Lake Dissolved Oxygen Modeling White Paper

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Example of Creating a Lake Dissolved Oxygen Model

The following example shows the creation and running of a lake dissolved oxygen model.

Step 1. Create a New DO Model

1. Go to NSDSS.net in your internet browser
2. Click on the Environmental Analyst (EA) Widget in the main tool bar. This will open up the EA widget.
3. Select the "Create Lake Dissolved Oxygen Model" Option from the drop down and click GO. This will create a 4-step workflow for creating your lake DO model (see figure 1).

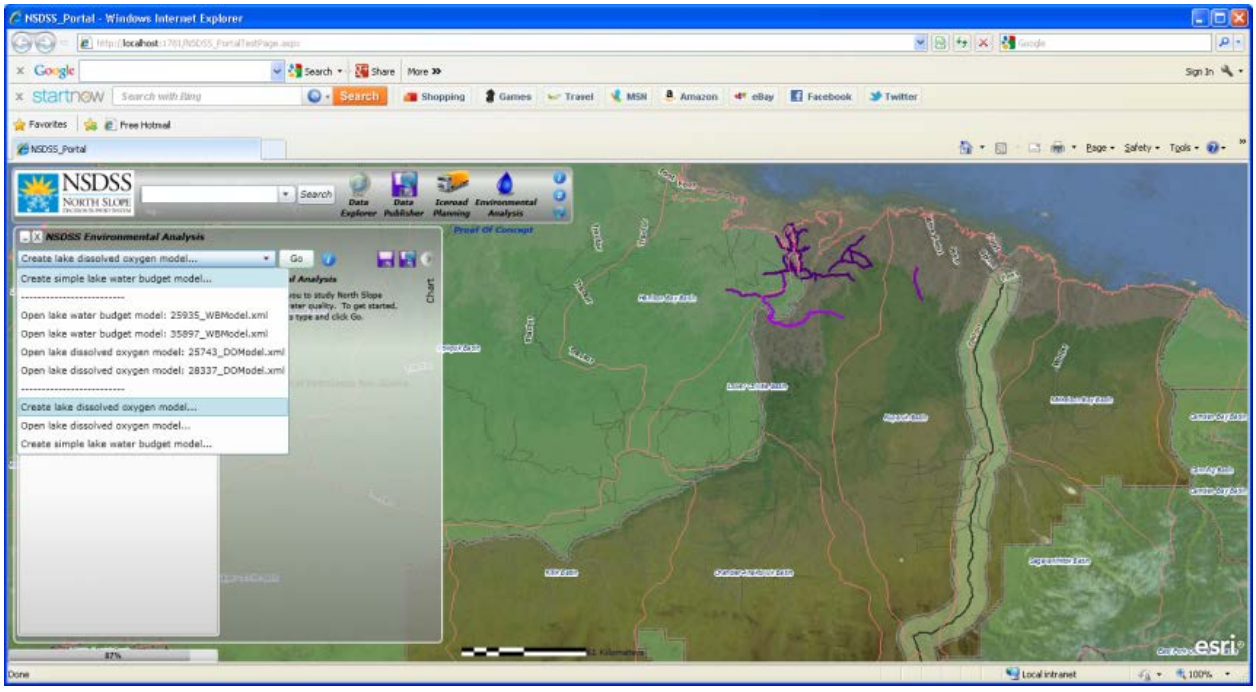

Figure 1. A newly created lake dissolved oxygen model. To create the model, follow the 4-step workflow.

Step 2. Select a Lake

1. Zoom to the place on the map where your Lake of interest is. To do this, simply use your mouse scroller to zoom in and out, and click and drag the map to pan.
2. Click on Step 1 in the tree
3. Click the Select Lake on Map option
4. Click the lake on the map. The tree will populate with information about the lake (i.e. Area).
5. Note that in many cases, the Lake Depth is not available from the Lakes Database. A window will pop up stating this. Click OK. We will enter a depth in the next step.
6. Note that the Start and End Date are set by default. They can be changed.

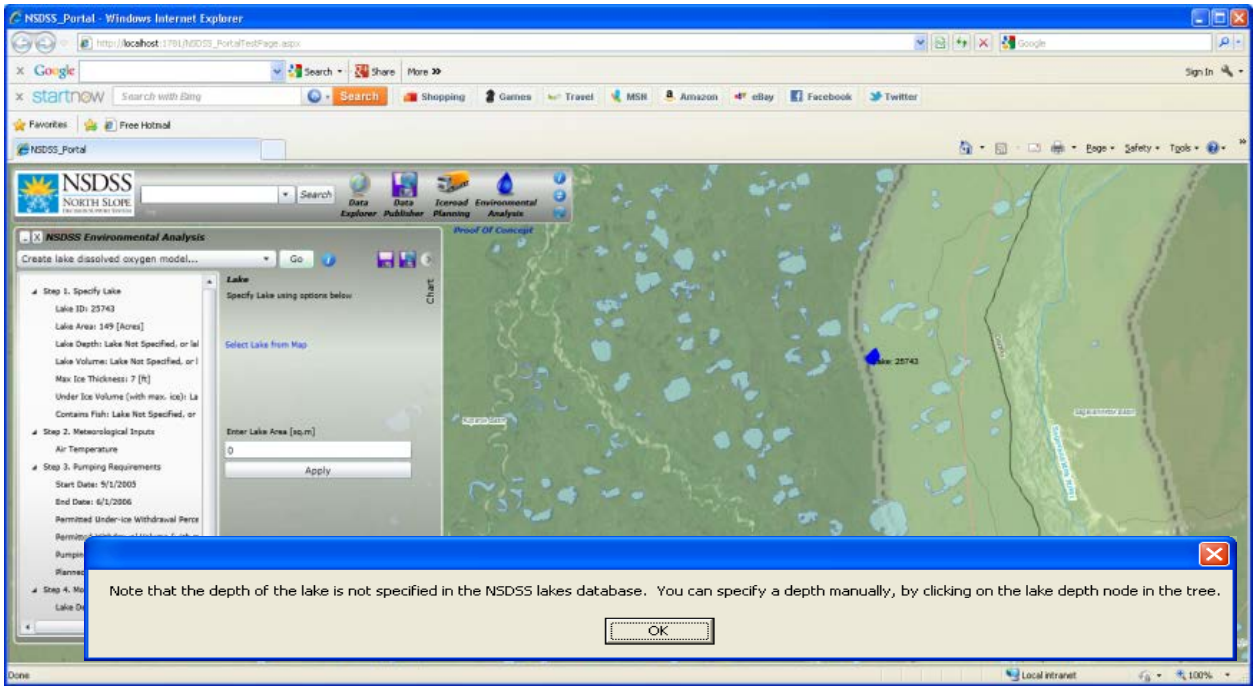

Figure 2. Lake 25743 has been selected. Its area and ID are populated in the tree automatically.

Step 3. Enter Lake Depth and Auto-calculate Lake properties.

1. Click on the Lake Depth node in the tree under step 1.
2. Enter the depth of the lake – you will know this from field survey. Enter 10ft.
3. With this information known, the tree can now auto-populate with other lake information:
    1. **Lake Volume** – surface area * depth [M.gal]
    2. **Under Ice Volume** – surface area * (depth – max ice thickness) [M. gal]
    3. **Permitted Withdrawal Volume** – Under Ice Volume * Permitted Under-ice Withdrawal Percentage [M.gal]
    4. **Pumping Rate at Permitted Max** – Permitted Withdrawal Volume / Number of Days between Start Date and End Date. [gal/d]

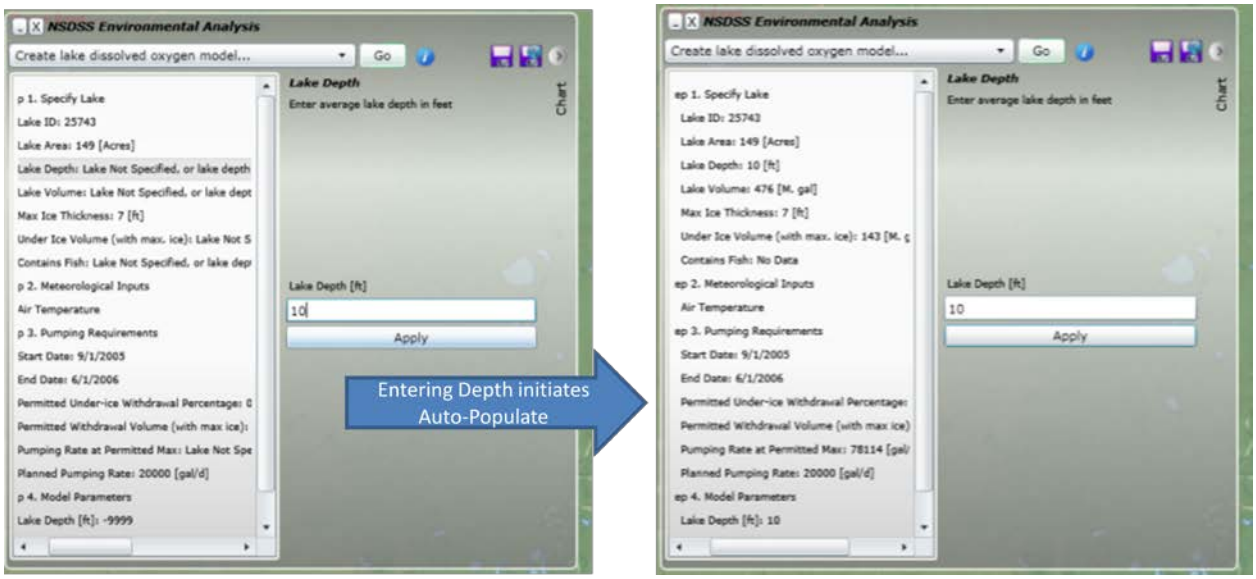

Figure 3. Entering lake depth auto-populates the tree with the lake volume, under ice volume, permitted withdrawal volume, and pumping rate at permitted max.

Step 4. Get Temperature Data

1. Click on the Step 2. Meteorological Inputs Node in the tree
2. Click the “Suggest Model Input” option – a progress bar shows the tool is searching for historic base site information.
3. When a site is found, it will be shown on map (note that this should take a few seconds while it is looking for closest site with longest record)
4. Click the “Collect Historic Site Data” option – a progress bar will show that the data is being collected.
5. When the data is collected, a pop up will say Data Collected (note that this should take a few seconds)
6. Click OK.

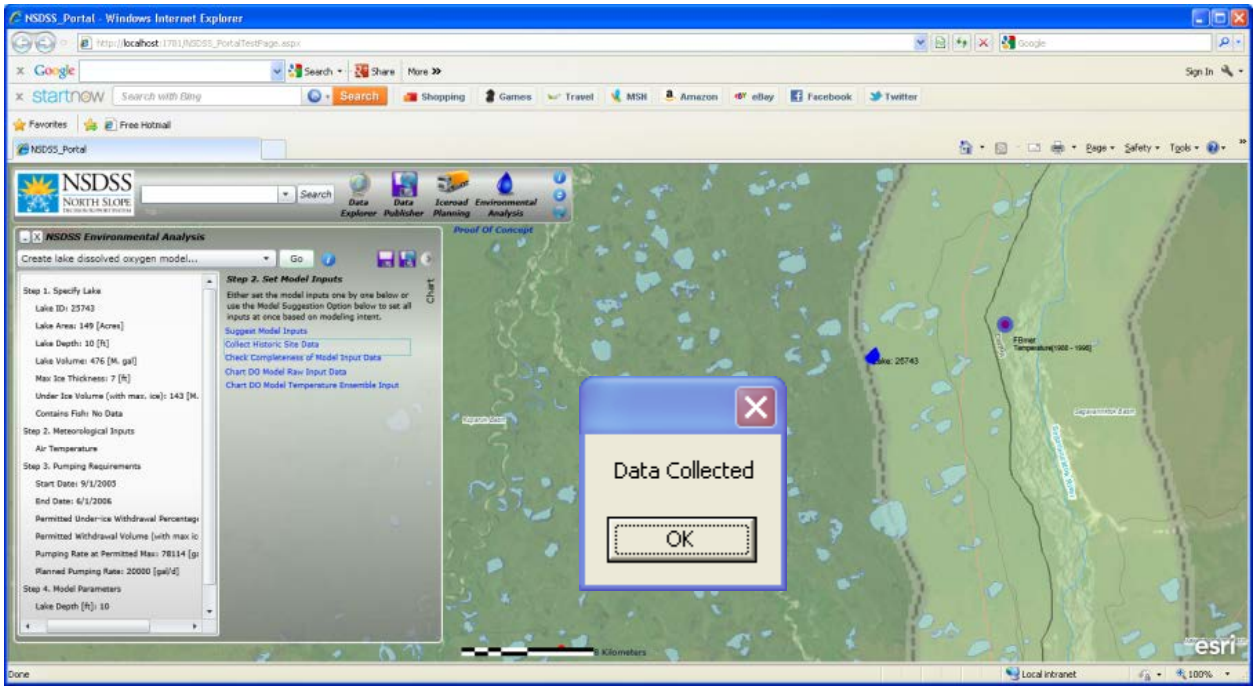

Figure 4. The suggest model input option finds the field data site closest to the lake that contains the longest record of temperature data. The collect historic site data then collects all the historic temperature data at that site.

Step 5. View Raw Temperature Data and Create Ensemble Input for Model.

1. Click on the Step 2. Meteorological Inputs node in tree – if not already clicked.
2. Click the "Chart DO Model Raw Input Data" option – a chart will be shown of the raw data.
3. Click on the "Chart DO Model Temperature Ensemble Input" option – a chart will be shown that covers the model time horizon and is an ensemble of time series built from the Raw Input data. All of these ensemble series will be used in running the DO model to get a range of possible DO conditions that might occur.

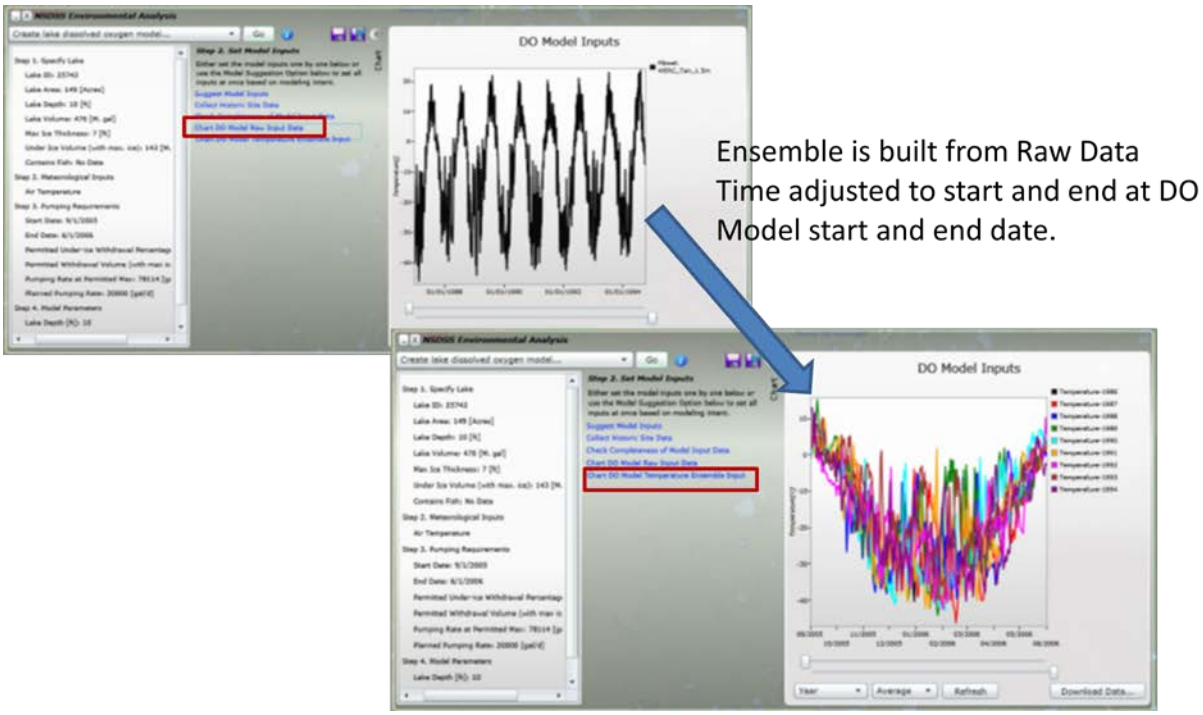

Figure 5. Once the data has been collected, you can view the raw data in a chart. Selecting the chart DO model temperature ensemble input option, opens a chart that covers the model time horizon and is an ensemble of time series built from the Raw Input data.

Step 6. Save DO Model

1. It's a good idea to save the DO model to your local cache frequently.
2. Click the Save Icon.
3. Your Browser may ask for permission to save information to the local cache. Click OK or YES.
4. A window will appear saying the DO model is saved.
5. This will save all the model properties, the raw data, and the ensemble input, so that you can quickly re-open the model in the future.

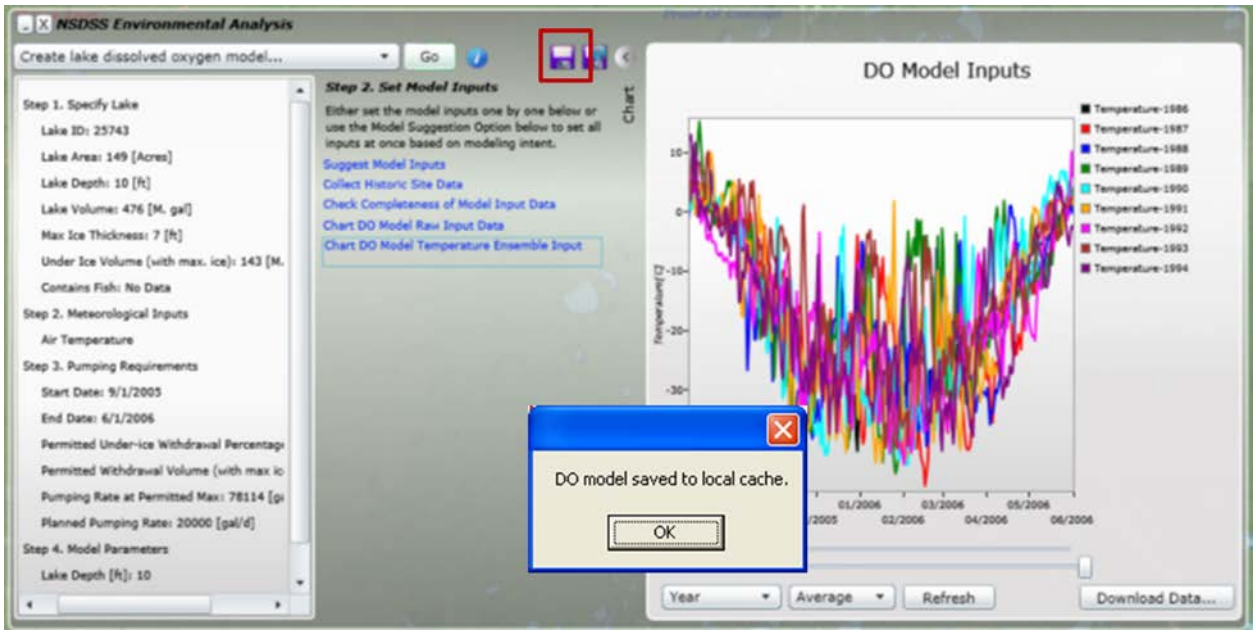

Figure 6. Saving the DO model to the local cache will save all the model properties, the raw data, and the ensemble input, so that you can quickly re-open the model in the future.

Step 7. Run DO Model

1. Click Step 4. Run Model and View Results node in the tree.
2. Click the "Run Model" Option
3. The model will take a few seconds to run.
4. When complete, the chart will now show the DO estimate time series for each temperature series in the ensemble input.
5. Save model to save all results.

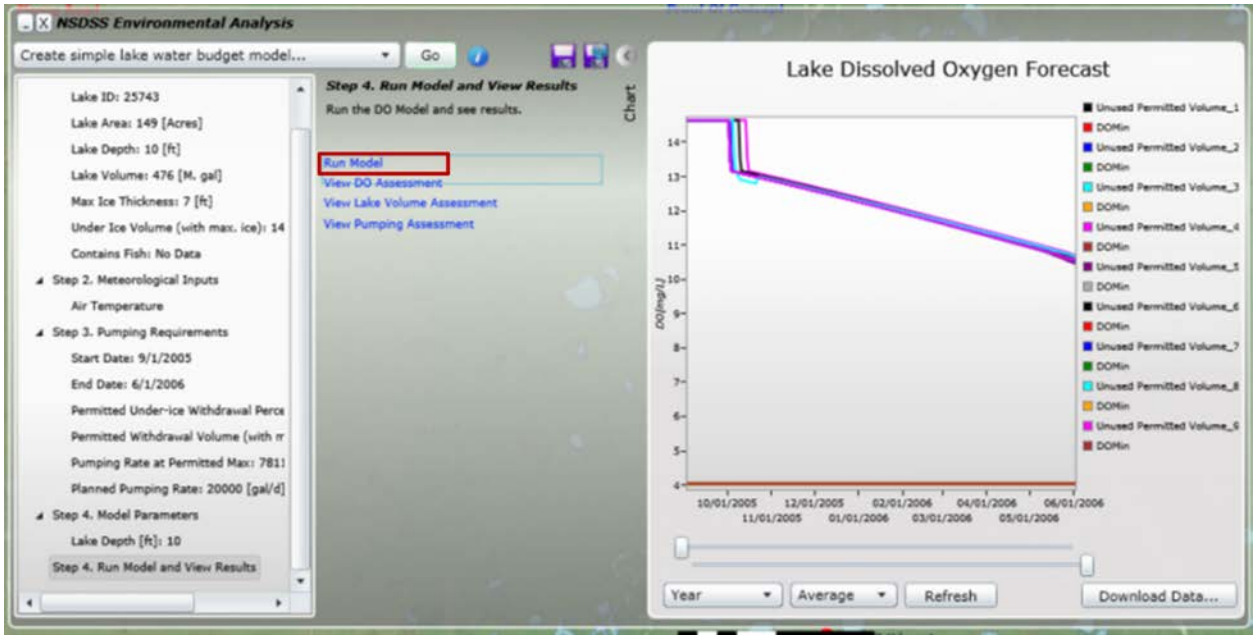

Figure 7. Upon running the model, a chart will display the DO estimate time series for each temperature series in the ensemble input.

Step 8. View DO Model Results (Lake Volume Assessment)

1. Click "View Lake Volume Assessment" option. The Chart shows the Remaining Liquid Water, Volume of the Ice (if converted to liquid water), and pumped volume over the model time horizon.

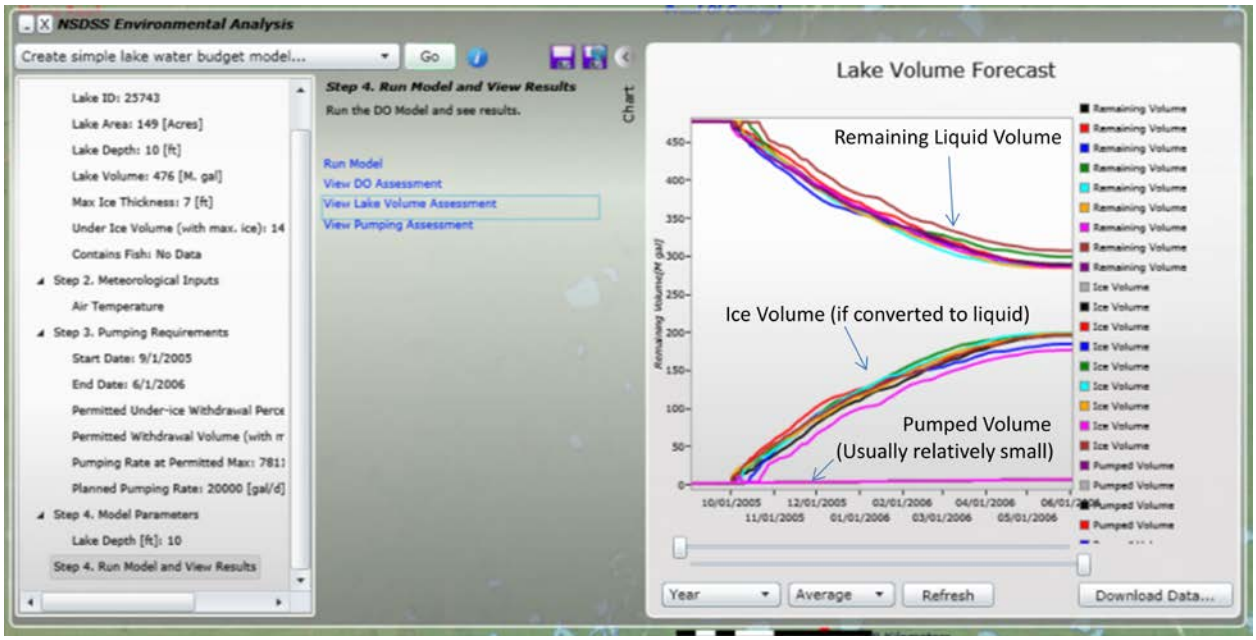

Figure 8. The view lake volume assessment charts the Remaining Liquid Water, Volume of the Ice (if converted to liquid water), and pumped volume over the model time horizon.

Step 9. View DO Model Results (Pumping Assessment)

1. Click “View Pumping Assessment” option. The Chart shows the permitted pumped total and the cumulative pumped volume over the model time horizon.

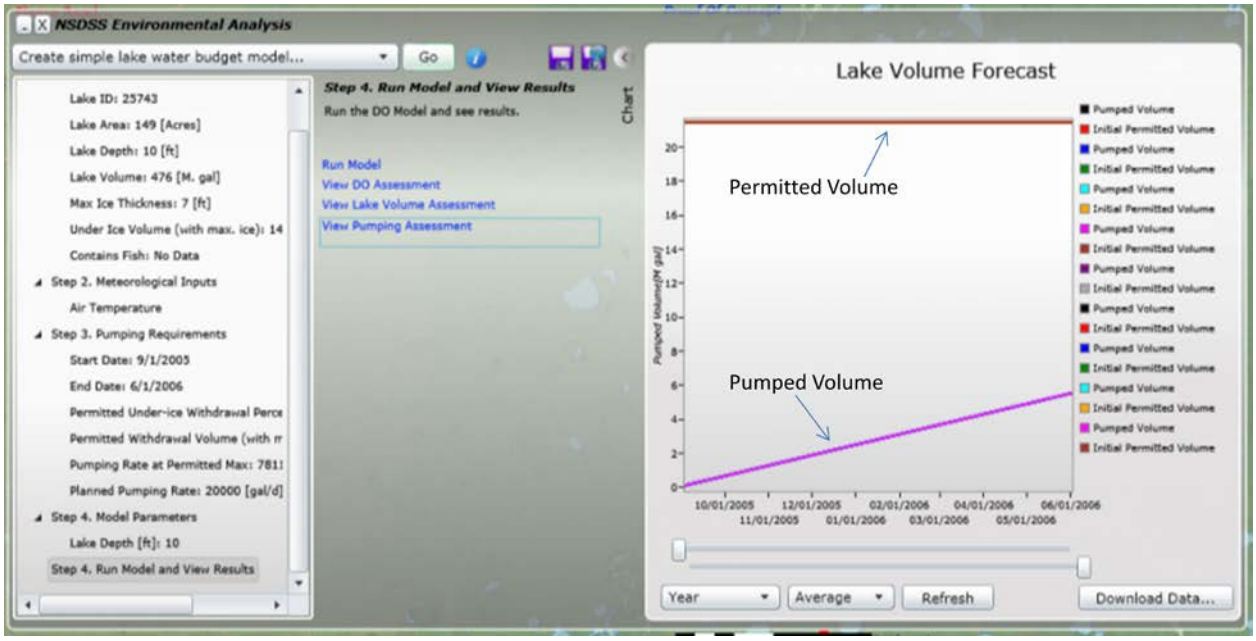

Figure 9. The view pumping assessment charts the permitted pumped total and the cumulative pumped volume over the model time horizon.