

# User guide for the medusahead web application

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## Context and purposes of the guide

This user guide comes from my master thesis work in collaboration with Utah State University and my school ISARA-Lyon. ISARA-Lyon (Institut Supérieur d'Agriculture et d'agroalimentaire Rhône Alpes) is a French graduate college that prepares students for an engineering degree (equivalent to a MSc) in agriculture, food science, environmental science and rural development. Due to medusahead management issue in the western US rangelands, we decided to work on "a new application to exchange knowledge about medusahead management in the western US" (Cabassu, 2015). In order to create an adaptive solution, we made an inventory of needs based on a literature review and interviews. We materialized needs into a database specifications in order to model the data. We modeled data using the MERISE method. Then we implemented our solution on the content management system File maker pro 14 with some help from a qualified developer. I made this user guide as a practical document ready to use for Utah State University. In the user guide, I present the steps to extract data from studies, enter and edit data in the database and how to search data with the application.

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## How to extract data from a publication or a report

**Objective:** This section will help users extract data from studies before entering them into the medusahead database.

**Materials needed for extraction:** research publications, case study reports or demonstration study reports. The data basin and web soil survey applications are needed to find a rangeland vegetation type and ecological site of study location.

Data basin application can be found here:

<http://databasin.org/datasets/1c7a301c8e6843f2b4fe63fdb3a9fe39>

Web soil survey application can be found here:

<http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm>

### 1. Data required for the database

The table below lists the data needed and their descriptions to enter into the database.

| Study information      |   |
|------------------------|---|
| Author                 | First author, Last name and First name  |
| Journal                | Name  |
| Title                  | Name  |
| Year                   | Year of publication   |
| Type                   | It can be "Research" or "Case" or "Demonstration" or a new one  |
| Objective              | It can be "medusahead control" or "desirables impact" or "medusahead control and desirables impact" or a new one  |
| Experimental condition | It can be "field" or "greenhouse" or a new one  |
| Summary                | Information about the study results and management implication found in the paper. Preferably written in non-technical language. You can see some examples at the end of the guide page 26. |
| URL link               | If possible, the URL address where an electronic version of the study or report is available online and it should be free   |

|                          |  |
|--------------------------|--|
|                          | to the general public. Or use the link of the journal that published the paper and the user can pay a fee to get the paper.  |
| <b>Study location(s)</b> |  |
| Rangeland vegetation     | Search the rangeland vegetation from the data basin website. Please see page 12 of this guide.   |
| State                    | State name.  |
| Ecological site          | Name. Use name found in the paper or search the ecological site with the web soil survey method. Please see on page 9 of this guide. If ecological site is not available either in the paper or with the method above then write N/A |
| Site name                | Name or report the location description as in the paper.   |
| GPS                      | Found in paper. For example: 118 56' 18.29"W, 44 26' 5.05"N. Use the same units as reported in the paper. If GPS coordinates are not available please write N/A.   |
| <b>Biological</b>        |  |
| Bio-controlled           | "Yes" or "No". Write "No" only if this tool is at least part of one of the treatments in the study.  |
| Year                     | When the treatment occurred  |
| Timing                   | As accurate as possible. Date (month/day) or Month or Season   |
| Medusahead phenology     | When the treatment was applied, if reported in the paper.  |
| Biocontrol organism      | "Scientific" and/or "(common name)"  |
| Method                   | Listed in the study  |
| <b>Grazing</b>           |  |
| Grazed                   | "Yes" or "No". Write "No" only if this tool is at least part of one of the treatments in the study.  |
| Year                     | When the treatment occurred  |

|                      |   |
|----------------------|---|
| Timing               | As accurate as possible. Date (month/day) or Month or Season  |
| Medusahead phenology | When the treatment was applied, if reported in the paper.   |
| Specie               | "Sheep" or "cow" or "goat" or other   |
| Stocking rate        | Report unit from paper  |
| Supplement type      | For example: ingredients, nutritional content, protein, energy, choice...                           |
| <b>Burning</b>       |   |
| Burned               | "Yes" or "No". Write "No" only if this tool is at least part of one of the treatments in the study. |
| Year                 | When the treatment occurred   |
| Timing               | As accurate as possible. Date (month/day) or Month or Season  |
| Medusahead phenology | When the treatment was applied, if reported in the paper.   |
| <b>Herbicide</b>     |   |
| Sprayed              | "Yes" or "No". Write "No" only if this tool is at least part of one of the treatments in the study. |
| Year                 | When the treatment occurred   |
| Timing               | As accurate as possible. Date (month/day) or Month or Season  |
| Medusahead phenology | When the treatment was applied, if reported in the paper.   |
| Chemical name        | Chemical name (common name), both if possible. For example: Imazapic (plateau)                      |
| Rate                 | Report unit from paper  |
| Method               | Precise ground or areal spray + equipment (helicopter, air plane or ATV...)                         |
| <b>Seeding</b>       |   |

|   |   |
|---|---|
| Seeded                                      | "Yes" or "No". Write "No" only if this tool is at least part of one of the treatments in the study.   |
| Year  | When the treatment occurred   |
| Timing                                      | As accurate as possible. Date (month/day) or Month or Season  |
| Medusahead phenology                        | When the treatment was applied, if reported in the paper.   |
| Specie seeded                               | Scientific and/or (common name)   |
| Rate  | Report unit in paper  |
| Method                                      | Precise ground or areal method + equipment (range drill, helicopter, air plane or ATV...)   |
| <b>Results medusahead control</b>           |   |
| Indicator measured                          | Density, cover, biomass, height, number of viable seeds. If there are choices in the paper, select a measured indicator rather than visually estimated.   |
| Control mean C                              | Use control mean in the same year as treatments where no treatments were applied or from the medusahead stand before any treatment(s) were applied. To select a control mean please see the decision rule page 7  |
| Treatment mean T                            | If several tools were used to control medusahead, treatment mean should represent medusahead stand after treatment(s). If not statistically different from the control, write "ns". To select a treatment mean please see the decision rule page 7              |
| <b>Result desirable plant establishment</b> |   |
| Indicator measured                          | Density, cover, biomass, height, number of viable seeds. If there are choices in the paper, select an indicator which has been measured rather than visually estimated.<br>Specify which plant species or groups according to information detailed in the paper |
| Control mean C                              | Sum up the different control means to have a single desirables control mean or report control means as written  |

|                  |  |
|------------------|--|
|                  | in the paper (by group or by specie etc...). If seeding, all plants in the seed mix will be desirable. Otherwise, all plants will be considered desirable except toxic and invasive species.   |
| Treatment mean T | Sum up the different treatment means to a single desirable treatment mean or report treatment means as written in the paper (by group or by specie etc...). If seeding, all plants in the seed mix will be desirable. Otherwise, all plants will be considered desirable except toxic and invasive species. If no difference with the control, write “ns”. If specie mix didn't establish (control mean = 0 and treatment mean = 0 then write “ne”). |

## 2. Decision rule to select control and treatment means according to study

|  | For the same treatment (combination of tool used with their own modalities) |   |  |   |
|--|---|---|--|---|
| Case   | <b>1</b>  | <b>2</b>                                | <b>3</b>                               | <b>4</b>                                |
| Number of applications                             | 1   | 1                                       | Several                                | Several                                 |
| Number of different control mean                   | 1 or several constant across years  | Several                                 | 1 or several constant across years     | Several                                 |
| Number of vegetation evaluations after application | Several (= monitoring data)   | Several (= monitoring data)             | 1                                      | 1                                       |
| Treatment and control means                        | Use the last evaluation   | Use the last evaluation                 | Use each evaluation                    | Use each evaluation                     |
| Examples   | Chart C, Figure 1 (Davies et al., 2011)                                     | Chart B, Figure 1 (Davies et al., 2011) | Chart A, Figure 1 (Kyser et al., 2012) | Chart D, Figure 5 (Sheley et al., 2007) |

## 3. Finding an ecological site for a location

Use the online web soil survey application proposed by NRCS here:

<http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm>

This application will allow you to find the ecological site name that matches with the location information written in the study.

**Conditions to find the ecological site of a location:**

You can find the site only if you have GPS coordinates of the study location or have an address close to the study location

The web soil survey might not have information about a location yet. In this case, it won't be possible to find the ecological site name.

Once you clicked on the link above, the web page will open then press start WSS as below.



Here are the main steps to find an ecological site of a study location:

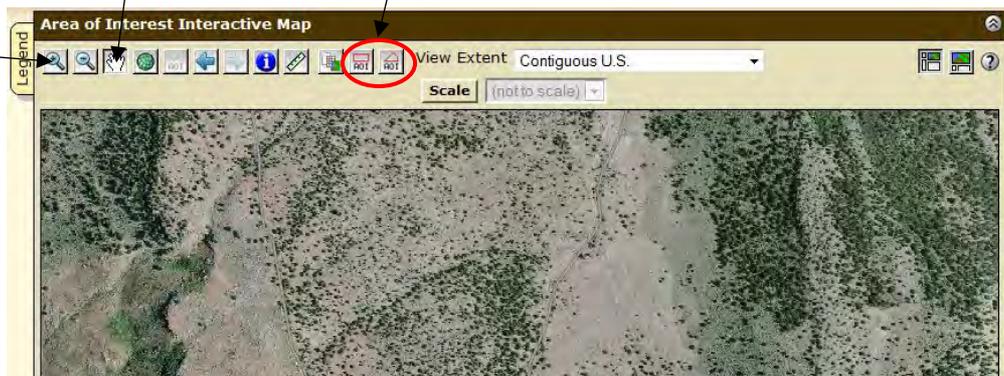
- Locate as precise as possible where the study was conducted on the map
- Draw an area of interest at this location on the map
- Get the ecological site name that match with this location

Map navigation information:

Drag the map in any directions

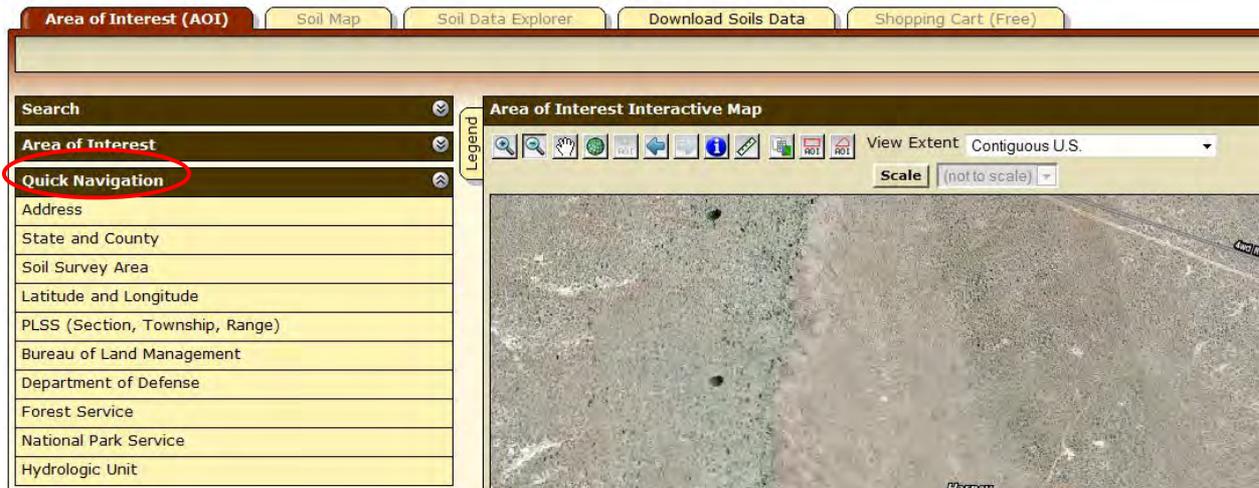
Define areas of interest (AOI)

Zoom



## 1-Define the study location:

Once you open the application, click on quick navigation on the left menu. You will be given different possibilities to search. Below are two examples.



Using latitude and longitude coordinates:

Click on latitude and longitude on the left menu. Enter the latitude and longitude of the study location. You will have to use one of the standard nomenclatures to search. Please click on the question mark button as below to get more information.

| Latitude and Longitude  |                                     |
|-------------------------|-------------------------------------|
| Latitude, Longitude     | 43° 26' 54.98" N, 118° 26' 43.94" W |
| Display location marker | <input checked="" type="checkbox"/> |

With this method, a point on the map will show where the study was conducted.

Using an address:

Click on address on the left menu. Enter an address as close as possible to the study location given in the paper. Please click on the question mark button as below to have more information on how write an address to achieve the search.

| Address              |                                     |
|----------------------|-------------------------------------|
| Address              | Alturas, California                 |
| Show location marker | <input checked="" type="checkbox"/> |

With this method, the person extracting the data will have to navigate with the map to be able to define the precise study location.

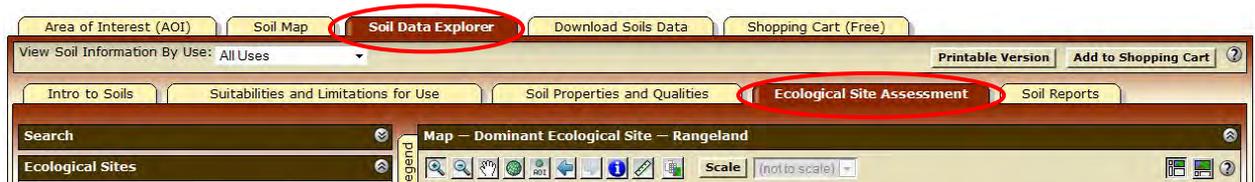
### 2-Draw an area of interest (AOI):

Once you have located the precise study location, click on one of the AOI buttons on the top of the map. Then draw an area as small as possible and center it on the study location. The result should look like:



### 3-Get ecological site name list:

Click on soil data explorer then click on ecological site assessment as below.



A small list of ecological sites might exist for one location. Make sure that the AOI was as small as possible or else the report will be a list of the different ecological sites found on the location.

Here is an example of result that you would get below the map:

| Table — Ecological Sites by Map Unit Component — Rangeland |  |                          |                                    |              |                |
|--|--|--------------------------|------------------------------------|--------------|----------------|
| Harney County Area, Oregon                                 |  |                          |                                    |              |                |
| Map unit symbol  | Map unit name                                      | Component name (percent) | Ecological site                    | Acres in AOI | Percent of AOI |
| 199  | Merlin-Observation complex, 2 to 20 percent slopes | Merlin (50%)             | R010XB0800R — JD CLAYPAN 12-16 PZ  | 1.6          | 100.0%         |
|  |  | Observation (35%)        | R010XC0320R — SR MOUNTAIN 12-16 PZ |              |                |
| <b>Totals for Area of Interest</b>                         |  |                          |                                    | <b>1.6</b>   | <b>100.0%</b>  |

#### 4. Finding a rangeland vegetation type for a location

Use the U.S. Potential Natural Vegetation, Original Kuchler Types, v2.0 (Spatially Adjusted to Correct Geometric Distortions) online proposed by Data Basin available here:

<http://databasin.org/datasets/1c7a301c8e6843f2b4fe63fdb3a9fe39>

This map shows all the different rangeland vegetation types across the US. Each color on the map matches a rangeland vegetation type.

##### **Conditions to find a rangeland vegetation type:**

Using Data Basin to find a rangeland vegetation type from the location requires that the user knows the GPS coordinates or an address or geographic information of the study location

Once you clicked on the link above, the web page will open then click on Open in Map as below:

Below are the main steps to find a Rangeland vegetation type of a study location:

- Locate where the study was conducted on the map
- Get the rangeland vegetation type of the location

Map navigation information:

Drag the map in  
any directions



Zoom



Locate



Identify

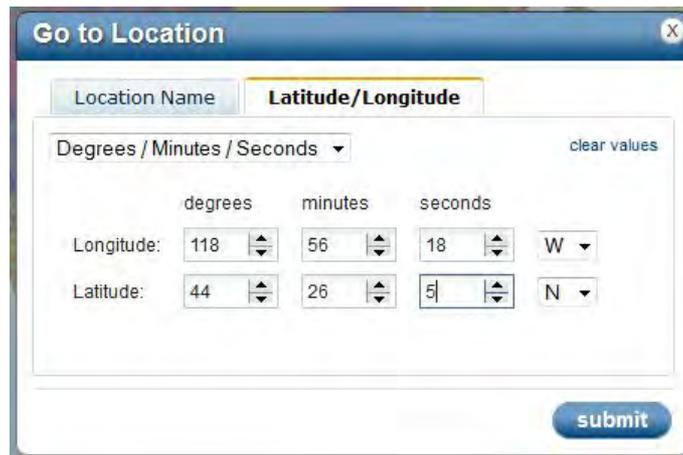


Help

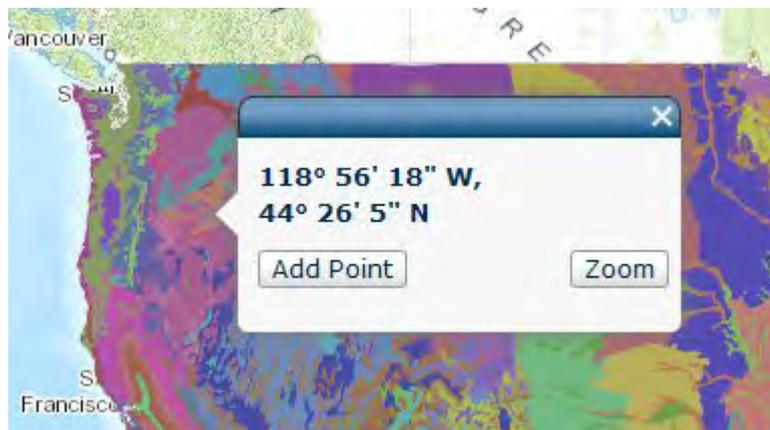


### 1-Define the study location:

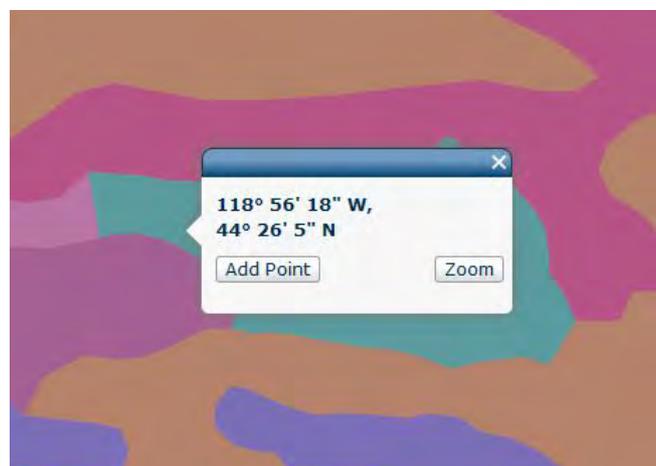
Click on the “Locate” button above the map and then enter GPS coordinates or the name of the place as below.



Then hit the “submit” button and a window, like the one below, will appear. The left part of the window is pointing on the location.



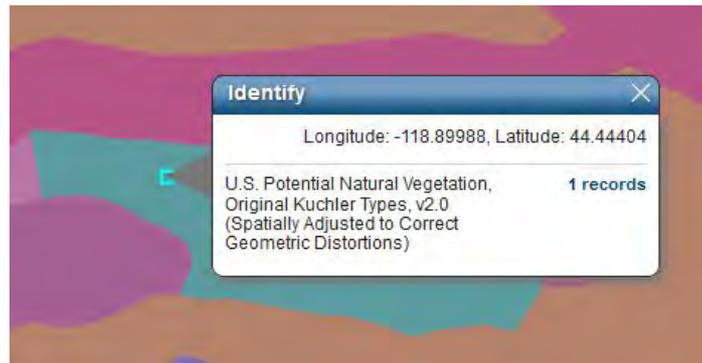
Click on the “Zoom” button to view the location and determine the color (rangeland vegetation type) the study site is located. The result should appear as below.



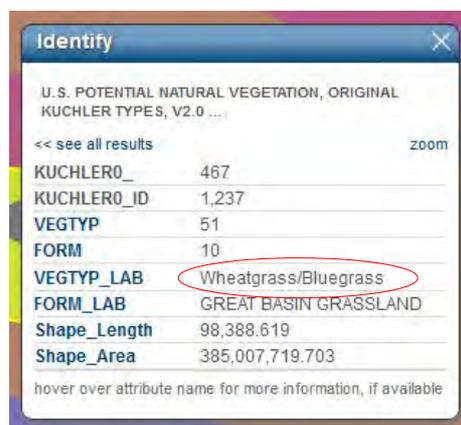
As a result, the study location belongs to the green color.

## 2- Get the rangeland vegetation type:

Instead of looking at the map legend (on the right), click on the “identify” button on the top of the map to identify the name of the rangeland vegetation type of the area. Point to the colored area with your mouse, where the study is located, and click. The window below will appear.



Click on the link named “1 records” and you will get the name of the rangeland vegetation in the table beside VEGTYP\_LAB as below.



## 5. How to determine and record treatment mean values and significance

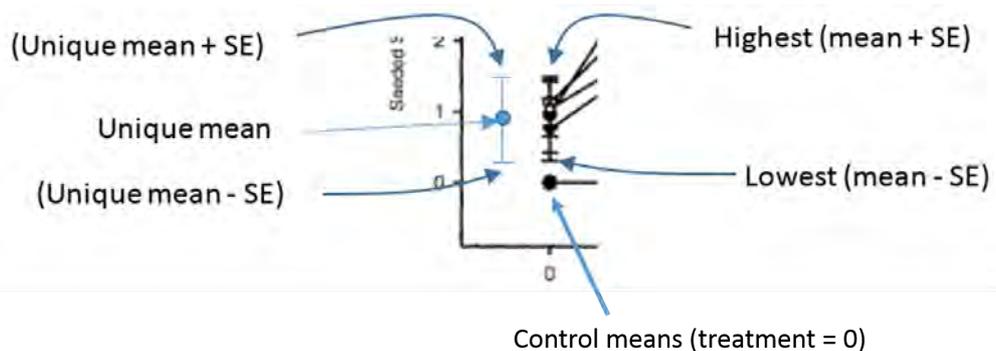
Tables presented in papers should be used, when they are available in papers, rather than graphs because tables are more accurate. Treatment means should be extracted from tables only if they are statistically different from the control, otherwise enter: “ns” for treatment mean. However, most of papers use graphs to display results. Below is the method we used to deal with mean values and significance issues.

### ✓ *Determining mean values*

Deciding which mean values are significant can be tough when there are different means with overlapping error bar. Let's take this usual example to find out about mean values.

Means from different treatments with overlapping error bars are not statistically different. We decided that this group of means should be represented by a unique mean and standardized error bars. The principle is to define the highest (mean + SE) point among the group of means as the (unique mean + SE) point. The same way to define the (unique mean - SE) point. As a result the unique mean point will be equaled to  $((\text{unique mean} + \text{SE}) + (\text{unique mean} - \text{SE}))/2$ .

Example to define the unique control mean and SE



In this case, there are 2 control means. One equaled to 0.9% (the one we just estimated) and one equaled to 0%.

This principle can be applied to define one or several control mean(s) and SE or one or several treatment mean(s) for a treatment characteristic.

### ✓ *Determining significance*

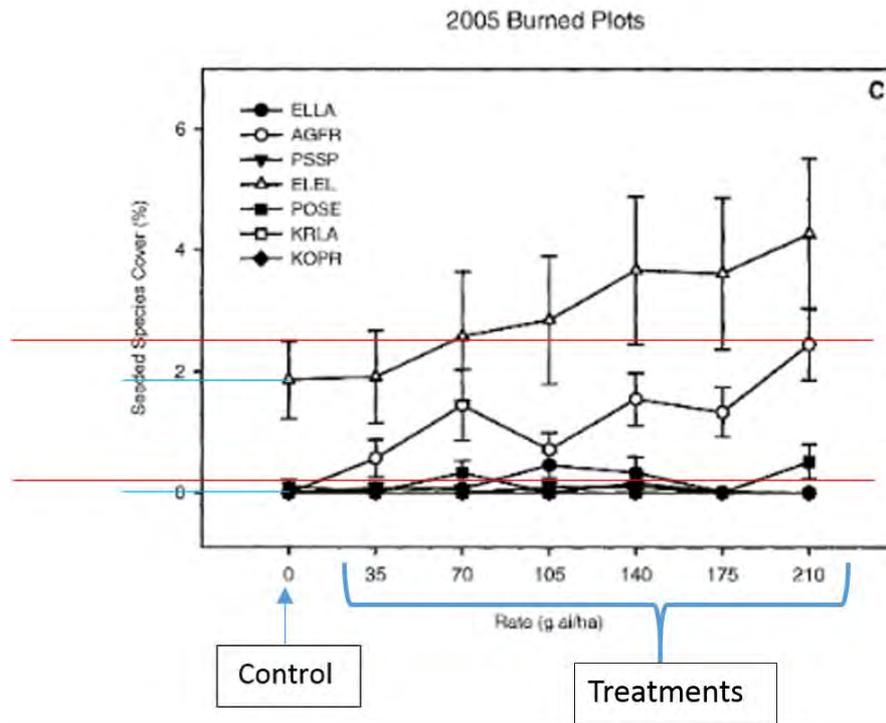
**Blue lines** = mark the control mean value

**Red lines** are used to evaluate treatments for significance. In examples below, the red line is positioned on the (control mean + standard error) point because we are measuring an increase in desirable plants. If it the publication was evaluating a decrease in medusahead control then the red line would be positioned on the (control mean – standard error) point.

Compared only control and treatment means recorded in the same year. “From the same year” means, when the vegetation evaluation was completed. If the red line is overlapping with treatment mean error bars then treatment mean is not different to the control mean. In this case the mean treatment value is “ns”. If error bar are not overlapping it means that treatment mean is different than the control mean, then enter the treatment mean value. Treatment means should be compared with their respective control. For desirable evaluation, if control and treatment means equal 0 then it means that desirable did not establish. In this case, “ne” should be entered for treatment mean.

✓ Some examples

Graph 1:



Control means:

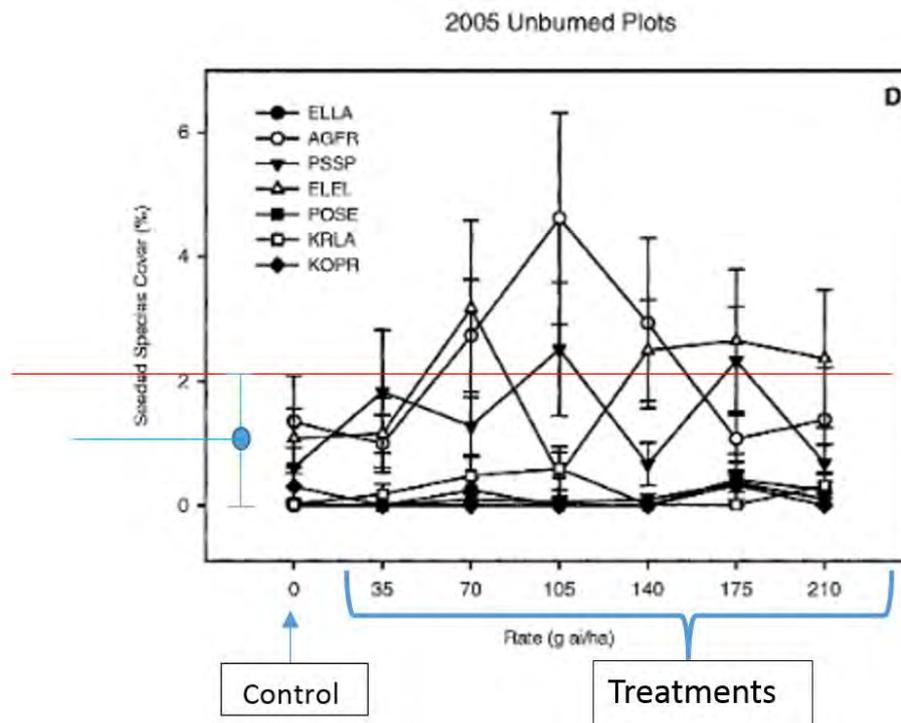
In this study there are 2 control means, 0% cover and 1.9% cover because control mean are separated in 2 groups without error bar overlaps. In other words, the specie ELEL has his own control mean.

| Graph 1        |                |           |              |                |
|----------------|----------------|-----------|--------------|----------------|
| Herbicide Rate | Species seeded | Indicator | Control mean | Treatment mean |
| 35             | ELLA           | %cover    | 0            | ns             |
| 35             | AGFR           | %cover    | 0            | ns             |
| 35             | PSSP           | %cover    | 0            | ns             |
| 35             | ELEL           | %cover    | 1.9          | ns             |
| 35             | POSE           | %cover    | 0            | ns             |
| 35             | KRLA           | %cover    | 0            | ns             |
| 35             | KOPR           | %cover    | 0            | ns             |
| 70             | ELLA           | %cover    | 0            | ns             |
| 70             | AGFR           | %cover    | 0            | 1.5            |
| 70             | PSSP           | %cover    | 0            | ns             |
| 70             | ELEL           | %cover    | 1.9          | ns             |
| 70             | POSE           | %cover    | 0            | ns             |
| 70             | KRLA           | %cover    | 0            | ns             |
| 70             | KOPR           | %cover    | 0            | ns             |

|     |      |        |     |     |
|-----|------|--------|-----|-----|
| 175 | ELLA | %cover | 0   | ns  |
| 175 | AGFR | %cover | 0   | 1.4 |
| 175 | PSSP | %cover | 0   | ns  |
| 175 | ELEL | %cover | 1.9 | ns  |
| 175 | POSE | %cover | 0   | ns  |
| 175 | KRLA | %cover | 0   | ns  |
| 175 | KOPR | %cover | 0   | ns  |

(Sheley et al., 2007)

**Graph 2:**



Control mean:

Only one control mean equaled to 1%. Error bars are overlapping and it is difficult to split means in different groups.

| Graph 2        |                |           |              |                |
|----------------|----------------|-----------|--------------|----------------|
| Herbicide Rate | Species seeded | Indicator | Control mean | Treatment mean |
| 35             | ELLA           | %cover    | 1            | ns             |
| 35             | AGFR           | %cover    | 1            | ns             |
| 35             | PSSP           | %cover    | 1            | ns             |
| 35             | ELEL           | %cover    | 1            | ns             |
| 35             | POSE           | %cover    | 1            | ns             |
| 35             | KRLA           | %cover    | 1            | ns             |

|     |      |        |   |     |
|-----|------|--------|---|-----|
| 35  | KOPR | %cover | 1 | ns  |
| 105 | ELLA | %cover | 1 | ns  |
| 105 | AGFR | %cover | 1 | 4.9 |
| 105 | PSSP | %cover | 1 | ns  |
| 105 | ELEL | %cover | 1 | ns  |
| 105 | POSE | %cover | 1 | ns  |
| 105 | KRLA | %cover | 1 | ns  |
| 105 | KOPR | %cover | 1 | ns  |

(Sheley et al., 2007)

## How to enter data in the database

**Objective:** This section will help users enter data from studies into the database

**First steps:** Open the FileMaker pro Database file called “Medusahead application” on your computer or you can access it online:

<https://129.123.22.55/fmi/webd#Medusahead%20application> (coming soon). The main menu will appear (Figure 1) and click on the button “Enter data” as below.

**User privileges:** Certain users will be allowed to enter data. Users will have to login with a user name and password to access this database function (coming soon)

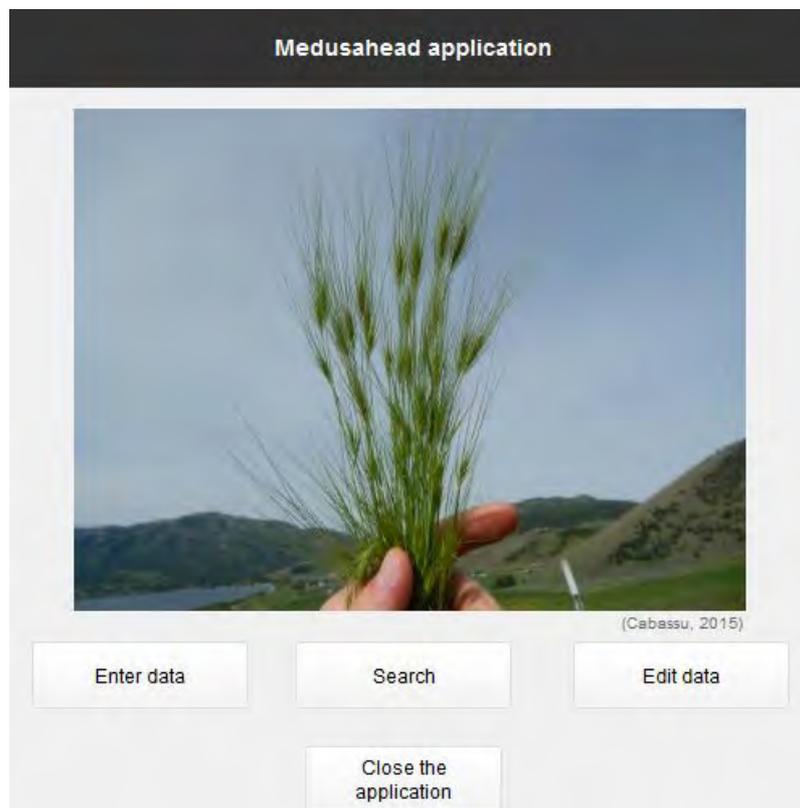


Figure 1 : Medusahead application main menu

# 1. Entering study and location information

After clicking on “Enter data” in the main menu, a page will come up as below (Figure 2).

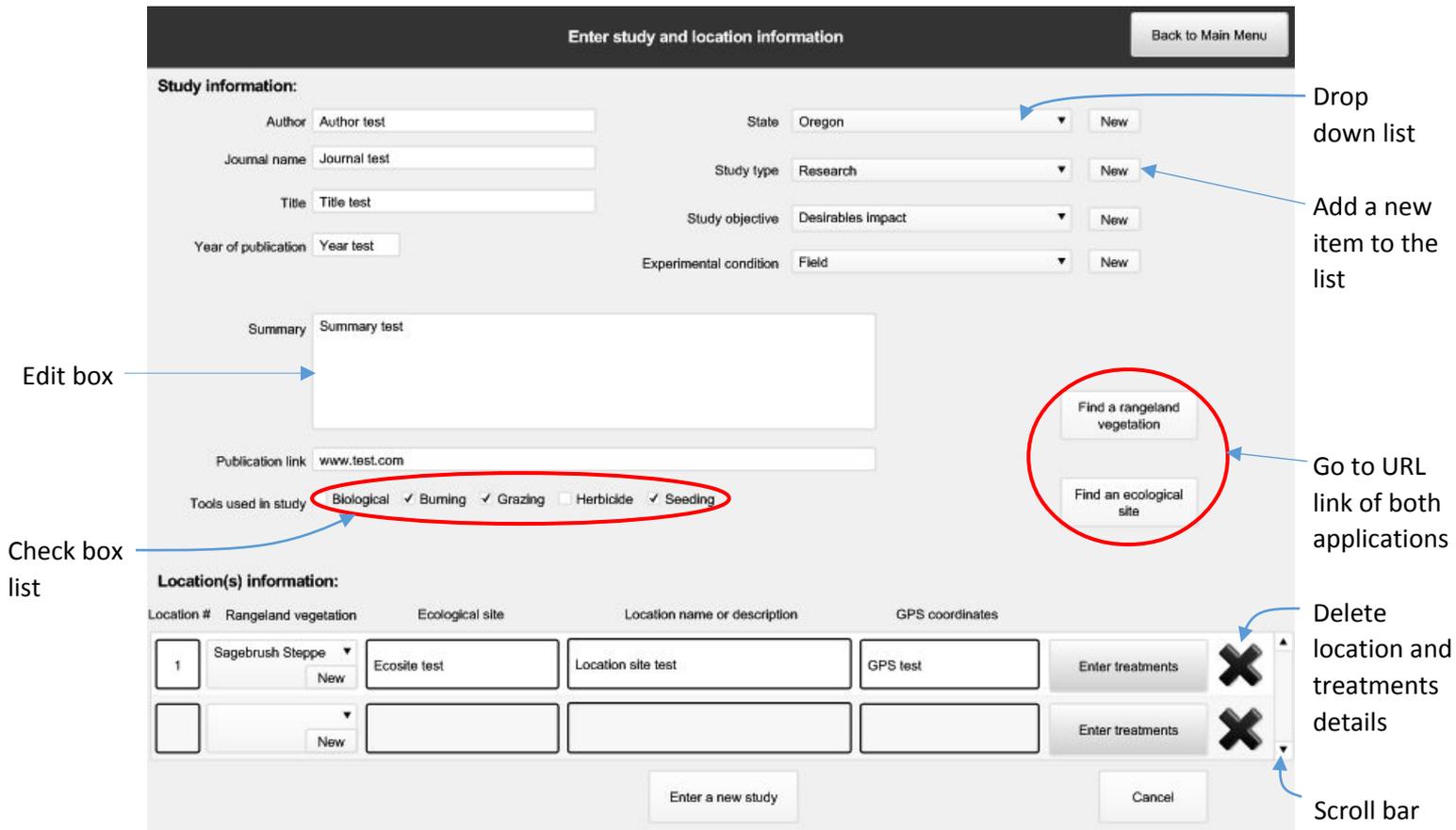


Figure 2 : Entering study and location information

In this page, you can enter all study and location(s) information. For any questions about the type of data to look for in studies, please review the data extraction section above.

You can type or copy directly into boxes the following information: author, journal name, study title, year of publication, summary, link, ecological site, location name and GPS coordinates. You can select information like state, study type, study objective, experimental condition or rangeland vegetation from the drop down lists provided. If the information needed is not in the list, you can add a new one clicking on “New”. After clicking on the “New” button, you will be directed to a page to enter the new item. Please see the example on adding a new state (Figure 3). You can select weed management tool(s) used in the study thanks to the check box list. If a new tool has to be added, please contact Beth Burritt, Wildland Resource Department at Utah State University.

Identification will be generated automatically. Please just ignore it and DON'T CHANGE IT.

Type the new state name

User guide for the medusahead web application. Romain Cabassu, 2015  
 Adds a new state to the list and returns to the previous page (Figure 2)

Will cancel the operation and returns to the previous page (Figure 2)



The image shows a dialog box titled "State". It has a dark header bar with the word "State" in white. Below the header, there are two input fields. The first is labeled "id\_State" and contains the number "37". The second is labeled "State\_Name" and is currently empty. At the bottom right of the dialog, there are two buttons: "Ok" and "Cancel".

*Figure 3: Add a new state*

For each new study location, you have to enter a study location number. Both button “find a rangeland vegetation” and “find an ecological site” open the URL link of respective applications. How to use these applications are available in the extraction section above. You can view the different locations using the scroll bar. You have to enter treatments for each study location by clicking on “Enter treatments”. You can use the cross button to delete a study location. This operation will also delete all treatment details entered for this location.

The cancel button located on the bottom left corner of this page (Figure 2), will delete all study information, location information and treatment details and then you will return to the main menu. When done with a study, you can also enter a new study by clicking on “Enter a new study” button located on the bottom of the page. This button will clear all fields to let you enter new information. When done with a study, you can also go back to the main menu by clicking on “Back to main menu” button located on the top right corner of the page to do other operations.

You should fill out all study and location information to go back to menu or add a new study or enter treatment details. This message will come up till information are not entered properly.

## 6. Entering treatment details

After clicking on the “Enter treatment” button, a page will appear as below (Figure 4). You can enter each treatment tried in the study for this location on this page.

The screenshot shows a web application interface for entering treatment details. At the top, there is a header with the following information: Study title: Title test, Location: Location site test, Rangeland vegetation: Sagebrush Steppe, Ecological site: Ecosite test, and GPS coordinates: GPS test. On the right side of the header, there are two buttons: "New Treatment" and "Back". Below the header, there are several tabs: "Burning", "Grazing", "Seeding", and "Vegetation evaluation". The "Vegetation evaluation" tab is currently selected. Below the tabs, there is a table with the following columns: "Treatment #", "Burned", "Year", "Timing", and "MedusaheadPhenology". The "Treatment #" column contains the number "1". The "Burned" column has a dropdown menu. The "Year", "Timing", and "MedusaheadPhenology" columns have input fields. Annotations on the right side of the image point to the "New Treatment" button (labeled "Add a new treatment"), the tabs (labeled "Tabs"), the "Treatment #" column (labeled "Treatment methods"), and the input fields (labeled "Treatment modalities").

Figure 4 : Enter treatment for a location according to tool used in the study

Current location information as well as the study title are displayed at the top of the page (Figure 4). Each control tool has its own tab with a description of the treatment methods. You can only enter data from the tool(s) used in the study (Figure 2). The vegetation evaluation tab allows you to enter medusahead and/or desirable results after treatment(s). You can enter medusahead and/or desirable results according to the study objectives selected in the previous page (Figure 2). If you have question about which data should be entered, please review the extraction section of this guide page 5. Switching between tabs is possible anytime while entering the treatment(s). A treatment number located in front of each treatment will be generated automatically for each new treatments and it will help you switching between tabs. To add a new treatment, click on the “New treatment” button located on the top right corner of the page (Figure 4). When done entering treatments, you can go back to the previous page (Figure 2) by clicking on the “Back” button located beside the “New treatment” button.

## How to edit data in the database

**Objective:** This section will help user editing data entered in the database

**First steps:** Open the FileMaker pro Database file called “Medusahead application” on your computer or you can access it online:

<https://129.123.22.55/fmi/webd#Medusahead%20application> (coming soon). The main menu will appear (Figure 1) and click on the button “Edit data”.

**User privileges:** Certain users will be allowed to edit data. User will have to login with a user name and password to access this database function (coming soon)

A page as below will come up (Figure 5)

**Study information:**

Author: Kyser B. Guy et al. State: California [New] [Edit]

Journal: Invasive Plant Science and Management Study type: Research [New] [Edit]

Title: Selective Control of Medusahead (Taenlatherum caput-medusae) in California Sagebrush Scrub using Low Rates of Study objective: Medusahead control and desirables [New] [Edit]

Year of publication: 2012 Experimental condition: Field [New] [Edit]

Summary: Best timing for application = medusahead at tillering stage with low rate of glyphosate (160 g ae/ha - 348 g ae/ha) achieved 95% reduction in medusahead cover and filled seeds. These application conditions would have minimal impact on big sagebrush. Need multiyears treatment to deplete the soil seed bank. Cost effective option for ranchers and land managers.

URL Link: <http://www.wssaajournals.org/doi/abs/10.1614/IPSM-D-11-00032.1>

Tools used in study:  Biological  Burning  Grazing  Herbicide  Seeding

**Expert information:**

First name: Theresa Last name: Becchetti Organism: University of California Job title: Farm Advisor Email: tabecchetti@ucanr.edu Phone number: 209 525 6800 [New expert] [Edit expert]

Find a rangeland vegetation Find an ecological site

**Location(s) information:**

| Location # | Rangeland vegetation          | Ecological site | Location name or description        | GPS coordinates   |                       |
|------------|-------------------------------|-----------------|-------------------------------------|-------------------|-----------------------|
| 1          | Sagebrush Steppe [New] [Edit] | N/A             | Approximately 12km south of Alturas | 41.23 N, 120.30 W | [Edit treatments] [X] |
|            | [New] [Edit]                  |                 |                                     |                   | [Edit treatments] [X] |

[←] [→] [Delete study]

Figure 5 : Edit study, location or expert information

You can edit all study, location or expert information either by directly clicking in the edit boxes or by clicking on edit buttons on this page (Figure 5). After clicking on an “Edit” button, you will be directed to a page to edit an item of the list previously entered. Please see an example to edit a rangeland vegetation type (Figure 6).

Identification will be generated automatically.

Please just ignore it and DON'T CHANGE IT.

User guide for the medusahead web application. Romain Cabassu, 2015

Save any changes on list items and go back to the edit page (Figure 5)

Allow navigation between the different list records



*Figure 6 : Edit rangeland vegetation(s)*

It is only on this page (Figure 5) that you can add or edit expert information. So far the database allows you to associate one expert to one state and the state will have only one expert.

If you try to add a new expert for a state that already has an expert, a message will come up to propose you to change or create a new state.

You can edit treatment modalities using the button “Edit treatment” for each location. You can navigate between studies entered using navigation arrows on the bottom of the page (Figure 5). The button “Delete” located on the bottom right corner of the page (Figure 5) will delete the current study (study information, location information and treatment details) that you are on. Once editing is done, you can go back to the main menu by clicking on the “Back to main menu” button on the top right corner of the page (Figure 5)

## How to search studies and treatments in the database

**Objective:** This section will help the user to search the data in the database

**First steps:** Open the FileMaker pro Database file called “Medusahead application” on your computer or you can access it online:

<https://129.123.22.55/fmi/webd#Medusahead%20application> (coming soon). The main menu will appear (Figure 1) and click on the button “Search data”. A page as below will come up (Figure 7)

**User privileges:** All users will be allowed to search data.

The screenshot shows the 'Search studies and treatments' interface. At the top, there are six dropdown menus for keyword selection: Rangeland vegetation (Sagebrush Steppe), State (Utah), Study type (Research), Study objective (Medusahead control), Tool (with a pop-up menu showing Biological, Burning, Grazing, Herbicide, and Seeding), and Unique grade (Good). Below these is a 'Sort studies by' section with buttons for State, Type, Objective, and Tool. A 'Search' button is on the right, along with 'Clear search and sort' and 'Back to main menu' buttons. The main content area is a table with columns for Year of publication, Study title, Study and expert information, Treatment methods and results, and Tool(s). The table lists three studies: 2012 (Selective Control of Medusahead...), 2009 (Are early summer wildfires...), and 2014 (Restoration of Exotic Annual Grass-Invaded Rangelands...). The 'Tool(s)' column for the 2009 study is circled in red and labeled 'Sort criteria values'. The 'Tool(s)' column for the 2014 study is also circled in red and labeled 'Sort criteria values'. Annotations on the left side include 'Keyword lists' pointing to the dropdowns, 'Sort criteria' pointing to the sort buttons, and 'List of study' pointing to the table. Annotations on the right side include 'Sort criteria selected' pointing to the 'Tool(s)' column and 'Sort criteria values' pointing to the specific tool names in the table.

Figure 7 : Search studies and treatments

### 1. Keyword selection and search engine

Search studies and treatments according to 6 dropdown menus of keywords. You can select one term from each list or you can choose not to select a term from a dropdown menu. If you choose not to select from one of the menus then the search will include all the terms within that menu. For example, if you fail to select a state then data from all states will be reported in your search. In the tool menu you can pick one or a combination of tools according to your interests. The search uses only an “AND” search. This means that the search engine will pull out only studies and treatments that match with the combination of keywords. In the page above (Figure 7), the system will pull out only studies and treatments that have all keywords selected (Sagebrush steppe and Utah and research and medusahead control and burning-herbicide-seeding and good).

When you select a rangeland vegetation type, the database will pull out studies that have treatments in locations included in the rangeland vegetation type selected. According to the study objective you select, the database will pull out different studies. If you select the medusahead control objective then you will get studies that only evaluated medusahead control after treatment. If you select desirables impact as the study objective then only

studies that measured desirables will be displayed. When you select medusahead control and desirables impact as study objective you will get only studies that measured both medusahead control and desirable establishment.

The unique grade menu allows you to select a treatment or combination of treatments by their success. Unique grade categories are comprised of a medusahead control grade and a desirable plant species grade alone or combined into a global grade (Figure 8). Medusahead control grades are based on percent reduction categories. Desirable plant grades are based on an increase, decrease or no change categories.

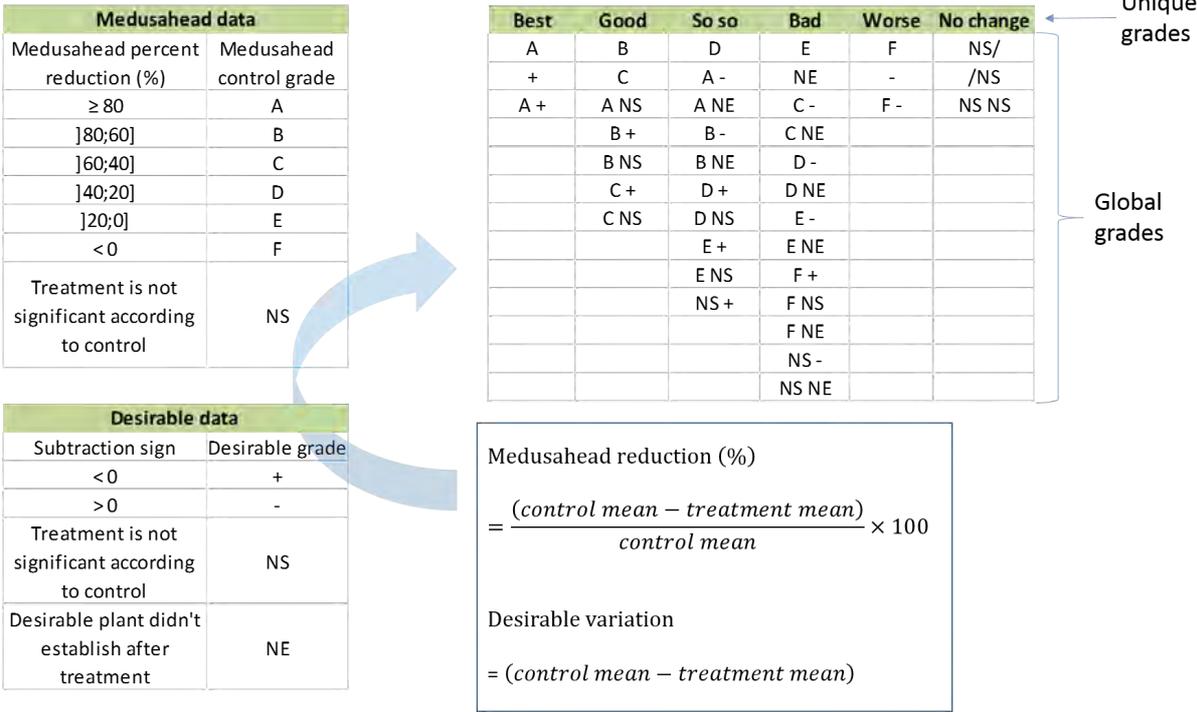


Figure 8 : Treatment grading

You can search again based on previous search findings by adding more keywords to the selection and hit “search” again. Thus, it will refine the search. If keyword selection doesn’t match with any studies, then a message will come up and suggest you to clear the previous search and enter new keywords. This message will come back until the keyword selection matches with studies available in the database.

### 7. Searching studies

Before any search, all studies available in the database are listed (Figure 7). Once all keywords are selected, click on the “Search” button on the top right corner. The list of studies matching your keywords will be displayed. Each study is described by its year of publication and title.

You can access study information with location(s) and expert details (Figure 9) with the button “Study and expert information”. You can access treatments details (Figure 10) with the button “Treatment methods and results”.

Study information with location(s) and expert details
Back to search

---

Stu\_Author:

Stu\_Journal:

Stu\_Title:

Stu\_YearPublication:

State\_Name:

Type\_Name:

Objective\_Name:

ExpeCondition\_Name:

Stu\_Summary:

Stu\_Link:

Expert\_FirstName:

Expert\_LastName:

Expert\_Organism:

Expert\_JobTitle:

Expert\_Email:

Expert\_PhoneNumber:

Tools used in study:  Biological  Burning  Grazing  Herbicide  Seeding

| Location # | Veg_Name         | Loca_EcologicalSite | Loca_SiteName                       | Loca_GPS          |
|------------|------------------|---------------------|-------------------------------------|-------------------|
| 1          | Sagebrush Steppe | N/A                 | Approximately 12km south of Alturas | 41.23 N, 120.30 W |
|            |                  |                     |                                     |                   |

Figure 9 : Study information with location(s) and expert details after a search

Study title: Selective Control of Medusahead (Taeniattherum caput-medusae) in California Sagebrush Scrub
Back

Rangeland vegetation: Sagebrush Steppe

Location: Approximately 12km south of Alturas

Ecological site: N/A

GPS coordinates: 41.23 N, 120.30 W

| Row # | Location # | Global Grade | Sprayed | Year | Timing   | MedusaheadPhenology | Rate        | Chemical   | Method |
|-------|------------|--------------|---------|------|----------|---------------------|-------------|------------|--------|
| 1     | 1          | CNS          | Yes     | 2009 | March 18 | Seedlings 5 cm      | 79 g ae/ha  | Glyphosate | Ground |
| 2     | 1          | BNS          | Yes     | 2009 | May 8    | Tillering           | 79 g ae/ha  | Glyphosate | Ground |
| 3     | 1          | BNS          | Yes     | 2009 | May 27   | Boot                | 79 g ae/ha  | Glyphosate | Ground |
| 4     | 1          | BNS          | Yes     | 2009 | March 18 | Seedlings 5 cm      | 158 g ae/ha | Glyphosate | Ground |
| 5     | 1          | ANS          | Yes     | 2009 | May 8    | Tillering           | 158 g ae/ha | Glyphosate | Ground |
| 6     | 1          | ANS          | Yes     | 2009 | May 27   | Boot                | 158 g ae/ha | Glyphosate | Ground |
| 7     | 1          | ANS          | Yes     | 2009 | March 18 | Seedlings 5 cm      | 236 g ae/ha | Glyphosate | Ground |

Figure 10 : Treatment details with global grade after a search

On both pages (Figure 9 and 10), all information is locked to avoid you editing data. A row number will help you to switch between tabs to understand the whole treatment. The global grade is available for each treatment to better appreciate the treatment result.

## 8. Sorting studies

Studies are automatically sorted by year of publication. After a search attempt, you can sort studies based on a sort criteria among four choices. According to the sort criteria chosen, criteria value(s) will be detailed for each study. If several studies have same criteria values, then these studies will also be sorted by year of publication (Figure 7)

## Example of summaries

### Example 1:

Study title: Control of Medusahead (*Taeniatherum caput-medusae*) Using Timely Sheep Grazing (DiTomaso et al., 2008).

Summary: The best time to reduce medusahead cover = medusahead at the boot stage. Mid-spring grazing reduced thatch and increased species richness and diversity. After mid-spring grazing, medusahead is unable to recover and produce new inflorescence due to the lack of soil moisture. There is a problem of logistics to be able to bring high animal density in a short period of time. Grazing medusahead has a negative impact on individual animal performance.

### Example 2:

Study title: Selective Control of Medusahead (*Taeniatherum caput-medusae*) in California Sagebrush Scrub using Low Rates of Glyphosate (Kyser et al., 2012)

Summary: Best timing for application = medusahead at tillering stage. Low rates of glyphosate (160 g ae/ha to 348 g ae/ha) achieved 95% reduction in medusahead cover and filled seeds. These application conditions would have minimal impact on big sagebrush. Need multi-year treatment to deplete the soil seed bank. Cost effective option for ranchers and land managers.

### Example 3:

Study title: Control of Medusahead (*Taeniatherum caput-medusae*) and Other Annual Grasses with Imazapic (Kyser et al., 2007).

Summary: Good tolerance of perennial grasses to low rates of imazapic. Medusahead and other invasive annuals are effectively suppressed after litter is removed by mowing, raking or burning. When rate increased plant cover decrease especially annual grasses. The margin of safety for desirable species is narrow. Each site should be evaluated before application to define chemical, timing and rate to improve medusahead control.

### Example 4:

Study title: Site Characteristics Determine the Success of Prescribed Burning for Medusahead (*Taeniatherum caput-medusae*) Control (Kyser et al., 2008)

Summary: Best timing = medusahead seedhead maturing. Burning seems to be a relevant strategy to control medusahead in warmer winter areas (California) rather than cooler winter areas (intermountain regions). In California, window for burning is longer because flowering period of medusahead is longer (March-june). Dried forage fuel from annuals is more abundant thus easier to carry a fire with higher intensity and may damage seeds. Moreover there is less risk to negatively impact other desirable plants species which have

already dried up at the time of burning. Competitive species should establish after burning to increase chances of success durability.

**Example 5:**

Study title: Medusahead Control with Fall- and Spring-Applied Herbicides on Northern Utah Foothills (Monaco et al., 2005)

Summary: Surface area burning at the low-litter site = 10% while for the high-litter site = 80%. Higher herbicide rates increased medusahead control and bare ground but this was affected by site, season, and herbicide. The low- and high-litter sites did not differ in perennial grass cover 2 years after treatment. Annual forb cover was greater, but perennial forb cover was lower at the low-litter site compared to the high-litter site. Several treatment combinations maintained greater than 50% medusahead control two years after herbicide applications Sulfometuron controlled medusahead better than imazapic when sprayed in fall rather than spring.

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|                        |            |                  |
|------------------------|------------|------------------|
| Author: Romain CABASSU | Year: 2015 | Confidential: No |
|------------------------|------------|------------------|

TOPIC: Research and development

Title: A web application to exchange knowledge about medusahead management in the western US  
Titre: Une application web pour échanger sur la gestion de la tête de méduse dans l'ouest Américain

Keywords: medusahead, control, revegetation, rangeland, database, web application  
Mots clés: tête de méduse, contrôl, restauration, parcours, base de données, application web

Summary:

Medusahead has already invaded nearly one million hectares in the western US. Controlling this invasive plant is essential to reduce its negative impacts on rangelands. However, only approximate results have been found. In this paper, we analyzed medusahead problem under several aspects in order to bring out main action means that could be investigated to improve management efficiency. We decided to build an application based on a database which would help to exchange knowledge about medusahead knowledge in the western US. We used the MERISE method to model data. We created a method to select main information from studies and a way to classify weed management practices. We implemented our solution on a content management system adapted to our situation. We also took a step back to evaluate strengths and limits of our application. This application is intended to propose a different view to refine medusahead management as well as to evolve according to user needs.

Résumé:

La tête de méduse a déjà envahi environ un million d'hectares dans l'ouest des Etats Unis. La gestion de cette adventice est nécessaire dans l'intention de réduire ses impacts négatifs sur les espaces de parcours. En revanche, seulement des résultats approximatifs ont été obtenus. Dans le cadre de ce mémoire de fin d'études, nous avons analysé le cas de cette plante sous différents aspects dans le but de faire ressortir les principaux leviers d'actions afin d'améliorer sa gestion. Nous avons décidé de créer une application basée sur une base de données. L'objectif est de faciliter les échanges de savoirs autour de la gestion de la tête de méduse dans l'ouest des Etats Unis. Nous nous sommes servis de la méthode MERISE pour modéliser les données. Nous avons mis au point une méthode pour sélectionner les informations principales depuis différents types de publications. De plus, nous avons proposé un moyen de classier les pratiques de gestion de la plante invasive testées en fonction de différents paramètres. Nous avons ensuite développé notre solution grâce à un logiciel de gestion de contenu adapté à nos besoins. Finalement, nous avons pris soin d'évaluer les forces et les limites du travail réalisé. Notre application propose une vue différente, nécessaire pour affiner la gestion de la tête de méduse dans l'ouest des Etats Unis. Cette application est ensuite destinée à évoluer en fonction des besoins des utilisateurs.

Number of volumes: 1  
Number of pages of the main document: 30

Requested by: Utah State University