Predictive Soil Health Economic Calculator (P-SHEC)

User Guide

Version 1

09/30/2025

American Farmland Trust

Contents

1. Introduction

The Predictive Soil Health Economic Calculator (P-SHEC) is designed to provide farmers and farm advisors with estimates for how soil organic matter (SOM), crop productivity, and farm profitability may change with the adoption of soil health practices in average and drought conditions. P-SHEC asks users to provide their county and information about their crop, input prices, and acreage. Users then select the soil health practices they are curious about and specify how they would manage them over the next ten years. Practices available include planting cover crops, transitioning to no-till or reduced tillage, and nutrient management. The tool then provides both annual and cumulative 10-year ecological and economic outputs for adopting the selected practices in their county (Figure 1). P-SHEC also provides an estimate for how much the soil health practice would buffer crop yields and income from drought in the long term.

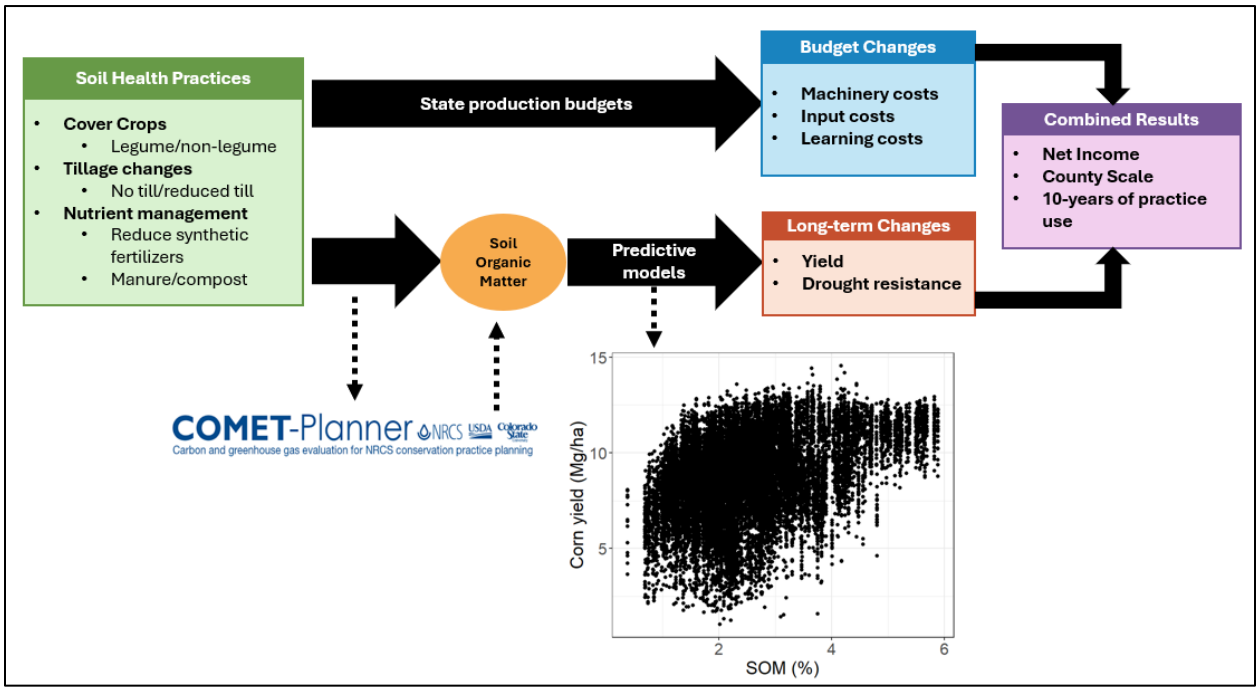


Figure 1. A flow chart for how the P-SHEC works and information it provides users.

P-SHEC estimates the long-term impacts of soil health practices using national datasets. It predicts how changes in SOM affect crop yields based on 24 years (2000–2023) of county-level yield data from USDA NASS as well as gSSURGO soil data, PRISM climate data, and nitrogen input estimates from Zhang, Cao, and Lu (2021). It also assesses how SOM influences yield losses during droughts, using USDA RMA insurance data to identify drought conditions. P-SHEC draws on COMET-Planner to estimate county-level changes in soil organic carbon (SOC) from specific practices, converts soil organic carbon to SOM, and applies the results to estimate changes in yield and drought resilience. Outputs

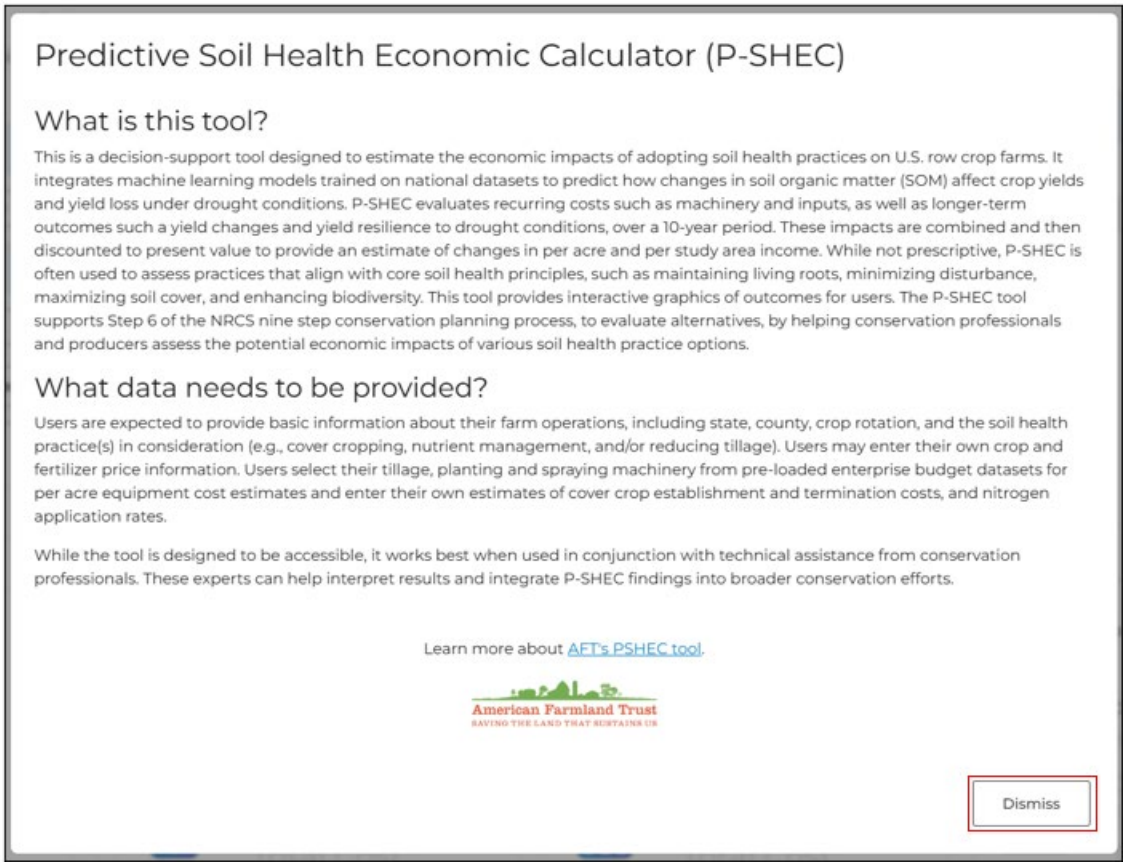
include estimated changes in SOM, yield, and drought resistance, based on practices included in COMET-Planner.

For more information about the data and modeling, refer to the **P-SHEC Technical Manual**.

2. Using the Tool: Setting up your scenario

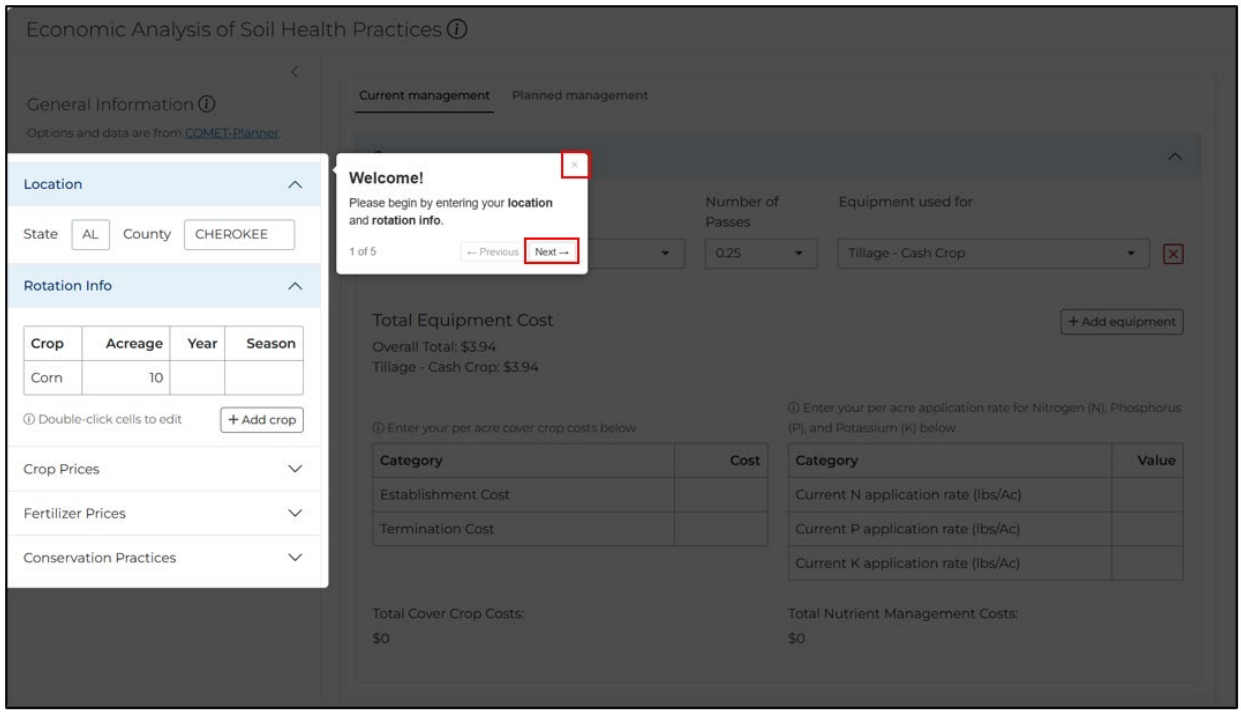
In the remainder of this document, we provide screenshots with relevant text below the screenshot.

Access the tool on any internet-enabled computer or smartphone using this **link**.



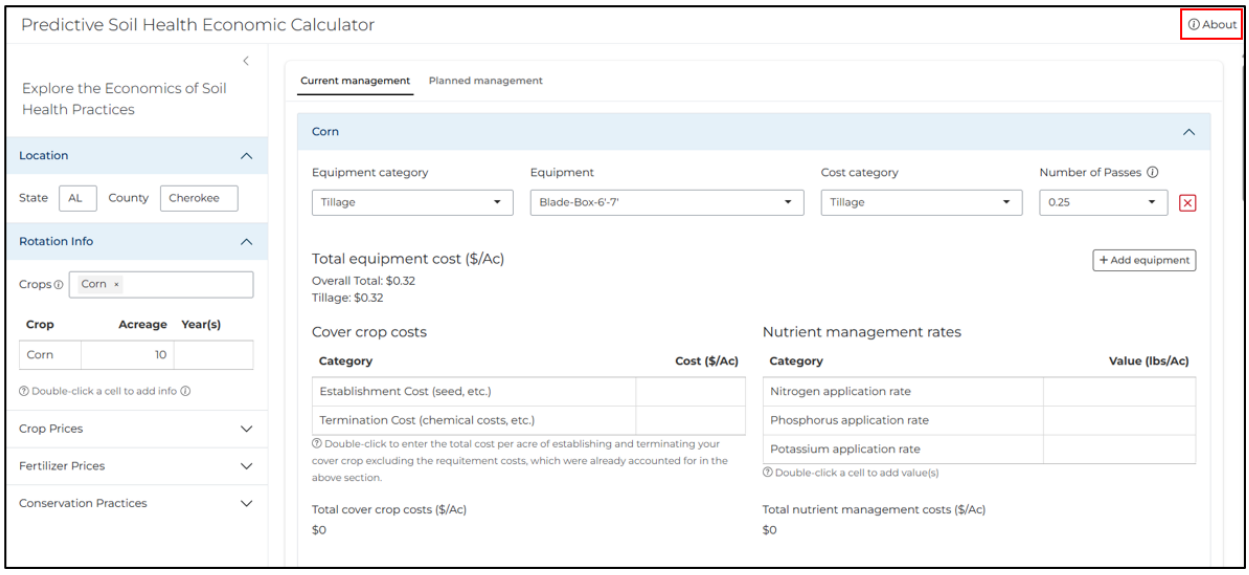
As a preface to the tool, an informational box will appear when the web application has loaded. This informational box provides a brief introduction to the tool's purpose, as well as what types of data the user will need to provide to successfully utilize the tool. This informational box provides a brief introduction to the tool's purpose, as well as what types of data the user will need to provide to successfully usethe tool. A hyperlink to the P-SHEC

website is provided at the bottom of the information box. Click '**Dismiss**' at the bottom right-hand corner of the information box to proceed to the tool.

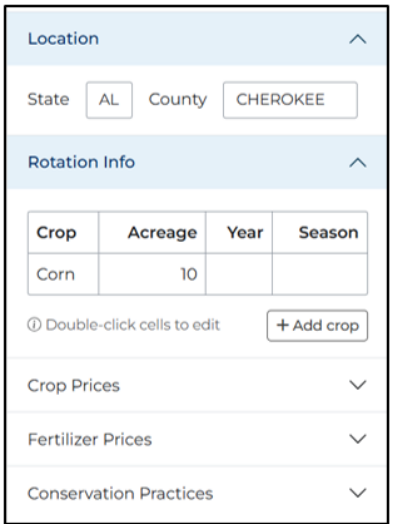


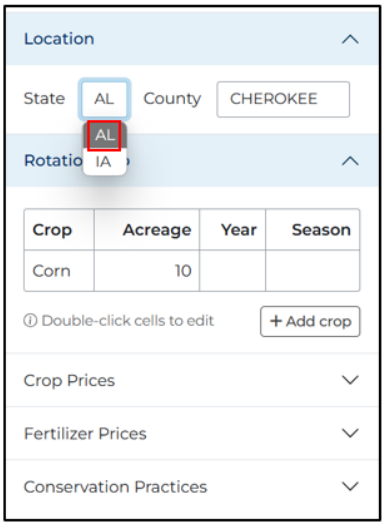
Use the '**Next →**' button to move through the five orientation notes. To go back, click '**← Previous**'. When finished, click '**Done**' to start entering data. At any time, users may click the '**x**' in the top righthand corner of the orientation notes to skip the orientation.

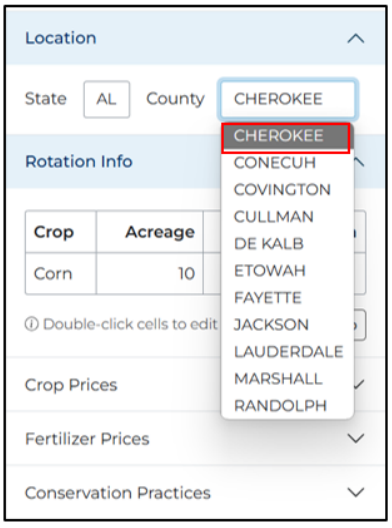
After completing the orientation boxes, users can click '**About**' located in the upper right corner of the screen to access the information box and orientation notes again.



- Location

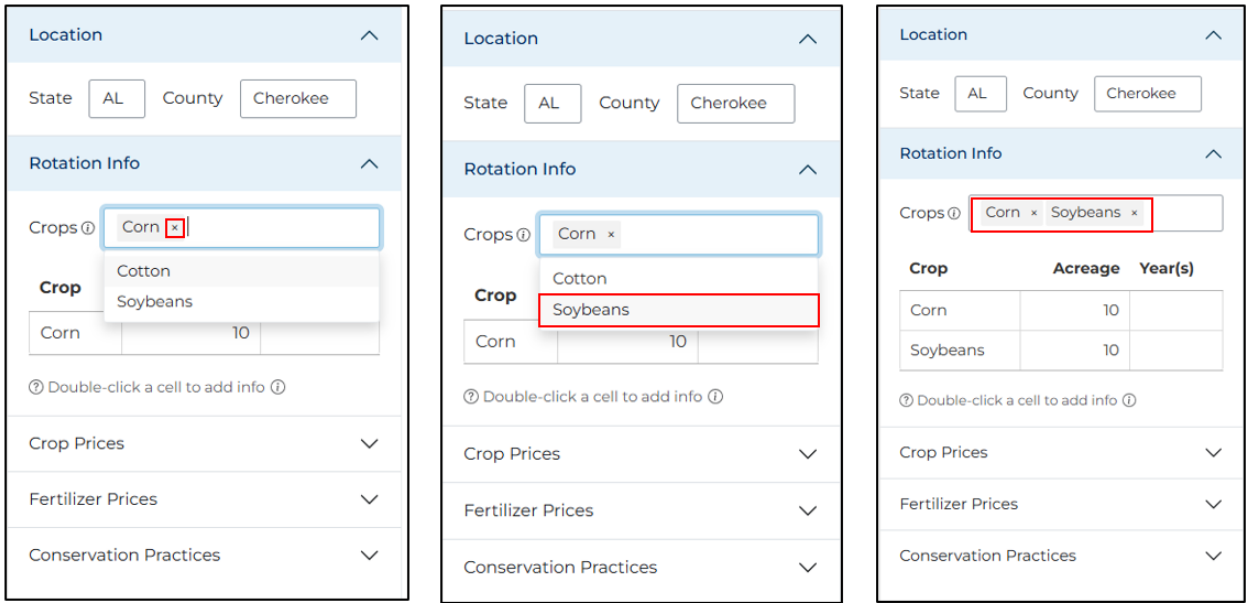




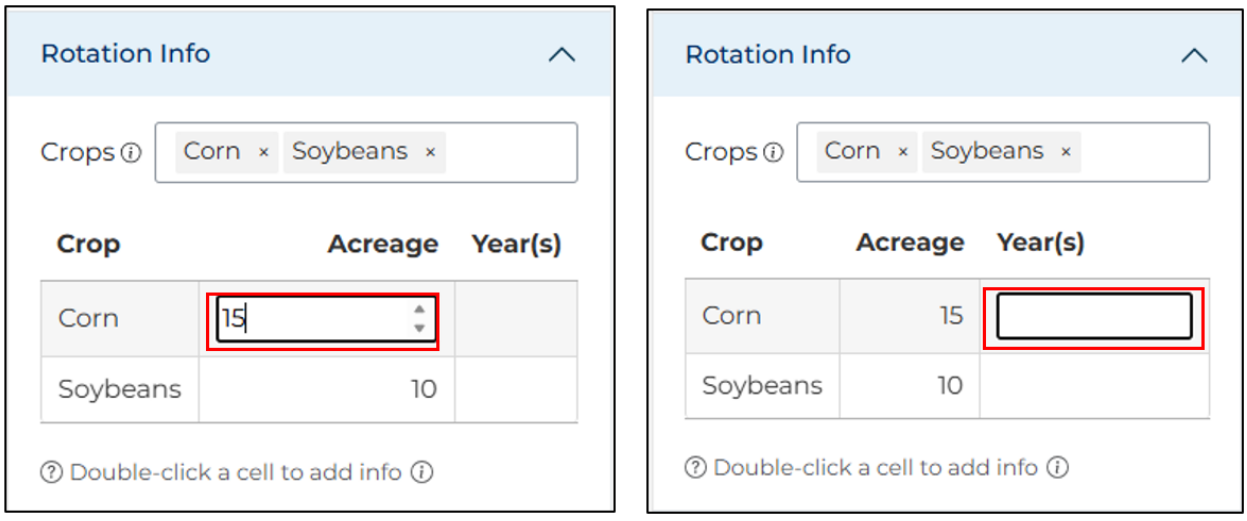


To start setting up your own P-SHEC scenario, go to the sidebar on the left-hand side of the screen and under **Location** select a state and county to get started. Click inside the '**State**' and '**County**' boxes to open dropdown menus and make selections. If a state or county is not listed, it means insufficient data was available to include it in P-SHEC.

- Rotation Info

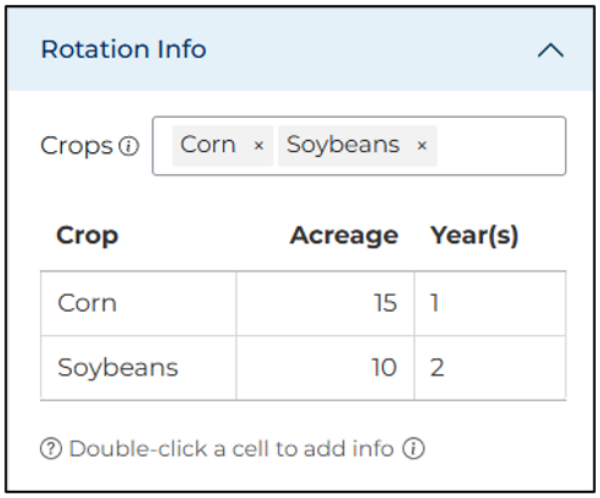


To enter **Rotation Info**, click once in the box to the right of "Crops." There will be a default crop selected. To remove the default crop, click the small '**x**' to the right of its name. To add a different crop to the "Crops" list, click in the empty space inside the "Crops" box to see a dropdown list of crops available for that county. Click once on the desired crop. Once selected, the new crop will be added to the "Crops" list. The table directly below the "Crops" box will automatically update to reflect the selected crops. The crops displayed are specific to each country and were included due to having sufficient data.



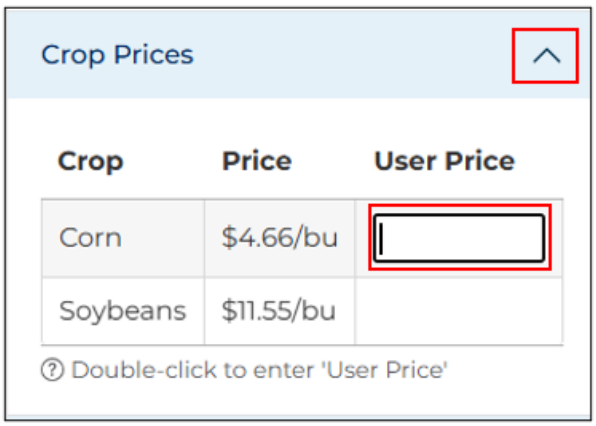
To enter the acreage associated with each crop in the “Acreage” column, double-click the default “10” value. Users may type in the acreage or click the ‘▲’ or ‘▼’ arrows to increase or decrease acreage, respectively. To define how many years the crop is grown within the rotation, enter values in the “Year(s)” column by double-clicking the empty cell in the row of interest and type in a number.

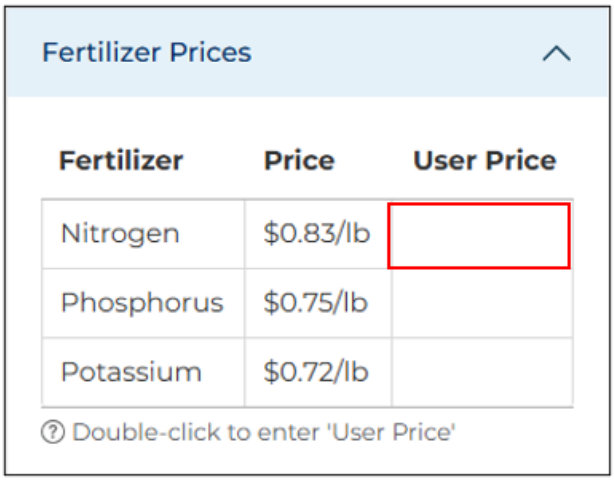
Rotation Info example:



The **Rotation Info** table above describes a rotation that is three (3) years long with two (2) crops (e.g., one (1) year corn followed by two (2) years soybean). To produce this table, select “Corn” and “Soybeans” in the “Crops” box. Double click in the “Year(s)” cell for the Corn row and type “1”. Double click in the “Year(s)” cell for Soybeans and type “2”. The tool will run a ten-year period, so it will repeat the provided rotation for the remaining years.

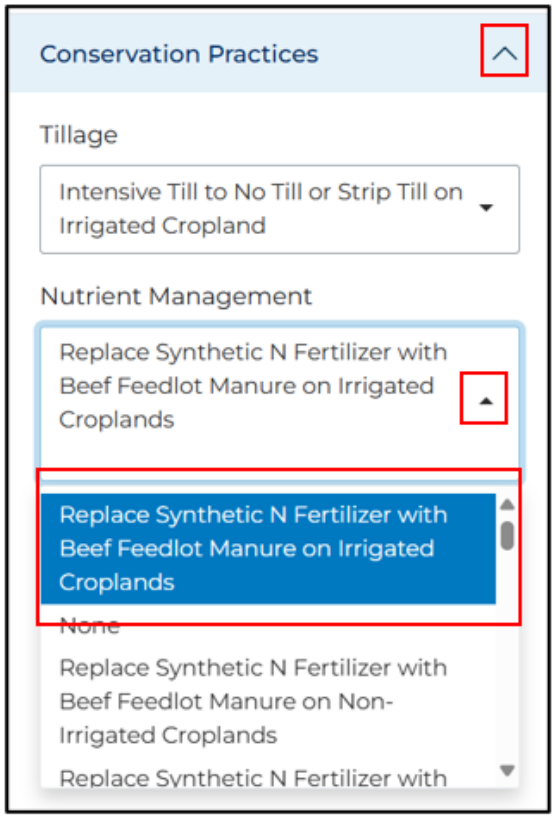
- Prices





Below **Rotation Info**, click the down arrow next to **Crop Prices** and **Fertilizer Prices** to view default prices and their respective units. To use the default prices provided you do not need to take any action in these tables. Alternatively, to enter a custom price double-click the empty cell under 'User Price' to type in a different price.

- Conservation Practices



Next, click the down arrow next to **Conservation Practices** to view three categories of conservation practices. Click the arrow in the box under the desired category to see a dropdown of available options. Click to select a practice you are curious about for the P-SHEC to evaluate.

3. Running the Tool: Recurring Budget Changes

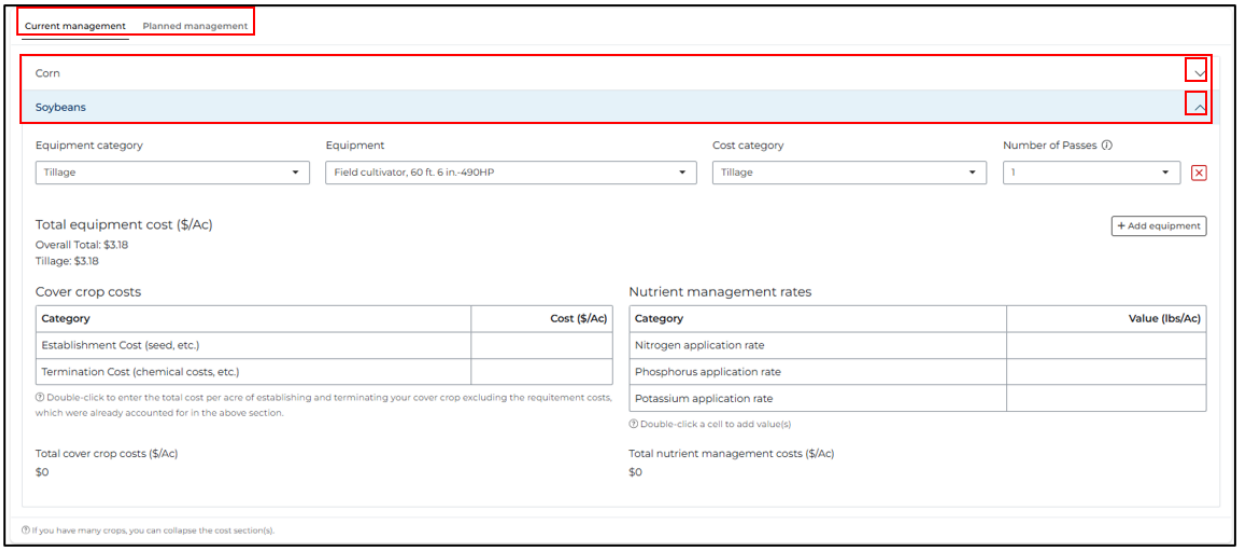
General guidance:

When entering information into the application for a partial budget analysis, the user should focus only on the factors that would change as a result of the management adjustment. This means considering changes in machinery, chemical use, or other

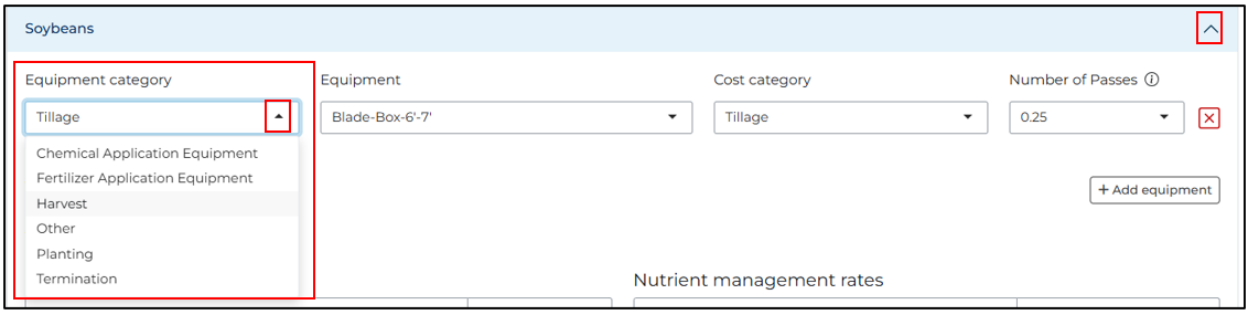
management practices directly affected by the adjustment, while leaving out any factors that remain unchanged before and after the practice implementation.

No-till example:

For a shift from conventional tillage to no-till, the user would enter items such as change in equipment and potential added herbicide costs if weed control needs increase. Some equipment, like a combine used for harvest, would likely remain the same and should not be included—only the items directly impacted by adopting no-till.



The main panel of the tool contains two tabs: **Current management** and **Planned management**. Click the tab names to switch between them. Both tabs collect the same type of information. Use **Current management** to describe your existing practices in the three conservation areas. Use **Planned management** to outline how you would like to implement the selected conservation practice(s).



Within each tab you will see a section for each crop, for example, **Soybeans**. Enter tillage, nutrient management, and cover crop information for each crop in the rotation. Use the

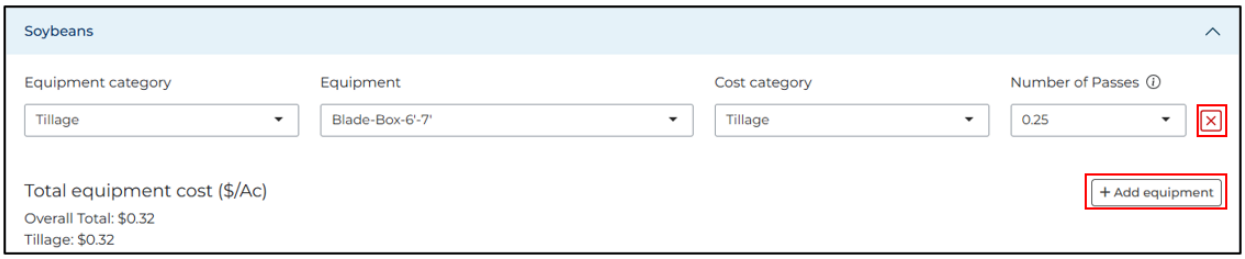
dropdown arrows (∨ or ∧) to the right of the crop name to expand or collapse these crop sections.

Begin entering equipment by selecting the "**Equipment category**" of interest. These include:

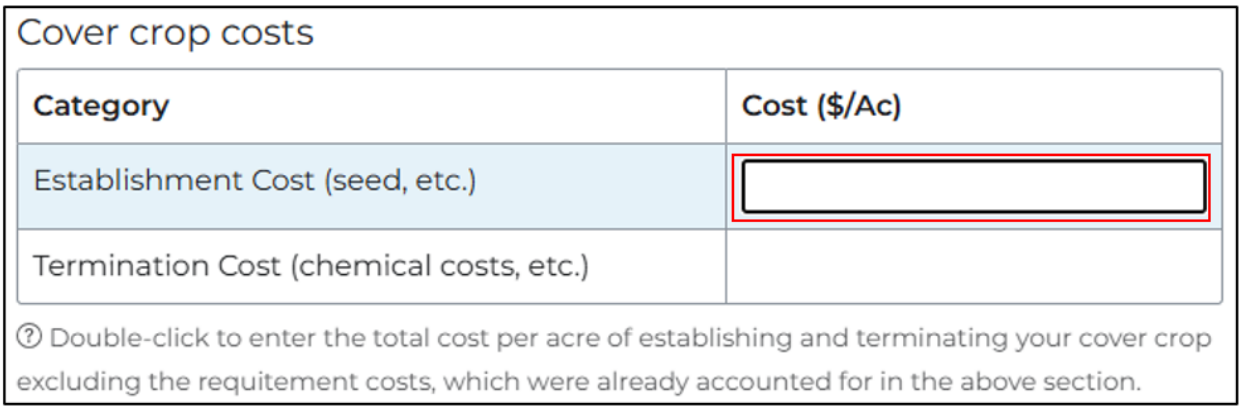
- Tillage
- Chemical Application Equipment
- Fertilizer Application Equipment
- Harvest
- Planting
- Termination
- Other

Click the '▾' to show the list of equipment categories. Select a category by clicking on it.

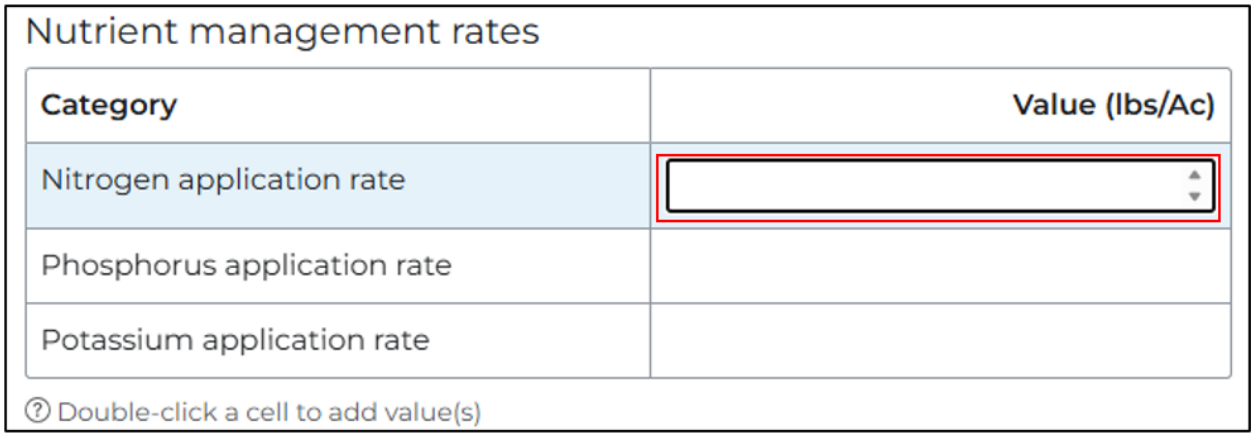
The "**Equipment**," "**Cost category**," and "**Number of Passes**" dropdowns function the same as "**Equipment category**". The "**Cost category**" dropdown allocates each piece of machinery to a specific soil health practice. Selecting the correct categories is important because it enables the application to organize and report costs by practice. This way, users can see how much each soil health practice is contributing to the overall economic impact of the practice change.



To delete a piece of equipment, click the red "**x**" to the right of that row. To add a piece of equipment, click the "**+ Add equipment**" button.



Moving down to **Cover crop costs**, double-click the cell next to "**Establishment Cost**" or "**Termination Cost**" to enter a dollar amount for these costs. In both the Current management and Planned management tabs, if cover crops are not used, enter '0' in both rows. The user must supply their own per acre estimate of cover crop establishment and termination costs. The P-SHEC application does not include default values.



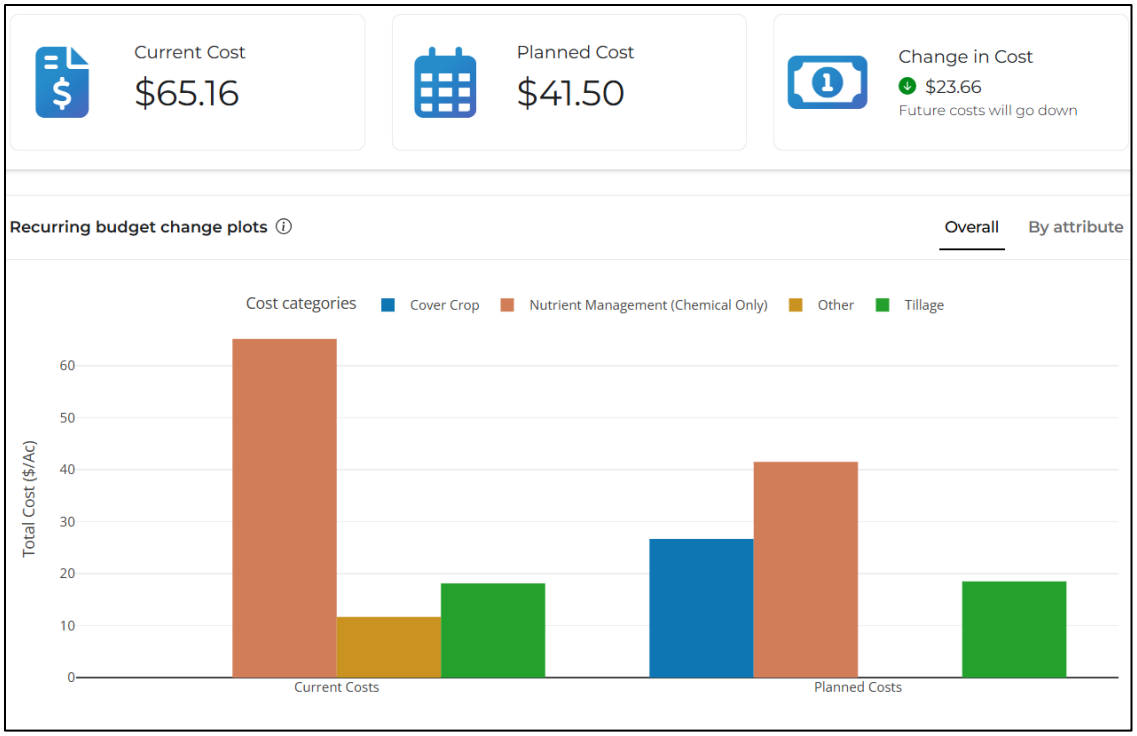
To the right of **Cover crop costs** is **Nutrient management rates**. Double-click the cells next to "**Nitrogen application rate**", "**Phosphorus application rate**", or "**Potassium application rate**" to enter a fertilizer application rate, if applicable.

Repeat this data entry process for **Planned management** for the practice changes you would like to make.

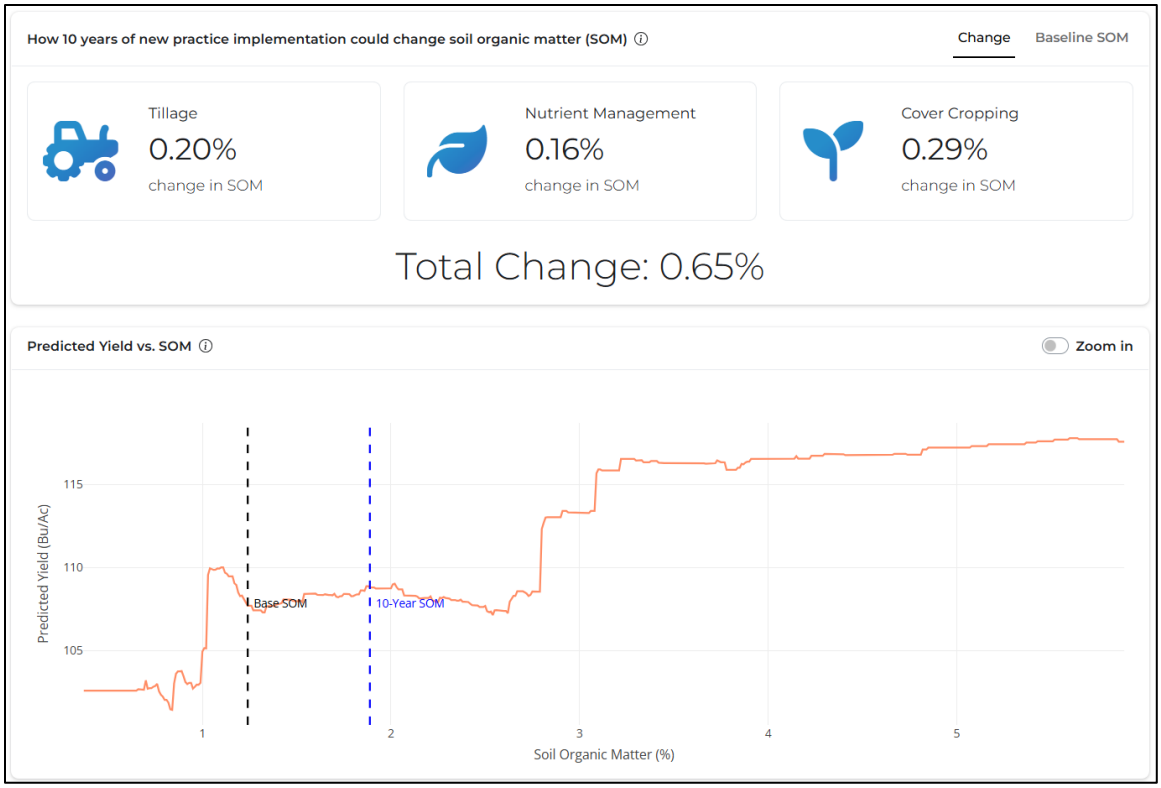
Note: The P-SHEC tool saves your data as you enter them. There is no "**Save**" button in the tool.

4. 10-Year Predictions and Combined Results

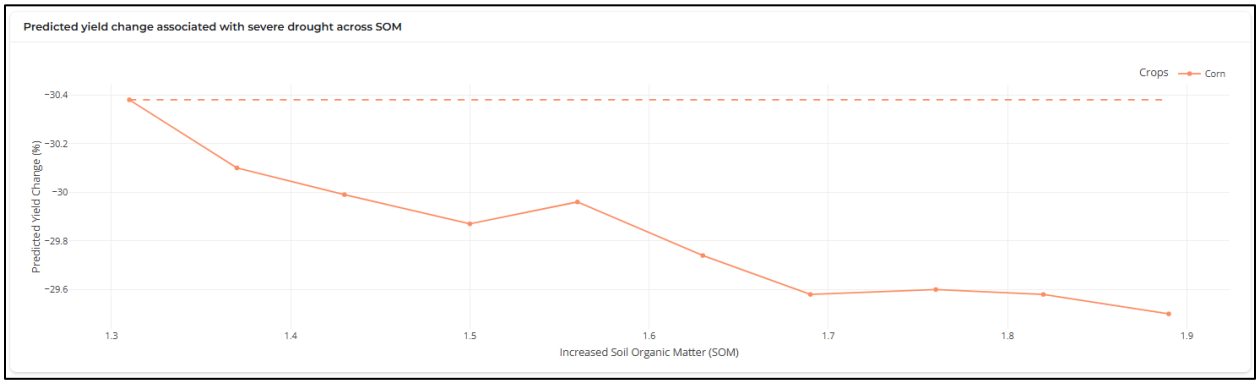
After entering all relevant information in the scenario set up and recurring cost changes section of the application, the application produces the following outputs:



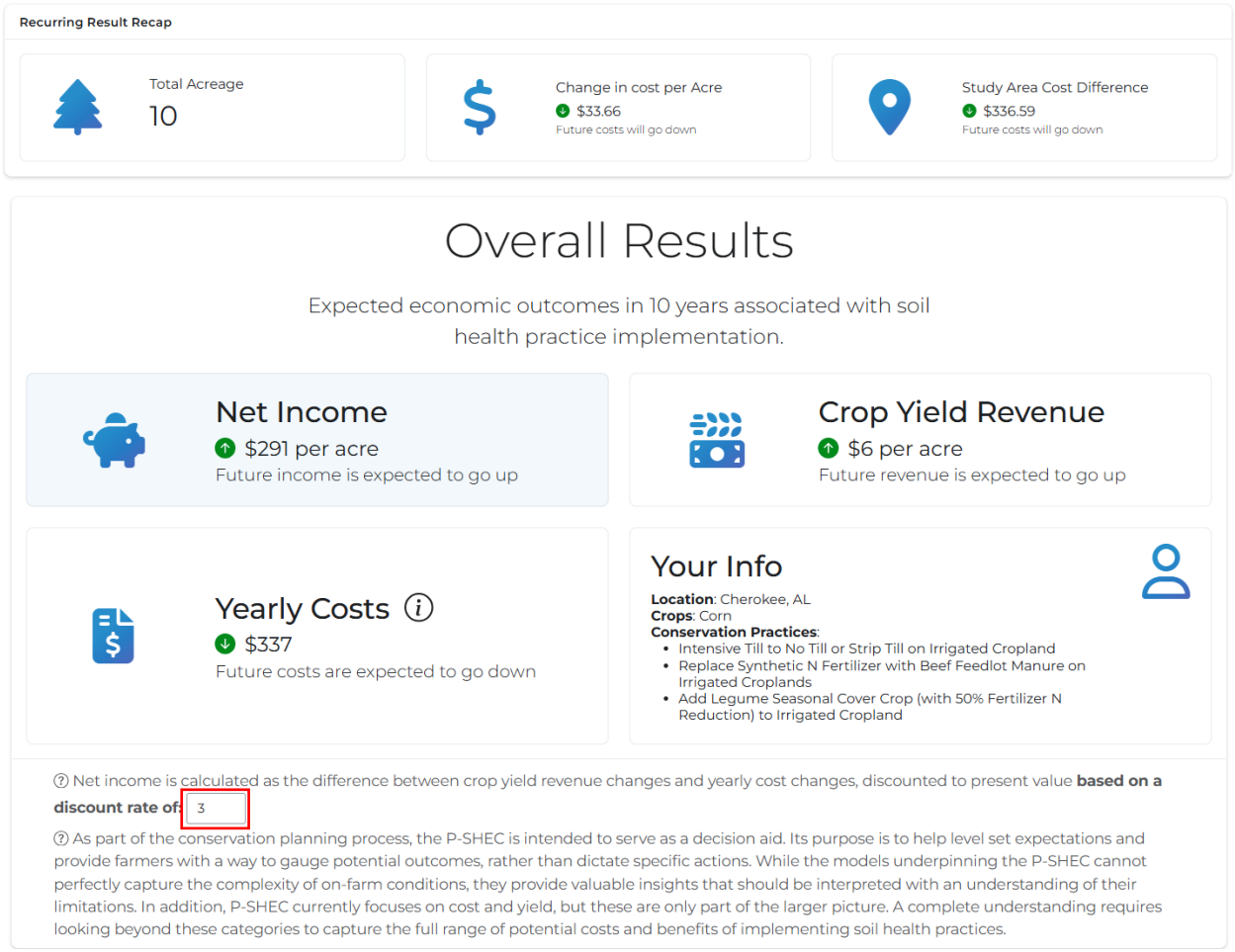
The application computes current and planned costs in dollars per acre and reports the estimated change in cost associated with the potential management change. For more information on how current and planned costs are calculated, please refer to section 2.1 in the P-SHEC Technical Guide. Users may interact with the bar graph by clicking on specific bars.



Based on the user's state and county, the application pulls the associated estimated change in soil organic matter (SOM) associated with the selected soil health practices. The application produces a line graph of predicted yield and SOM and includes vertical bars to show the beginning level of SOM (baseline) and the ending level of SOM (after 10 years of continuous practice implementation). Users may hover a cursor over the line to see point estimates of yield at various levels of SOM.



The application also displays the predicted yield change associated with severe drought from beginning levels of SOM to the ending level of SOM. The line graph shows how the predicted yield change may vary as SOM increases. Users may hover a cursor over the line to see point estimates of yield change at various levels of SOM.



The application then produces an “Overall Results” section including a recap of the results from the recurring cost change sections and the long-term yield revenue changes. Use the ‘▲’ or ‘▼’ buttons to select a discount rate that will be applied to the net income calculation.

The “Overall Results” section presents three main findings: (1) the projected change in net income per acre over 10 years, (2) the anticipated change in crop yield revenue per acre over 10 years, and (3) the total yearly costs per acre accumulated over 10 years. The section also includes a summary of the information used for the analysis within the box labeled “Your Info.” This format allows the “Overall Results” section to be saved (via screenshot) and/or shared with a conservation professional as needed.