017.
Ecosystem service factsheets (which include ecosystem service maps available through the database)	Rely on output from database. Anticipated release spring 2018.
Producer trainings/ workshops	24 outreach talks and 4 outreach publications (in newsletters of stakeholders) during project. The trainings on the database and monitoring tools will occur during the 2017-18 growing season.

Ecosystem services monitoring handbook:

The handbook has been completed (see attached), and will be publically available on the project website, once that is opened to the public by the database team.

The current handbook highlights the measures that were most robust in sampling across multiple sites and years (mostly during the drought, and then during the 2015-16 moderate year of rain). Common alternative measurement approaches are included here, with references that provide detailed methods, but we did not include detailed methods for the alternative approaches here, because they were not consistent in measures across sites and years during the drought, compared to the ones included in the handbook. We are testing how consistent they are in the 2016-17 growing season, which will be an indicator of their robustness in a wet year, as well as in the 2nd year of recovery after drought (which is seeming more “normal” compared to the 1st year of recovery). Those that are robust under wetter conditions will be included in a modified version of this handbook (to be updated after this field season).

Once the database is ready for public use, we will do trainings on both the ecosystem monitoring and database entry and use. Based on feedback at these workshops, we will modify the ecosystem services handbook in response to feedback, and include videos of specific measurements from the workshops.

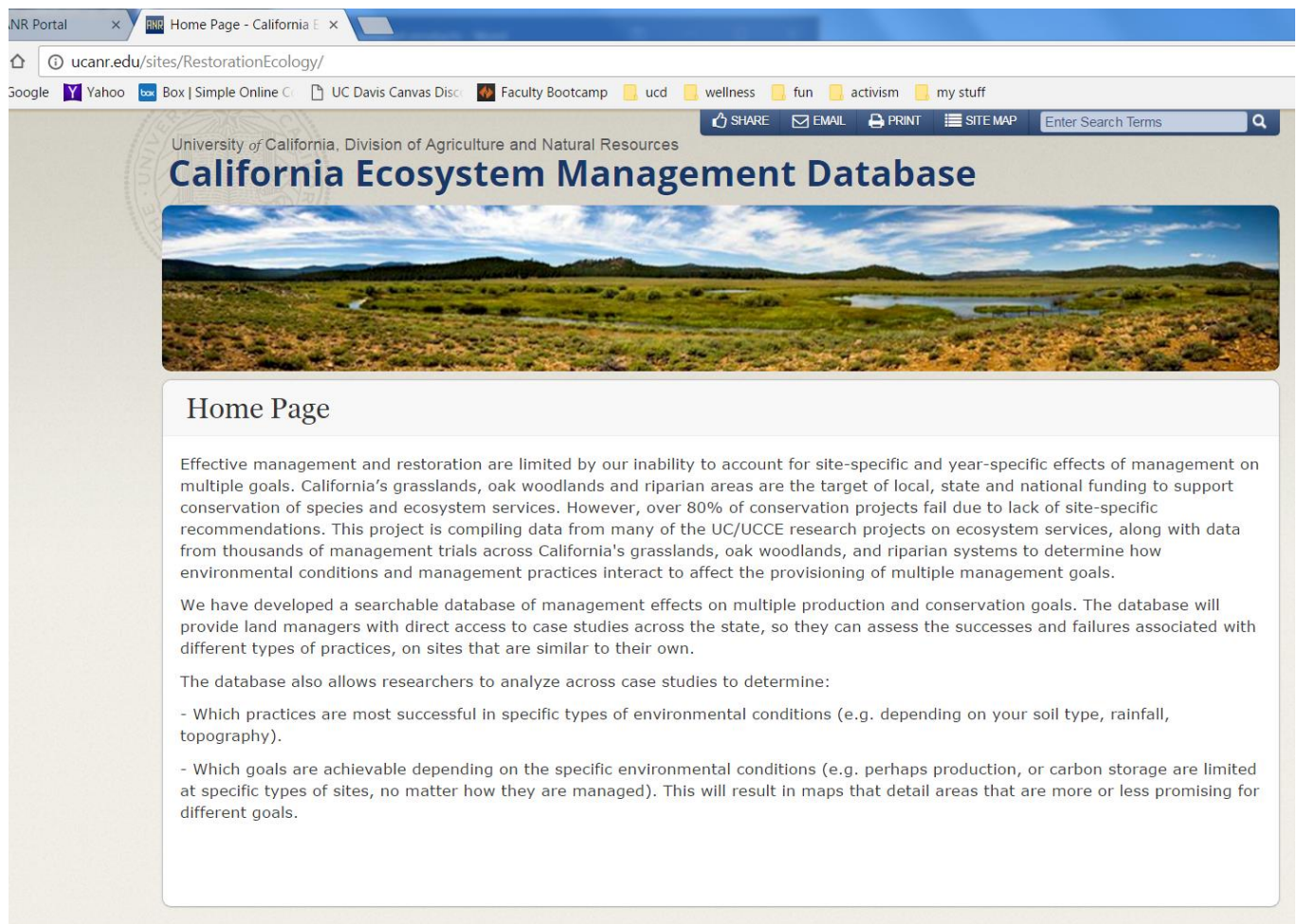
Database

The database construction was contracted to University of California’s, Agriculture and Natural Resources Communication Services and Information Technology (CSIT) division. They have had repeated delays over the past 3 years, leading to repeated postponements of the other planned outreach and synthesis activities that rely on the database. These delays have been due to a combination of the database being more complex to develop than they anticipated, staffing changes, and some high priority system-wide projects that were unexpected and coopted staff time for this project. The full database is nearly complete, with a couple of sections (management practices

and data) currently in a “1.0” mode, meaning that they are now at a base level of functionality, and will be updated with pull-down menus to match other sections, in July-September of this year. Once that is complete, the case studies collected through this project can be uploaded into the database (we are formatting their data into an excel sheet that the developers can use to populate the database). This is anticipated to occur in October, with a public release of the website and available data in November.

Current status of specific parts of the database are outlined below, including screenshots of the current database sections. CSIT can provide WSARE access to these in development pages if they would like to work through the current “in development” web page.

Front page: Will be including links to the database and management handbook, will include the brands of funders (WSARE, UC ANR)



The screenshot shows a web browser window with the URL ucanr.edu/sites/RestorationEcology/. The page header includes navigation links for Google, Yahoo, Box, Simple Online, UC Davis Canvas Disc, Faculty Bootcamp, ucd, wellness, fun, activism, and my stuff. A search bar is located in the top right corner. The main heading is "California Ecosystem Management Database" under the University of California, Division of Agriculture and Natural Resources. Below the heading is a large landscape photograph of a grassy field with a small pond and mountains in the background. The section is titled "Home Page" and contains the following text:

Effective management and restoration are limited by our inability to account for site-specific and year-specific effects of management on multiple goals. California's grasslands, oak woodlands and riparian areas are the target of local, state and national funding to support conservation of species and ecosystem services. However, over 80% of conservation projects fail due to lack of site-specific recommendations. This project is compiling data from many of the UC/UCCE research projects on ecosystem services, along with data from thousands of management trials across California's grasslands, oak woodlands, and riparian systems to determine how environmental conditions and management practices interact to affect the provisioning of multiple management goals.

We have developed a searchable database of management effects on multiple production and conservation goals. The database will provide land managers with direct access to case studies across the state, so they can assess the successes and failures associated with different types of practices, on sites that are similar to their own.

The database also allows researchers to analyze across case studies to determine:

- Which practices are most successful in specific types of environmental conditions (e.g. depending on your soil type, rainfall, topography).
- Which goals are achievable depending on the specific environmental conditions (e.g. perhaps production, or carbon storage are limited at specific types of sites, no matter how they are managed). This will result in maps that detail areas that are more or less promising for different goals.

Database search page:

The current search functions allow searching by ecosystem type, key word, floristic province or project name (see below).

University of California, Division of Agriculture and Natural Resources

California Ecosystem Management Database

Database

New Search

Floristic Province: Choose

Ecosystem Type: Choose

Words/phrases in descriptions:

Clear Search

3 projects found

Show 10 entries Search:

Project	Public?	Sites	Contacts
ARP post-burn	Yes	1	1
UCD Site 1	Yes	1	1
UCD Site 2	Yes	1	1

Showing 1 to 3 of 3 entries

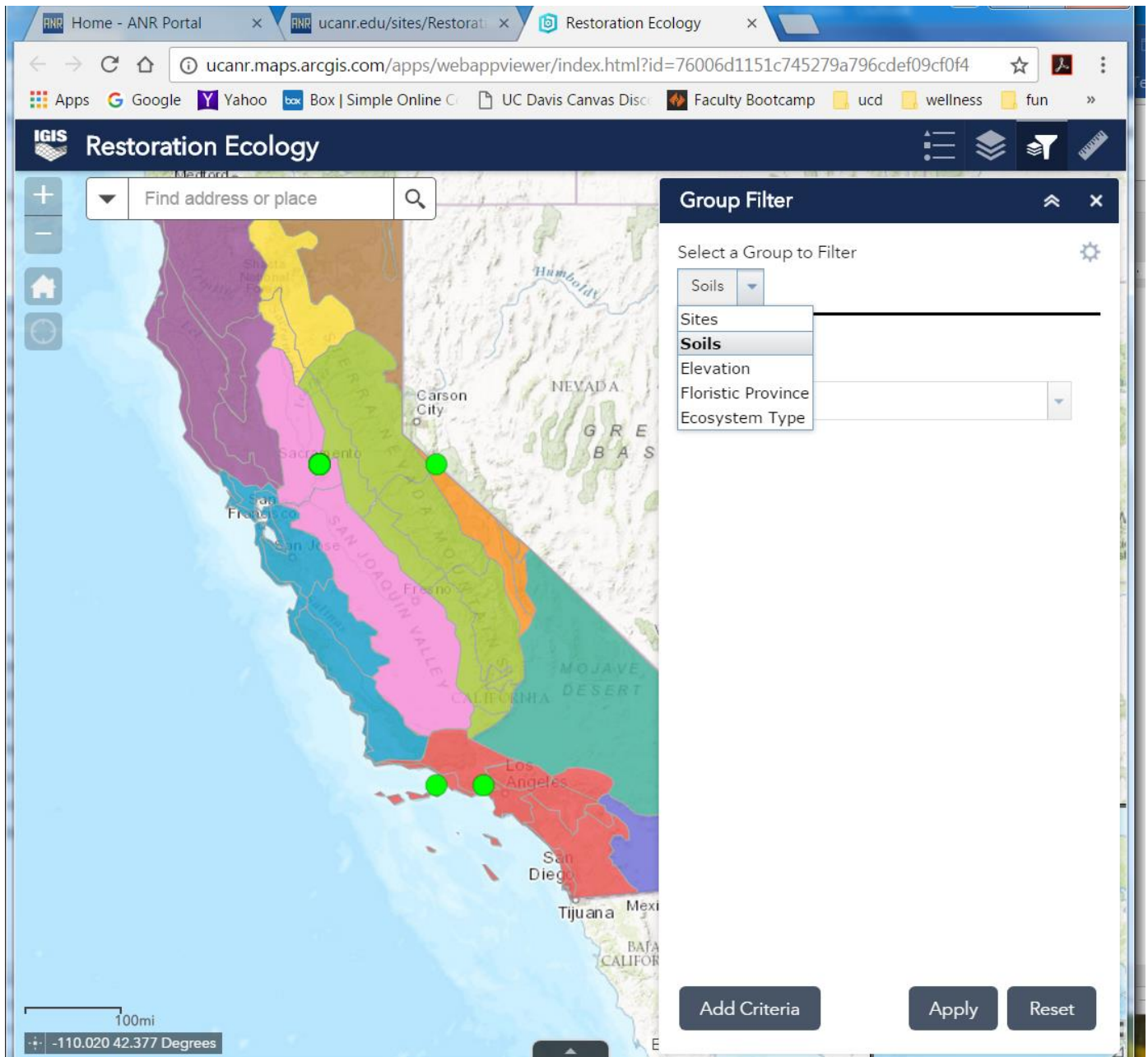
Previous 1 Next

Add New Project

CSIT is updating the fields to search including:

- A drawdown menu of common management approaches
- A drawdown menu of common management goals
- Environmental conditions, including site challenges identified by managers (e.g. erosion, invasive species, low productivity, etc.)
- What type of data is available (e.g. forage production, soil C sequestration, invasive species % cover, etc.)

- A map to click on locations of available case studies (map on left). Case studies will also be searchable through the map based on similar soils, elevation, floristic province, and ecosystem type (See pull-down menu on the right). In these cases, users are able to search by a particular condition, to conditions similar to those at a site in the database, or to conditions similar to a point on the map they choose (e.g. their own property, and then the search will pull up sites with similar environmental conditions)



Site data:

- Current modules for site data include location and broad conditions (which will also be up-loadable by clicking on location of site, which will populate soils, data from nearest weather stations, topography, and vegetation classes through the GIS tool link). Site information also includes specific goals and monitoring techniques, and includes an export function to download the data.
- This front page provides an overall summary of the project

The screenshot shows a web browser window with the URL `ucanr.edu/sites/RestorationEcology/database/?asdf=1&prj_id=83B85F40-59F0-4369-8B5A-754B5`. The browser's address bar and tabs are visible at the top. The website's header includes the ANR logo and navigation links. The main content area is titled "Database" and features a "Back" link. Below this, the "UCD Site 1" project is displayed. The project details are organized into sections: "Project Overview" (with sub-sections for Project Name, Public status, Background Public/Private), "Project Results" (with a brief summary and a list of questions), and "Contacts". The "Project Results" section includes a table with questions and answers. At the bottom of the project details, there are "Edit Project" and "Clone Project" buttons. The "Contacts" section is partially visible at the bottom of the page.

Database

[Back](#)

UCD Site 1

[Project Overview](#) [Contacts](#) [Sites](#) [Goals](#) [Export](#)

Project Name	UCD Site 1
Public?	Yes
Background Public	Native grassland restoration on former agricultural field
Background Private	

Project Results

Brief summary of the project results	Good establishment of particularly <i>Stipa pulchra</i>
What changed?	Restoration decreased surface (0-15cm) soil organic matter and soil C, and decreased erosion resistance. Higher aboveground and belowground biomass in restored plots
Over what time frame?	4 years
Was it a success?	Yes in terms of native vegetation
What criteria used to determine success vs. failure?	Native grass cover
What were the key impediments to success?	High invasive grass cover
What facilitated success?	Repeated mowing
Were there unexpected benefits?	
Were there unexpected tradeoffs?	
In hindsight, what would you have done differently?	
Would you recommend this practice?	
If available, please include cost estimates for the management practices	
Additional attachments	
1. What numbers are reported?	
2. Were site conditions measured as a co-variate? If so, which were assessed and how?	

[Edit Project](#) [Clone Project](#)

Contacts

Site-specific data is then entered as seen below, in a series of screenshots

dev.ucanr.edu/sites/Resto x

du/sites/RestorationEcology/database/?asdf=1&prj_id=CCFD5-3836-4F76-A43A-64847E09A565&site_id=740ACA23-3E2E-4823-9C19-FAF7791D45

Box | Simple Online C UC Davis Canvas Disc Faculty Bootcamp ucd wellness fun activism my stuff

ANR Development Environment - Click to Move

ARP post-burn | ARP

[Project Overview](#) [Contacts](#) [Sites](#) [Goals](#) [Management Practices](#) [Export](#)

Editing Site (ARP)

Name

ARP

Latitude

38.58567000

Longitude

-121.42995000

Floristic Province

Sacramento Valley

Ecosystem type

Other

Size

24

acres

Topography

flat

Aspect

n/a

Soil Description

sandy, deep

Weather

drought, with late spring rains

History

frequent fires (every few years) due to arson, unknown but variable history of management (mowing, seeding, prescribed fire)

Vegetation

largely yellow starthistle dominated, with frequent patches of wildrye, and occasional patches of exotic annual grasses and forbs.

Home - ANR Portal

ucanr.edu/sites/Restorati

ucanr.edu/sites/RestorationEcology/database/?asdf=1&prj_id=26B077D4-6E3C-477B-9F42-3189

Apps

Google

Y Yahoo

Box | Simple Online C

UC Davis Canvas Disc

Faculty Bootcamp

ucd

wellness

fun

History

frequent fires (every few years) due to arson, unknown but variable history of management (mowing, seeding, prescribed fire)

Vegetation

largely yellow starthistle dominated, with frequent patches of wildrye, and occasional patches of exotic annual grasses and forbs.

Species

Common Name	Latin Name	Rank	Action
barb goatgrass	Aegilops triuncialis	Occasional (11-25%)	Delete
Bluegrass	Poa secunda	Present (<1%)	Delete
California brome	Bromus carinatus	Present (<1%)	Delete
Clover	Trifolium microcephalum	Occasional (11-25%)	Delete
Fiddleneck	Amsinckia douglasiana	Rare (1-10%)	Delete
Filaree	Erodium botrys	Common (26-50%)	Delete
Geranium	Geranium sp.	Occasional (11-25%)	Delete
Oniongrass	Melica californica	Present (<1%)	Delete
Purple needlegrass	Nasella pulchra	Common (26-50%)	Delete
soft brome; soft chess; lopgrass	Bromus hordeaceus	Abundant (51-75%)	Delete
Sunflower	Helianthus sp.	Rare (1-10%)	Delete
Wild lettuce	Lactuca sp	Rare (1-10%)	Delete
wild oats	Avena fatua	Abundant (51-75%)	Delete
Wildrye	Elymus triticoides	Common (26-50%)	Delete
yellow starthistle	Centaurea solstitialis	Dominant (75-95%)	Delete
yellowflag iris; pale yellow iris	Iris pseudacorus	Full cover (>95%)	Delete

Showing 1 to 16 of 16 entries

Add species

Home - ANR Portal

ucanr.edu/sites/Restorati

ucanr.edu/sites/RestorationEcology/database/?asdf=1&prj_id=26B077D4-6E3C-477B-9F42-3189

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Pre-project condition

Challenges

Erodible

Low Production

Low Forage Quality

Low Plant Diversity

Invasive Plants

Yellow starthistle

Soil Compaction

Water Runoff

Low Water Holding Capacity

Low Water Quality

Low Soil Fertility

Low Wildlife Habitat

Raptors

Low Pollinator Habitat

Home - ANR Portal | ucanr.edu/sites/Restorati

ucanr.edu/sites/RestorationEcology/database/?asdf=1&prj_id=26B077D4-6E3C-477B-9F42-3189

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Fire Risk

Regulation
limits on time of herbicide use, mowing, prescribed fire

Advantages

Site Advantages
The site had high productivity, and supported high densities of pollinators from May through June. Erosion was low due to flat terrain.

Low Erosion

High Production

High Forage Quality

Plant Diversity

Low Invasive Plants

High Native Success
Blue wild rye

Low Compaction

Low Water Runoff

High Water Holding Capacity

High Water Quality

Home - ANR Portal | ucanr.edu/sites/Restorati

ucanr.edu/sites/RestorationEcology/database/?asdf=1&prj_id=26B077D4-6E3C-477B-9F42-3189

Apps | Google | Yahoo | Box | Simple Online | UC Davis Canvas Disc | Faculty Bootcamp | ucd | wellness | fun

High Soil Fertility

High Wildlife Species
Deer, ground squirrels

High Pollinator Habitat

Low Fire Risk

Surrounding landscape
Surrounding areas have high densities of fennel and poison hemlock. The site is part of a 23-mile corridor along the American River, providing high connectivity for wildlife.

Other site info

Management goals:

Management goals, and their relative priority are entered via a pulldown menu platform

The screenshot displays a web browser window with the URL `dev.ucanr.edu/sites/RestorationEcology/database/?asdf=1&prj_id=CCDFDC5-3836-4F76-A43A-64847E09A565&site_id=740ACA23-3E2E-4823-9C19-FAF7791D45`. The page is titled "California Ecosystem Management Database" and features a landscape image. Below the header, the "Database" section is active, showing "ARP post-burn" and "ARP" tabs. A navigation bar includes links for "Project Overview", "Contacts", "Sites", "Goals", "Management Practices", and "Export". The "Management Goals" section indicates that no goals have been added and provides a button to "Add new Management Goal?". A dropdown menu is open, listing various goals such as "Management", "Livestock production", "Forage production", "Forage quality", "Resistance", "Resilience", "Invasive species and noxious weed control", "Native plant conservation", "Native plant restoration", "Plant diversity", "Wildlife habitat", "Water supply", "Water storage in soil", "Water quality", "Erosion control", "Soil compaction alleviation/prevention", "Soil fertility", "Carbon sequestration", and "Other". The "Research Goals" section also shows no goals added and a button to "Add new Research Goal?". The Windows taskbar at the bottom includes icons for Internet Explorer, File Explorer, VLC, Firefox, Word, Excel, PowerPoint, Outlook, Chrome, and Word.

Their reporting is seen as below:

ARP Home - ANR Portal x ucanr.edu/sites/Restorati x

ucanr.edu/sites/RestorationEcology/database/?asdf=1&prj_id=26B077D4-6E3C-477B-9F42-3189

Apps Google Yahoo Box | Simple Online UC Davis Canvas Disc Faculty Bootcamp ucd wellness fun

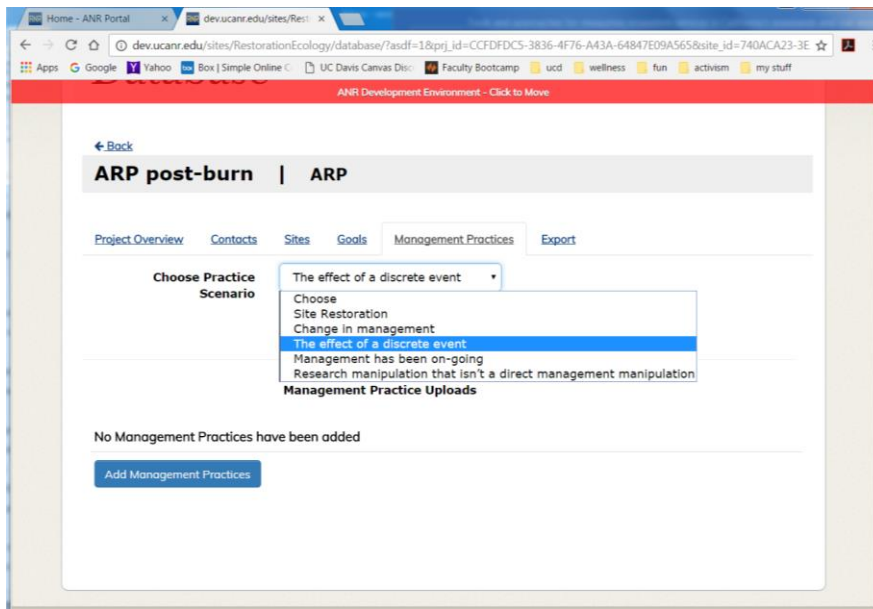
ARP post-burn | ARP

Project Overview Contracts Sites Goals Export

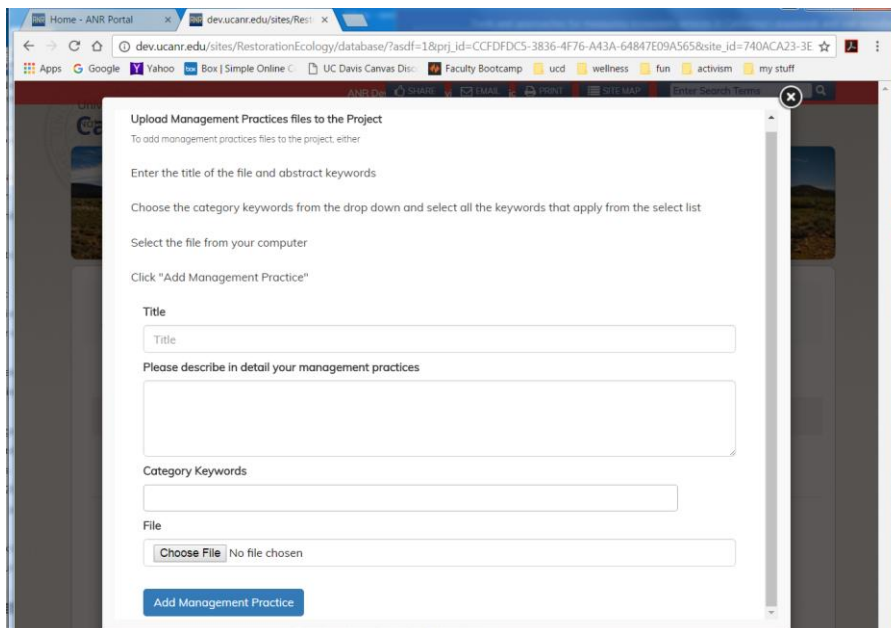
Management Goals

Goal	Ranking	Short or long term?	Current Status	Desired Status	Action
Carbon sequestration	3: Secondary goal (nice to achieve, but not the focal goal)	Long Term	Unclear	Enhance	Delete
Erosion control	4: Important goal, but not the highest priority	Long Term	high gully formation in big storms	eliminate formation of gullies, restore current gullies	Delete
Forage production	4: Important goal, but not the highest priority	Long Term	500 g/m2	20% increase	Delete
Forage quality	4: Important goal, but not the highest priority	Short Term	dominated by unpalatable species, medusahead	increase cover of filaree and legumes	Delete
Invasive species and noxious weed control	4: Important goal, but not the highest priority	Long Term	dominance by goatgrass and yellow starthistle	decrease cover to less than 20%	Delete
Livestock production	5: Highest priority goal	Long Term	production has decreased by 30% over time	increase by 20%	Delete
Native plant conservation	3: Secondary goal (nice to achieve, but not the focal goal)	Long Term	have patches of Stipa pulchra	Maintain	Delete
Native plant restoration	3: Secondary goal (nice to achieve, but not the focal goal)	Long Term	increase native forbs	increase cover to at least 30%	Delete
Other	4: Important goal, but not the highest priority	Short Term	Lack of trails	Build 5 mile loop trail	Delete
Plant diversity	3: Secondary goal (nice to achieve, but not the focal goal)	Long Term	currently have 20 species across a 100 ha ranch	increase to 40 species	Delete
Resilience	5: Highest priority goal	Long Term	poor recovery from fire	ability to have 80% cover in year after fire	Delete
Resistance	5: Highest priority goal	Long Term	60% decrease on forage production in response to drought	20% forage production in response to drought	Delete
Soil compaction alleviation/prevention	3: Secondary goal (nice to achieve, but not the focal goal)	Short Term	Ponding water	alleviate ponding, allow infiltration	Delete
Soil fertility	4: Important goal, but not the highest priority	Long Term	low production, yellowing forage	increase legumes to enhance fertility, and enhance production by 20%	Delete
Water quality	3: Secondary goal (nice to achieve, but not the focal goal)	Short Term	high sediment load	Increase clarity	Delete
Water storage in soil	4: Important goal, but not the highest priority	Long Term	little water storage to support spring growth	support plant growth through May	Delete

Management practices: This section is still under development. It is split into a few different types of approaches to help users search for case studies that most match their own, and to aid in categorizing case studies for analysis.



The many different options possible in this section has made this the most challenging for the database development team. They plan to have a fully developed set of specific drop down prompts (parallel to other sections, such as goals) with discrete questions associated with many of the potential management practices. Estimated completion for this section is September 2018. But in the mean time, a simpler text description or upload option is being used.



Monitoring approaches and data:

Monitoring approaches are inputted through a question box format, and a drop-down menu is being developed.

Monitoring

Management Treatment Plot Count
1

Management Treatment Plot Details
moved before restoration
seeded with native perennial grasses
moved periodically after restoration

Control Comparison Plot Count
1

Control Comparison Plot Details
adjacent non-restored area

Measurement Count

Measurement Details

Monitoring Details What
Soil measures in 15cm increments from 0-90 cm depth
Water holding capacity
Bulk density
Soil organic matter, and C and N

Monitoring Details How
soil cores taken with 5cm diameter core; 3 replicate cores; bulked
vegetation taken from 15cm diameter ring

Monitoring Details When
May-June 2009

Monitoring Details Frequency
once

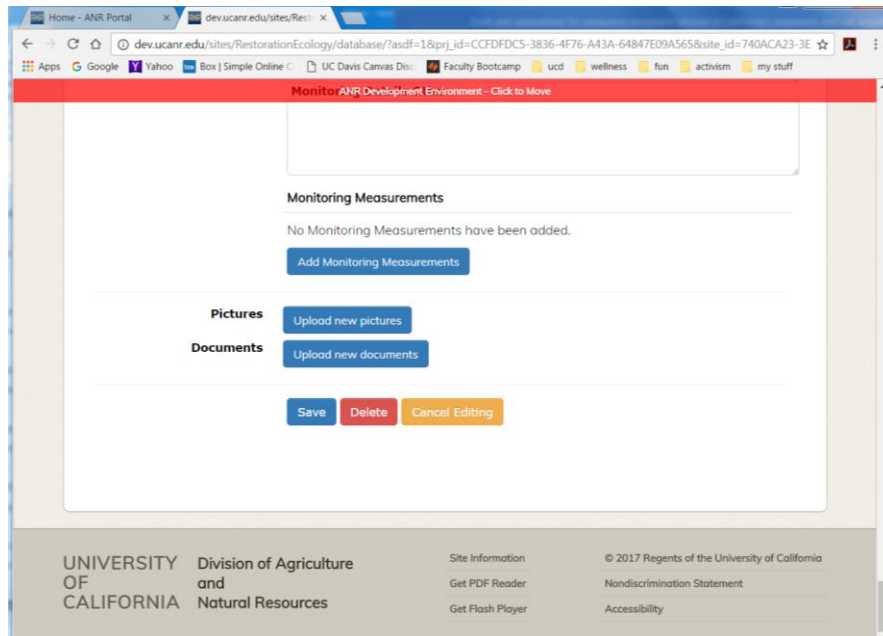
Monitoring Details Wishes

Monitoring Details Other

Monitoring Measurements

Type	Details	Protocol	Timing	Action
Soil %C & bulk density	Soil samples taken every 15cm increments from 0-90 cm depth	3 soil samples taken and bulked	May-June 2009	Delete

The module for uploading data will be further developed (to mirror the goals section, above), but is available now in by uploading files:



Uploading of case study data:

- A few case studies have been entered thus far to test the existing database. Once the last two sections have been fully developed (management practices and data), the CSIT will populate the database with the existing case studies (over 1,700 sites) through an excel upload, so that they don't have to be individually entered.

Maps, fact sheets and producer trainings:

The factsheets and maps depend on a synthesis of the data from the database, so will be completed within a few months after the database is complete and has the case studies uploaded into it (allowing us to do the synthesis maps that the fact sheets are based on). This is expected to occur December 2017-April 2018, when the PI (Eviner) will be on a local sabbatical that is focused on the analyses of this database and outreach based on the database.

The producer trainings on the database and ecosystem services monitoring tools will likewise be scheduled once the database is public (we are currently scheduling this for the Fall 2017-Spring 2018 growing season).

During the course of the project, articles in stakeholder publications related to this project include:

- Eviner, VT. 2014. Effects of weather variations on species composition and production in California's grasslands. *Grasslands* 24:2-7.
- Eviner, VT. 2014. Database of management trials to provide site-specific tools for more effective management. *California Invasive Plant Council News* 22: 10-14.
- Eviner, VT. 2013. Database of management trials to provide site-specific tools for more effective restoration. *Grasslands* Winter 2013.
- Eviner, VT, J Heraty, J Baty, C Malmstrom and K Rice. 2013. Impacts of native vs. exotic grassland vegetation. *California Invasive Plant Council News* 21: 13-14.