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## APPENDIX 2 – MODEL SUMMARIES

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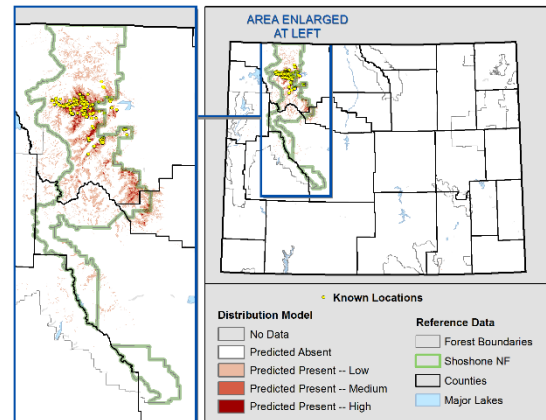
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# Overview

This appendix provides summary information for the models produced as part of this project, in alphabetical order by common name. The summary for each species' model comprises 3-4 pages and includes an overview map displaying the four-category expression of each model, details on modeling software, model thresholds and statistics, and graphs of variable importance and univariate responses for each predictor used in the model. Each of these components are described below, with accompanying sample images.

At the top of the first page of each model summary is the species' common and scientific name, followed by a model version. The version is simply the date the model was produced, in YYYY-MM-DD format,

to distinguish these models from any previous or subsequent models generated for the species. Below this header is a map showing a four-category representation of the model. In this representation, white indicates areas where the species is not predicted to occur; the predicted probability values in this category range from 0 to the lowest predicted probability assigned to any known presence location used in building the model. The next three categories define low, medium, and high predicted probabilities of occurrence for the species, and were defined by applying the 25<sup>th</sup> and 75<sup>th</sup> percentiles of predicted probabilities at known presence locations as thresholds between the three categories.



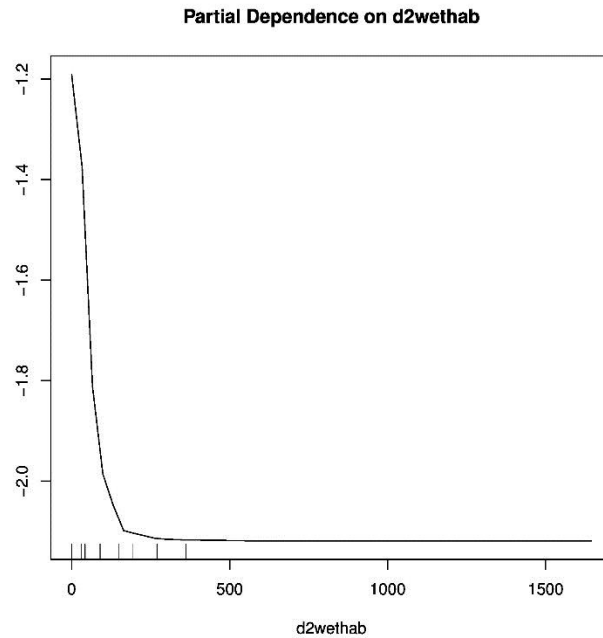
In the “**Model Information**” section, the algorithm and software used for modeling are indicated first. The “Binary Threshold (MaxTSS)” provided next gives a probability threshold that can be used to produce a binary (i.e., “predicted presence/predicted absence”) map that maximizes the True Skill Statistic (TSS; see report for references). A binary representation of the model created by applying this threshold would balance the tradeoff between sensitivity (correctly classifying known presence as such), and specificity (minimizing the amount of unoccupied area falsely predicted as presence). Next, a reclassification table gives the thresholds applied to each model to produce the four-category expression of the model shown above.

The “**Model Details**” section gives the number of presence locations used to generate the model, along with model statistics including Out-of-Bag (OOB) error, TSS, Kappa, Sensitivity, and Specificity (see report text for references). Each of these metrics is based on a binary version of the model created with an arbitrary probability threshold of 50%, using data that was averaged over “out of sample” data in each tree in the model. TSS may be the most important and informative statistic, as it integrates both sensitivity and specificity, and is less influenced by the relative number of presence and absence points than Kappa or the OOB error.

The “**Model Comments**” section at the top of the next page provides comments from WYNDD’s lead botanist on model interpretation or limitations. In some cases these comments can be applied as an additional “verbal model” that can be layered on top of the statistical model, helping a model user to hone in on specific habitats or areas within areas predicted present by the model. In other cases, they indicate limitations in occurrence or environmental data that might be addressed on SNF by use of SNF-specific environmental layers, or with further refinements and additions to sensitive and rare plant data.

The relative importance of each predictor used in producing a model is illustrated in the variable importance plots in the “**Predictor Variable Importance**” section. Two different measures of variable importance are presented in side-by-side plots here, and the difference between the two measures is explained further in text. Briefly, the further to the right a point representing each predictor falls, the more important and informative the predictor layer was for this model. MeanDecreaseAccuracy, depicted in the graph on the left, is generally thought to be a more reliable indicator of importance.

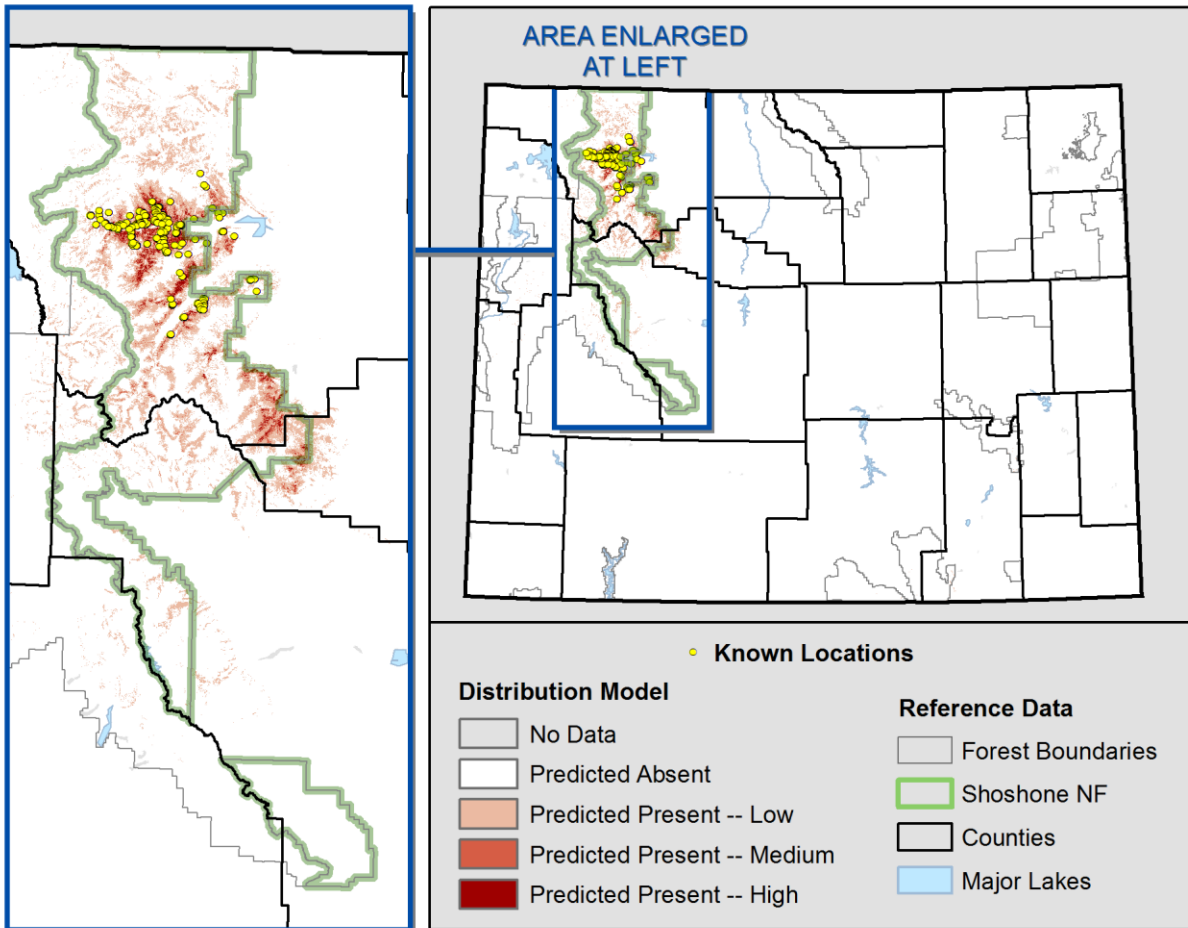
Finally, the “**Partial Plots**” section shows the relationship between a given environmental predictor and its effect on the predicted probability for the species, holding all other predictor values constant. Although the y-axis does not present predicted probabilities *per se*, the basic interpretation is that higher values on the line or bar indicate higher likelihood of occurrence, for given values on the x-axis. For example, the partial plot on the right shows the relationship between the “d2wethab” predictor and the likelihood of occurrence for Colorado butterfly plant. As expected, this riparian species is predicted to be most likely to occur in areas nearest to mapped wetland habitats, and the predicted likelihood of occurrence drops as the distance from wetland features increases.





# Absaroka beardtongue (*Penstemon absarokensis*)

Model version: 2016-06-23



## Model Information

- **Algorithm:** Random Forest
- **Software:** R version 3.3.0 (2016-05-03); randomForest package v. 4.6.12
- **Binary Threshold (MaxTSS):** 0.490
- **Reclassification Table for Four-Category Version:**

From	To	Becomes
0	0.470	Predicted Absent (0)
0.470	0.834	Low (1)
0.834	0.976	Medium (2)
0.976	1	High (3)

## Model Details

- **Number of Locations:** 136
- **Out-of-Bag Error:** 5.7%
- **TSS:** 84.6%
- **Kappa:** 84.8%
- **Sensitivity:** 88.3%
- **Specificity:** 96.3%

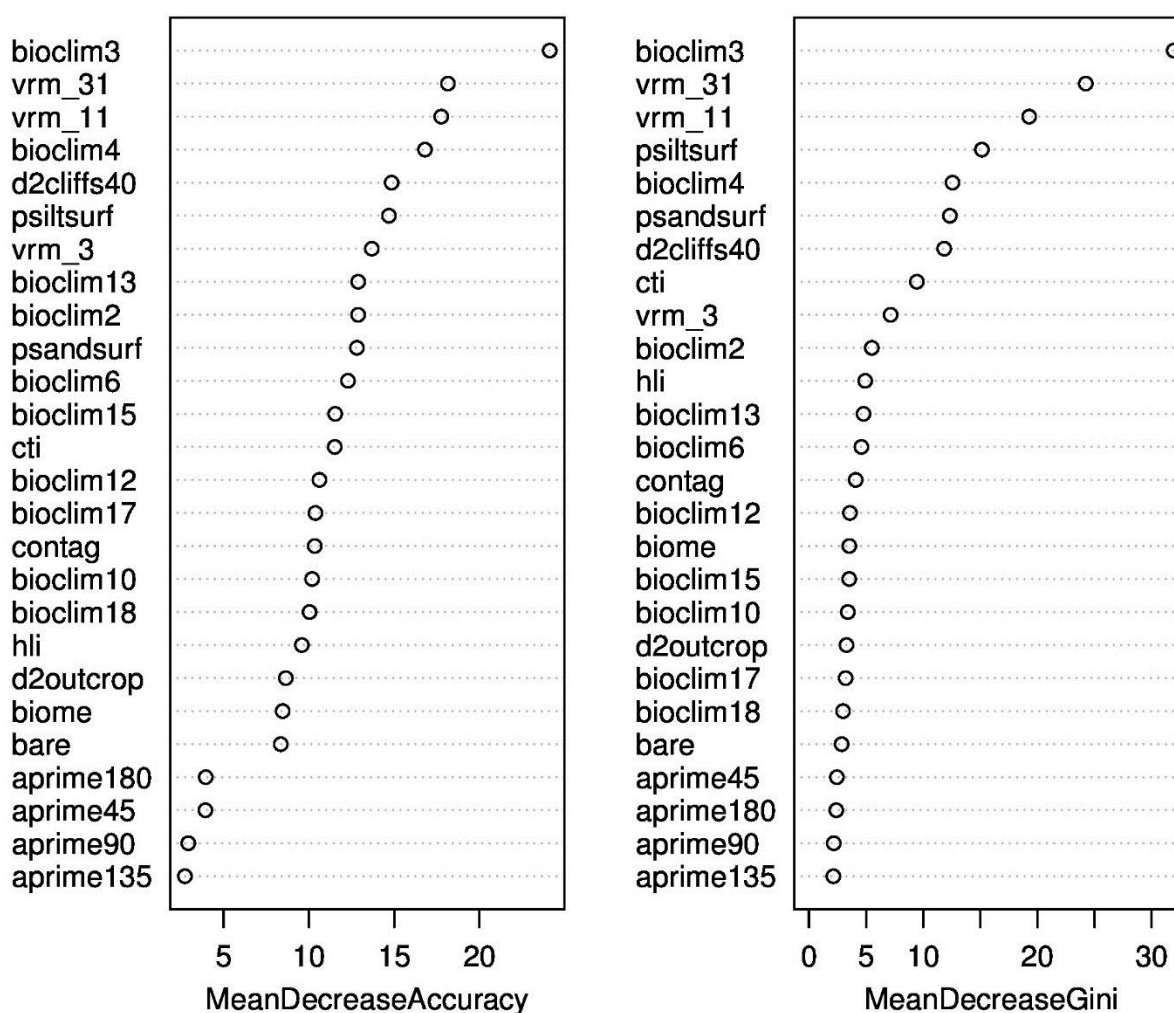
## Model Comments:

Endemic plant species that are restricted to specific soil conditions are difficult to model because statewide data are coarsely mapped and categorical. The statewide soils layer was parameterized to produce layers with gradients reflecting different soil properties. Absaroka beardtongue is limited to

substrates derived from Absaroka volcanics, but bedrock geology was not included among environmental layers and it would eliminate most low probability potential habitat.

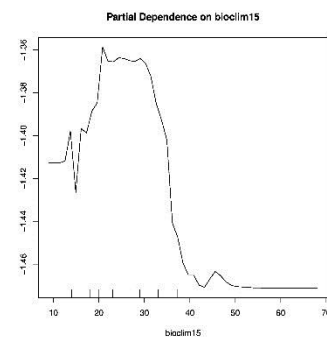
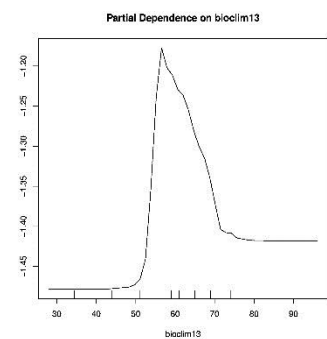
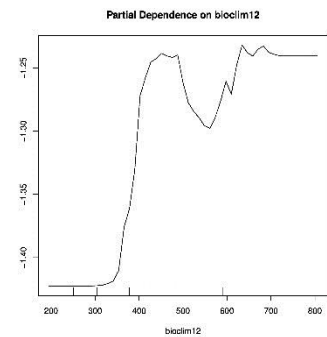
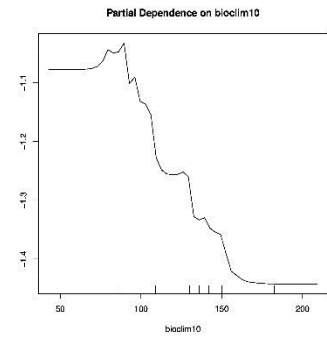
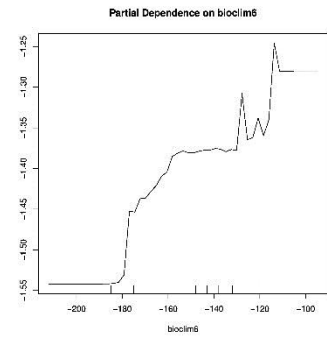
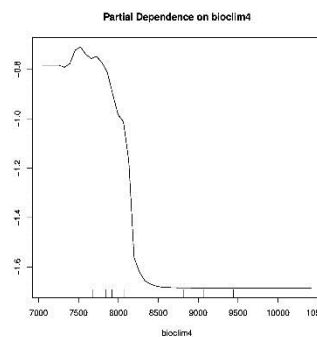
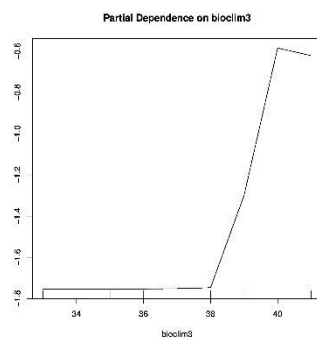
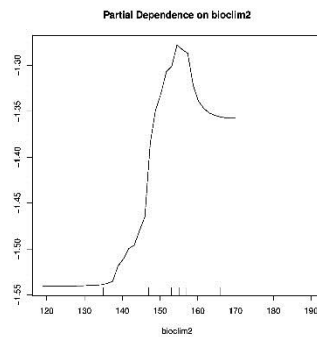
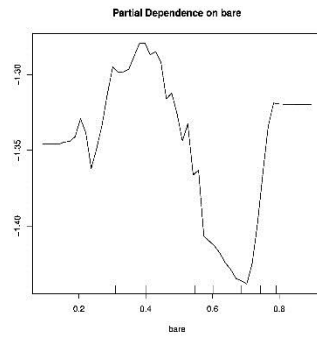
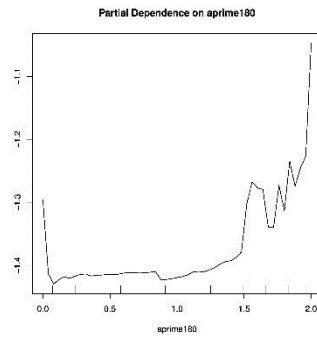
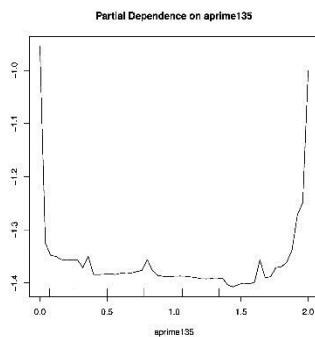
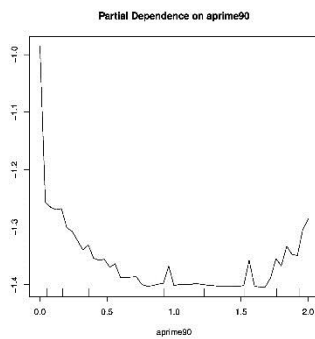
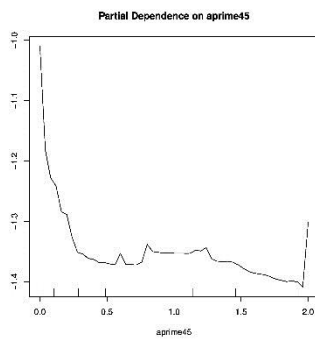
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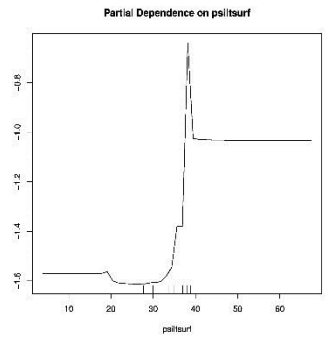
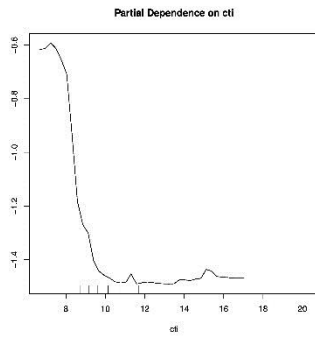
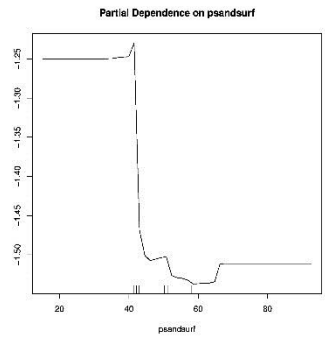
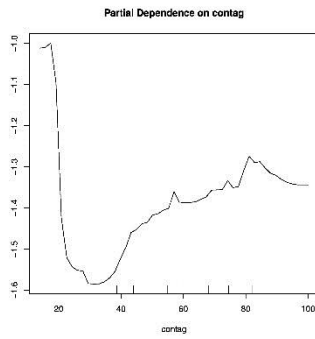
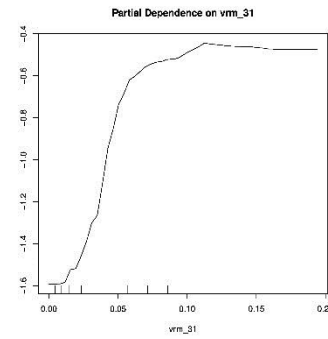
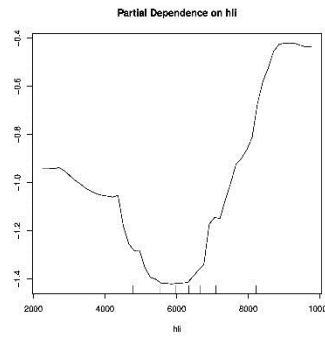
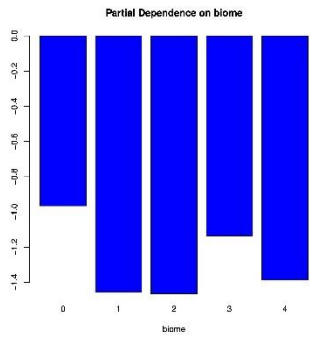
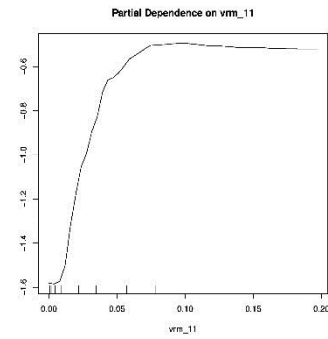
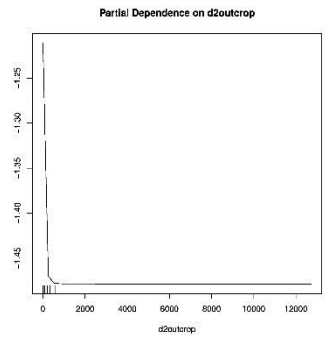
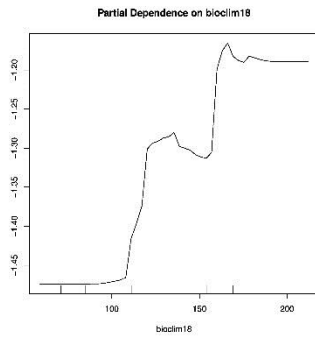
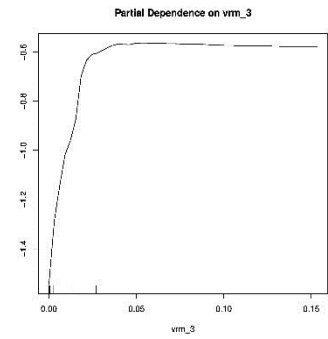
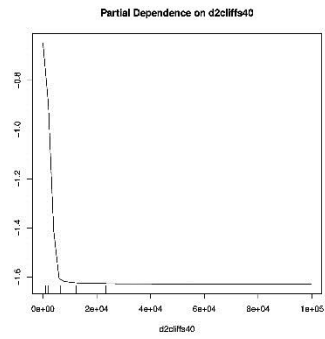
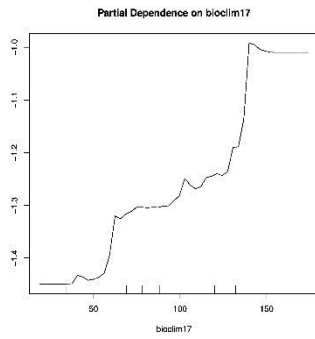
The graph below indicates the relative importance of predictors in modeling distribution for this species. “MeanDecreaseAccuracy” calculates importance by permuting (i.e., randomizing) values for the predictor and measuring the resulting decrease in model accuracy. This measure is typically a more reliable indicator of importance than “MeanDecreaseGini,” which measures improvement in a model due to splits based on the predictor. In both graphs, the further to the right the point falls on the graph, the higher the relative importance of the corresponding predictor. See Appendix 1 of this report for a detailed description of each predictor.



## Partial Plots

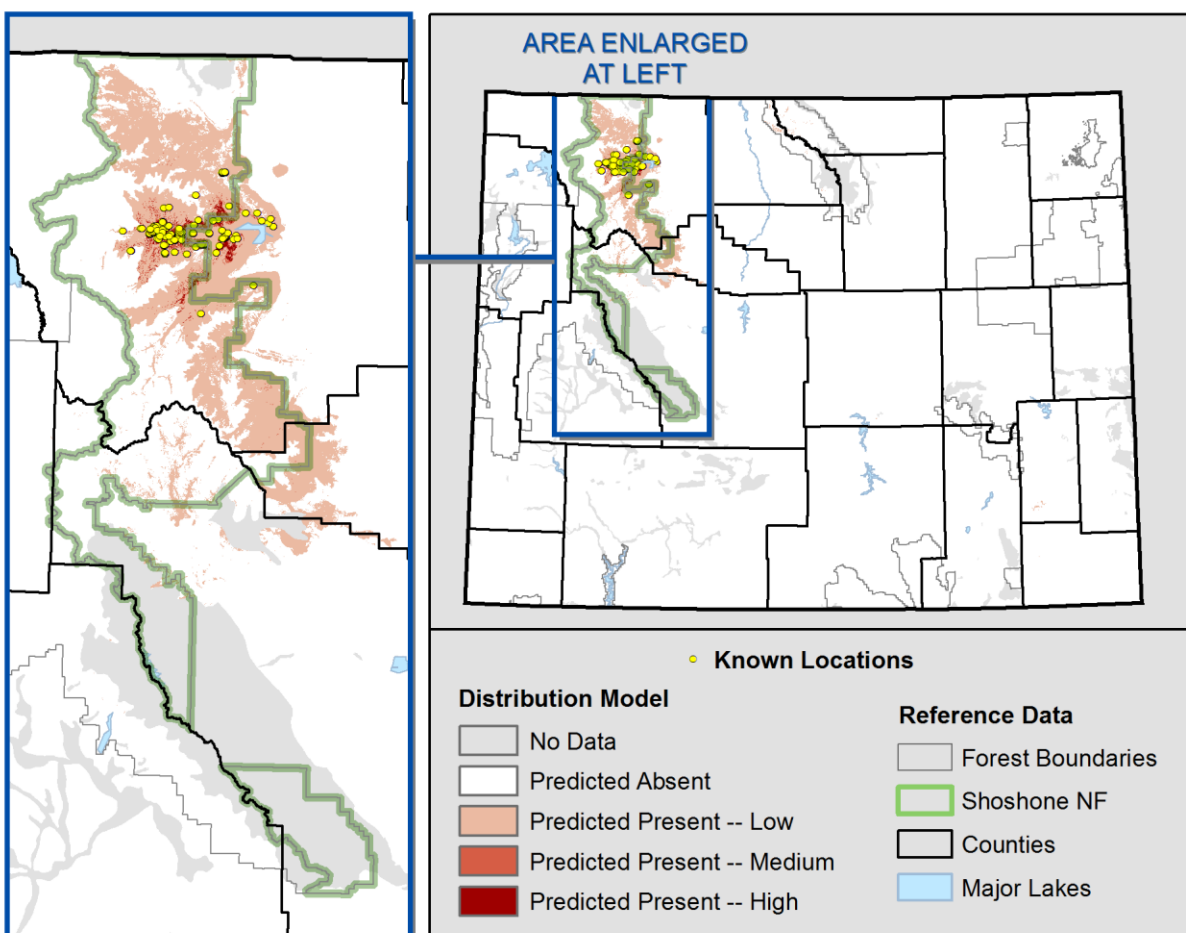
Partial plots show the relationship between a predictor variable and the predicted probability of occurrence, holding all other predictors at their average values. Probability values on the y-axis are unscaled; higher values on this axis indicate a higher relative probability of occurrence.





# Absaroka biscuitroot (*Lomatium attenuatum*)

Model version: 2016-06-23



## Model Information

- **Algorithm:** Random Forest
- **Software:** R version 3.3.0 (2016-05-03); randomForest package v. 4.6.12
- **Binary Threshold (MaxTSS):** 0.638
- **Reclassification Table for Four-Category Version:**

From	To	Becomes
0	0.286	Predicted Absent (0)
0.286	0.908	Low (1)
0.908	0.982	Medium (2)
0.982	1	High (3)

## Model Details

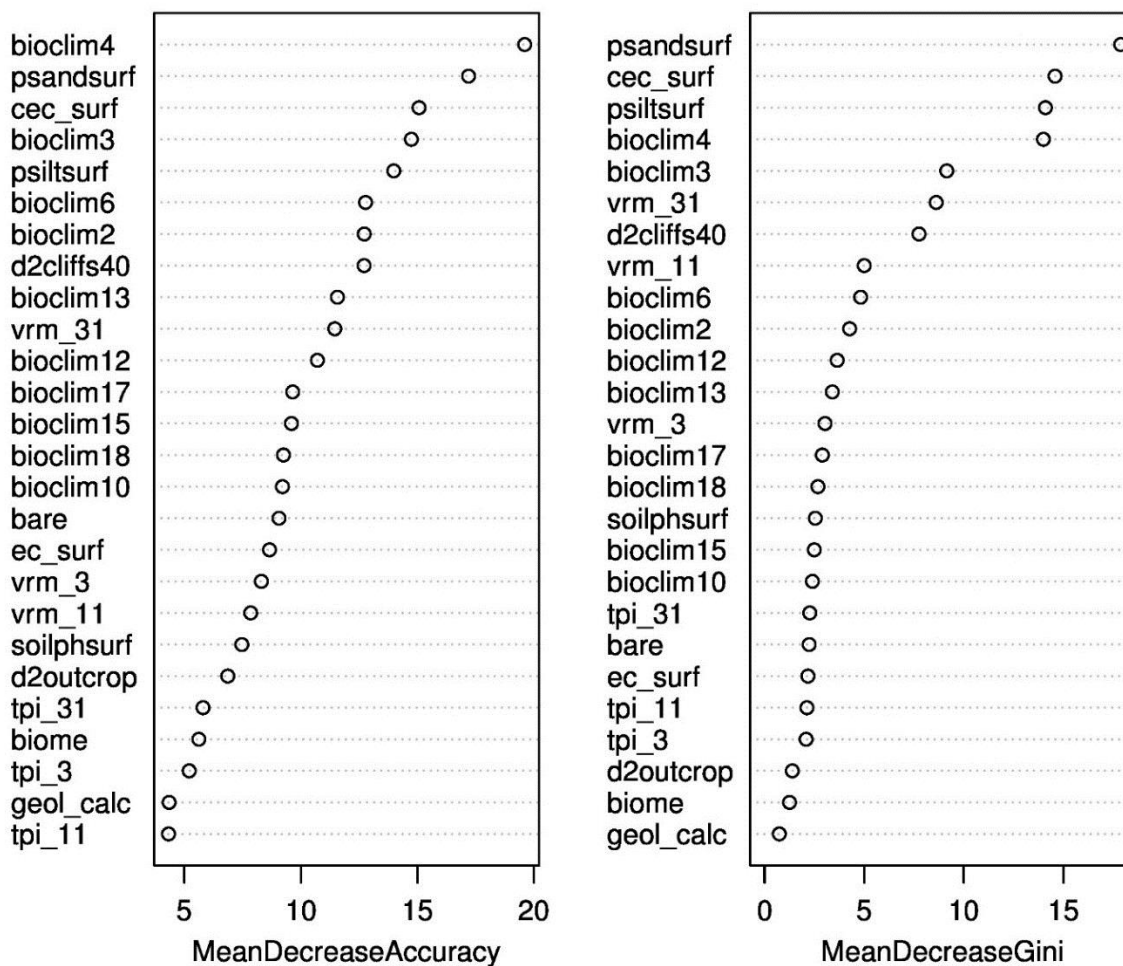
- **Number of Locations:** 92
- **Out-of-Bag Error:** 5.0%
- **TSS:** 88.1%
- **Kappa:** 86.8%
- **Sensitivity:** 92.2%
- **Specificity:** 95.9%

## Model Comments:

Regionally endemic plant species that are restricted to specific soil conditions are difficult to model because statewide data are coarsely mapped and categorical. The statewide soils layer was parameterized to produce layers with gradients reflecting different soil properties. In addition, for calciphilic species such as *Absaroka biscuitroot*, a surrogate layer was developed from bedrock geology layers to reflect calcium carbonate content. The geological complexity and crudeness of the surrogate layer might account for the breadth of low probability potential habitat.

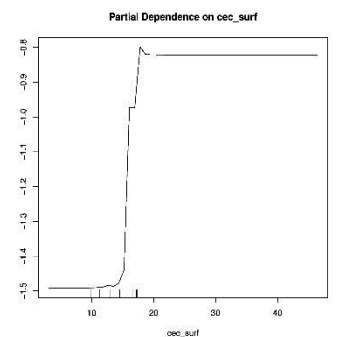
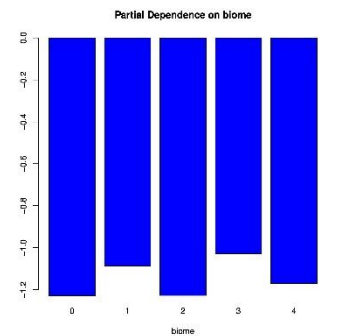
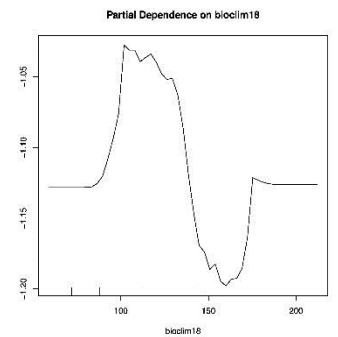
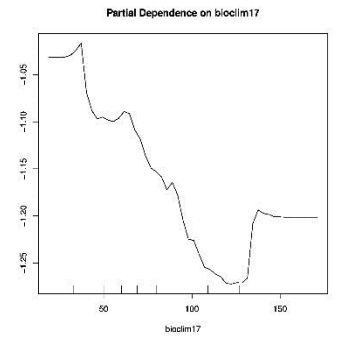
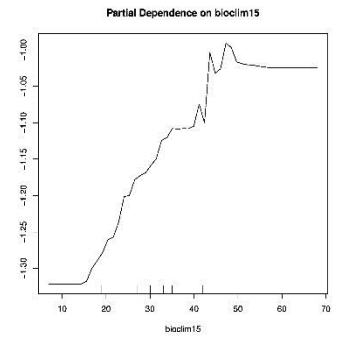
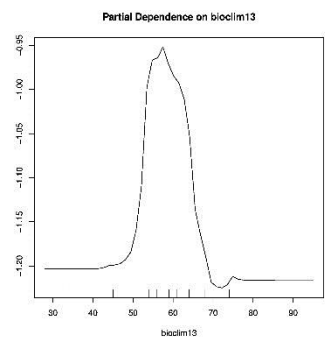
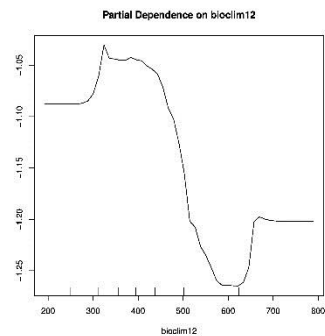
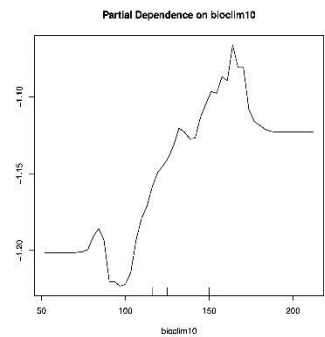
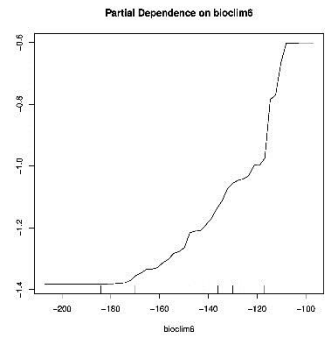
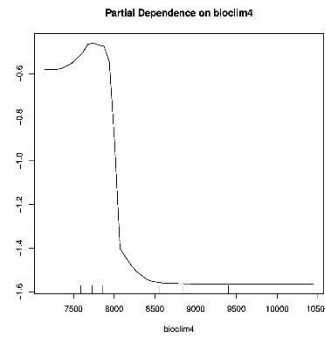
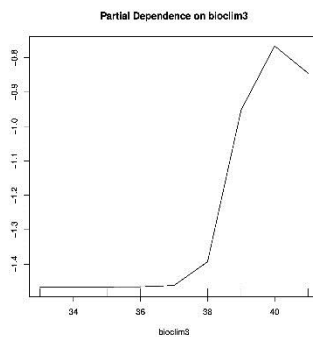
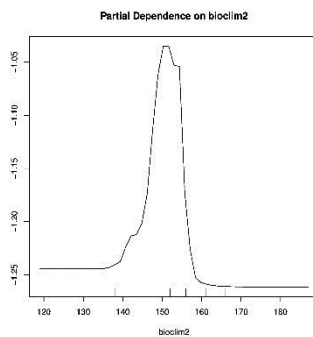
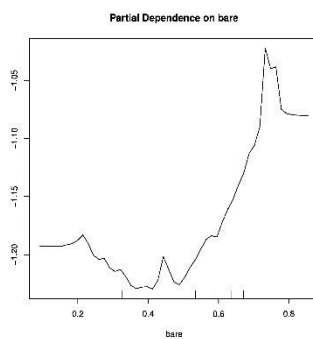
## Predictor Variable Importance:

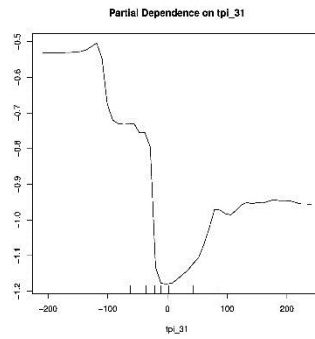
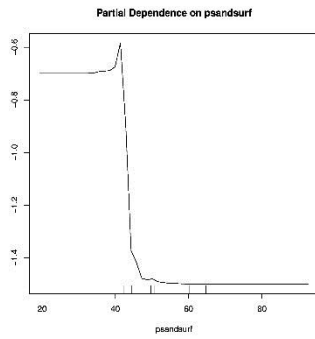
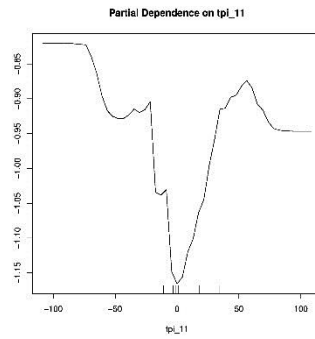
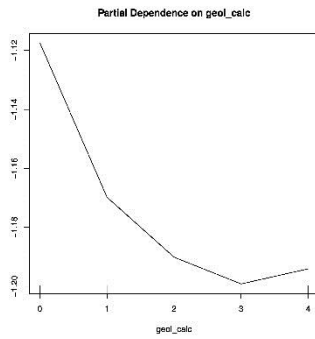
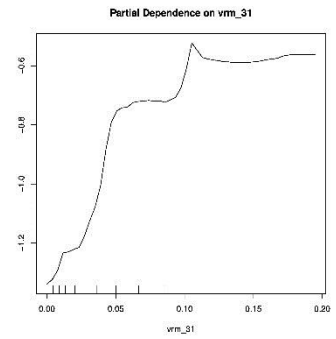
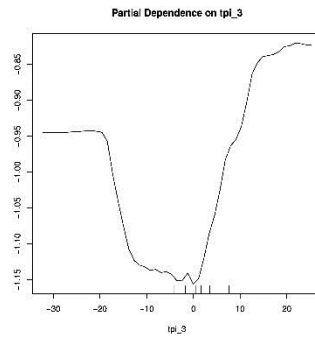
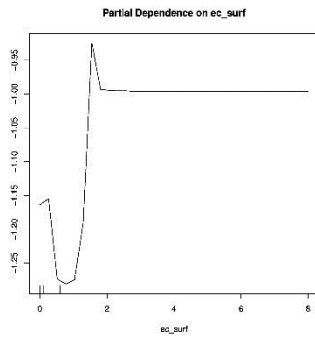
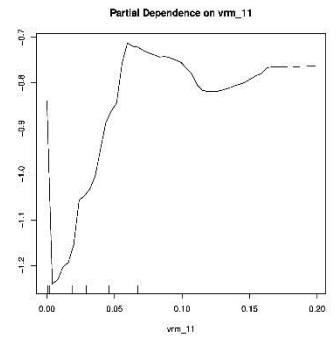
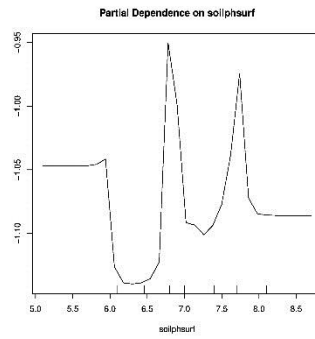
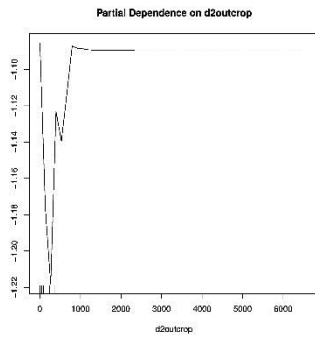
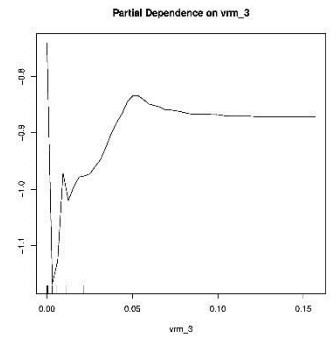
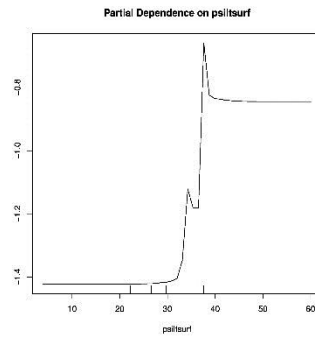
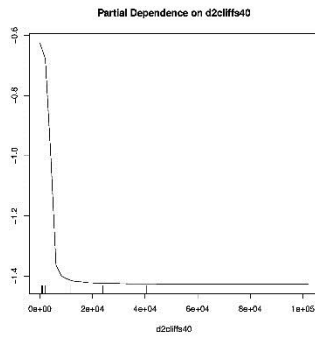
The graph below indicates the relative importance of predictors in modeling distribution for this species. “MeanDecreaseAccuracy” calculates importance by permuting (i.e., randomizing) values for the predictor and measuring the resulting decrease in model accuracy. This measure is typically a more reliable indicator of importance than “MeanDecreaseGini,” which measures improvement in a model due to splits based on the predictor. In both graphs, the further to the right the point falls on the graph, the higher the relative importance of the corresponding predictor. See Appendix 1 of this report for a detailed description of each predictor.



## Partial Plots

Partial plots show the relationship between a predictor variable and the predicted probability of occurrence, holding all other predictors at their average values. Probability values on the y-axis are unscaled; higher values on this axis indicate a higher relative probability of occurrence.

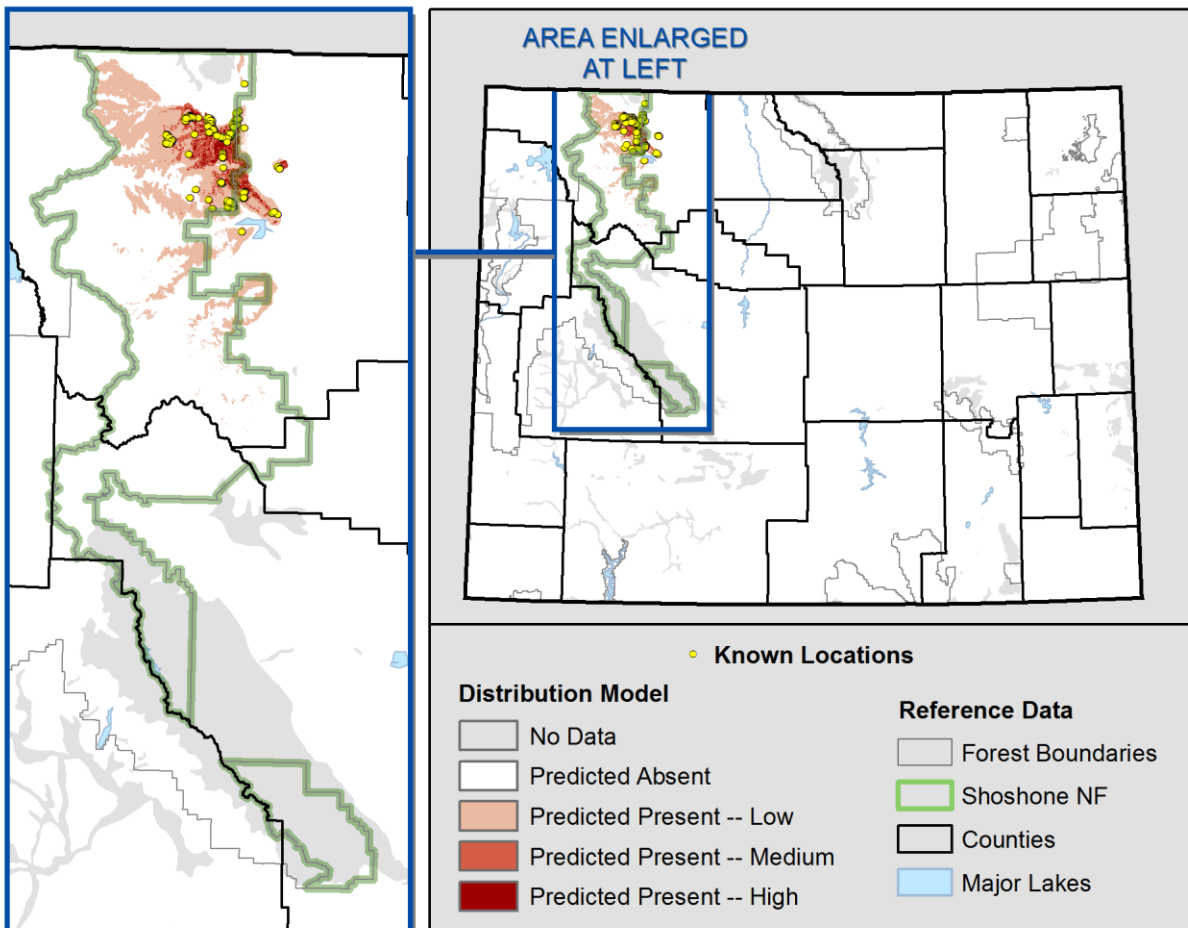






# Absaroka goldenweed (*Pyrrocomma carthamoides* var. *subsquarrosa*)

Model version: 2016-06-24



## Model Information

- **Algorithm:** Random Forest
- **Software:** R version 3.3.0 (2016-05-03); randomForest package v. 4.6.12
- **Binary Threshold (MaxTSS):** 0.646
- **Reclassification Table for Four-Category Version:**

From	To	Becomes
0	0.410	Predicted Absent (0)
0.410	0.934	Low (1)
0.934	0.988	Medium (2)
0.988	1	High (3)

## Model Details

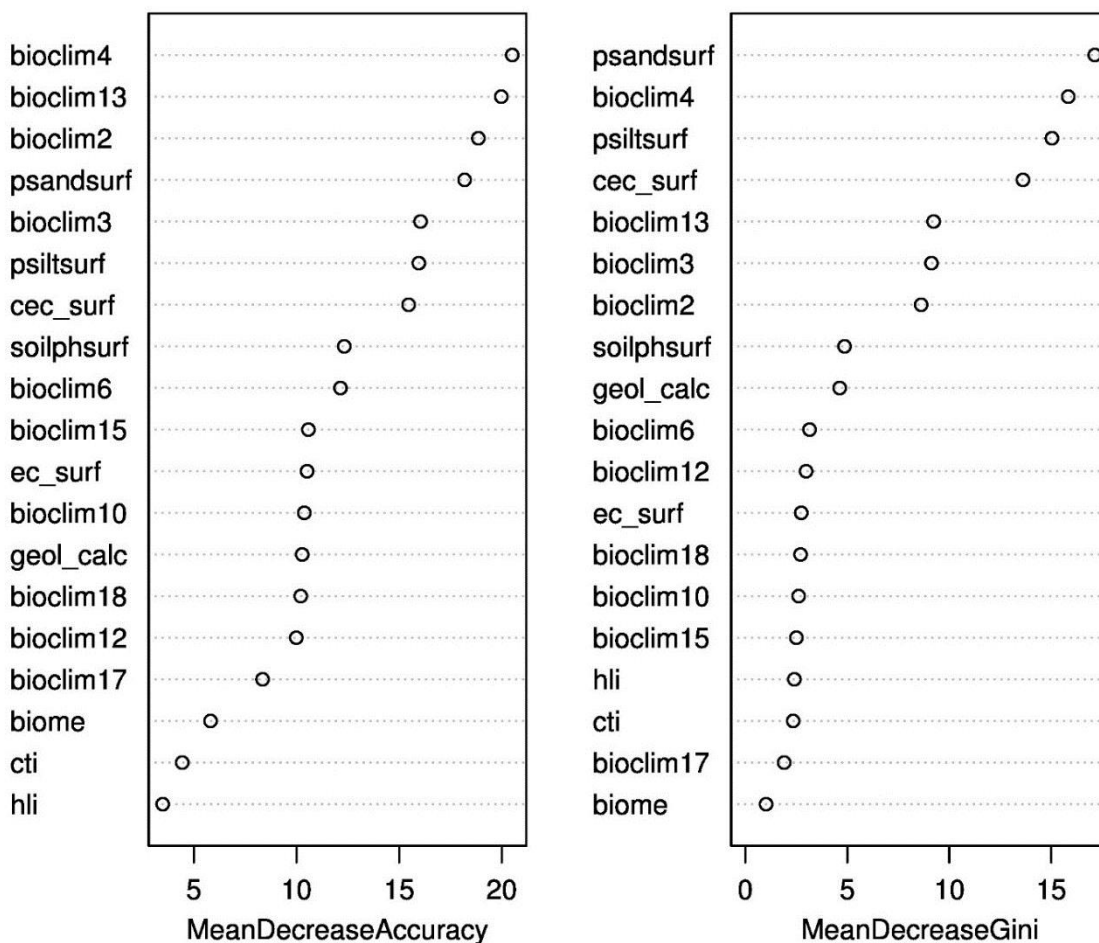
- **Number of Locations:** 82
- **Out-of-Bag Error:** 3.8%
- **TSS:** 89.9%
- **Kappa:** 89.9%
- **Sensitivity:** 92.4%
- **Specificity:** 97.5%

## Model Comments:

Regionally endemic plant species that are restricted to specific soil conditions are difficult to model because statewide data are coarsely mapped and categorical. The statewide soils layer was parameterized to produce layers with gradients reflecting different soil properties. In addition, for calciphilic species such as Absaroka goldenweed, a surrogate layer was developed from bedrock geology layers to reflect calcium carbonate content. The geological complexity and crudeness of the surrogate layer might account for the breadth of low probability potential habitat.

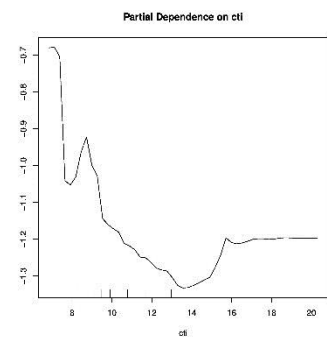
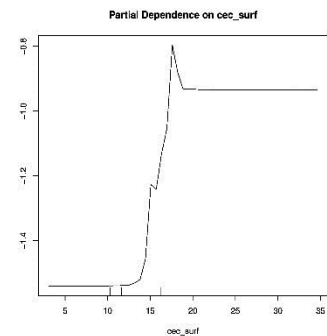
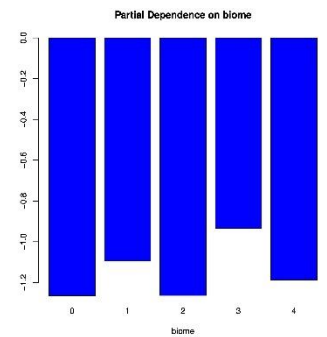
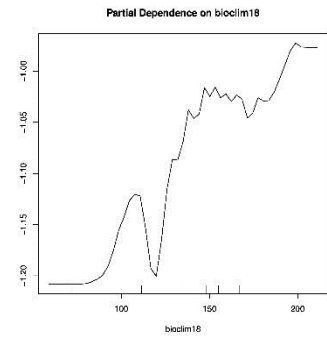
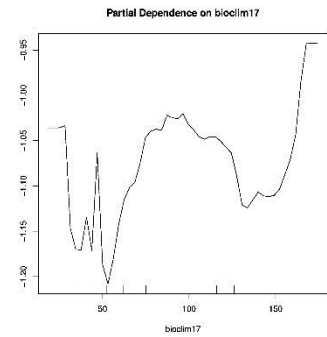
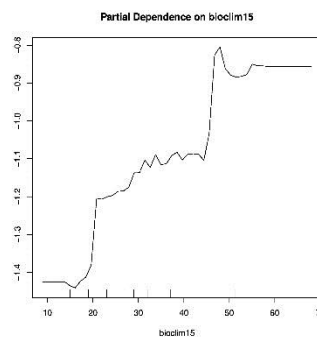
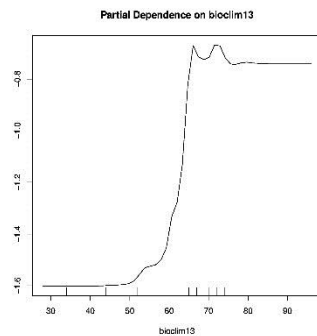
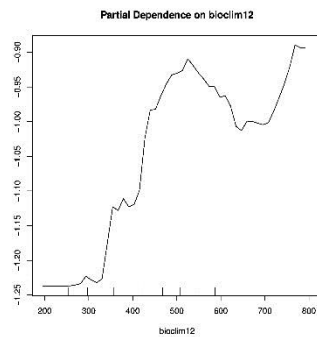
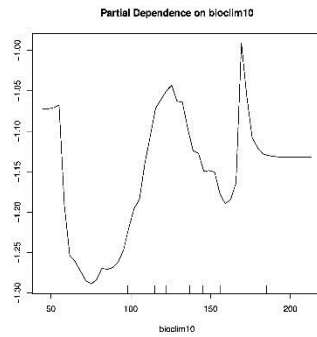
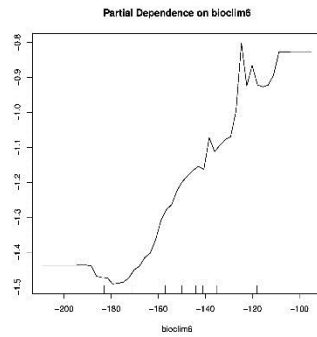
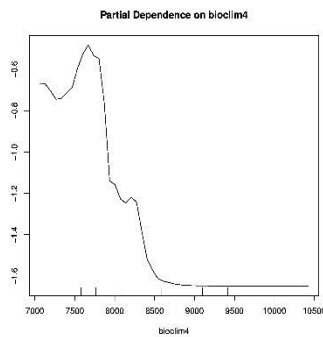
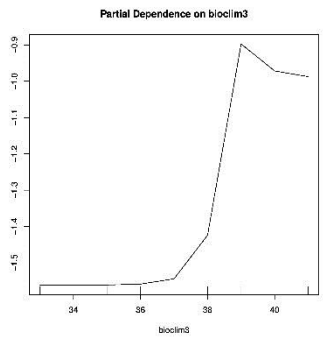
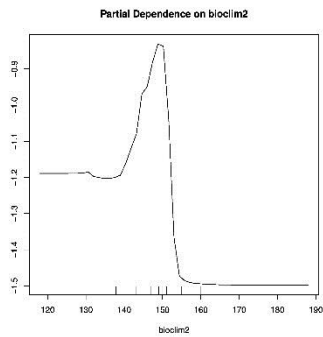
## Predictor Variable Importance:

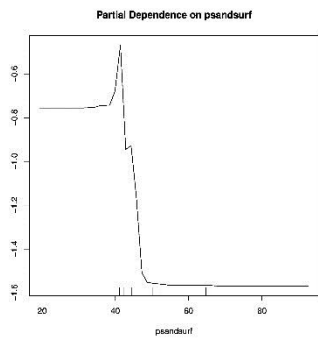
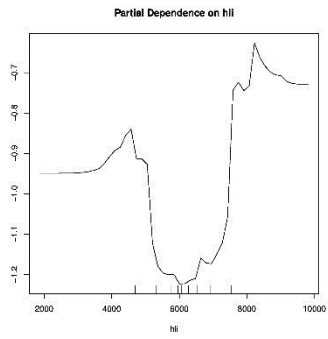
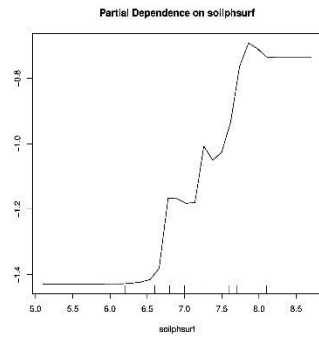
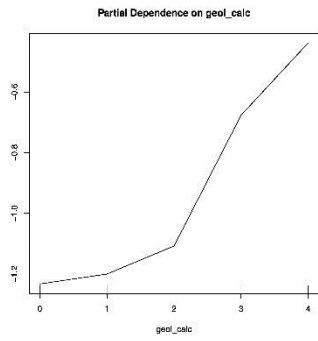
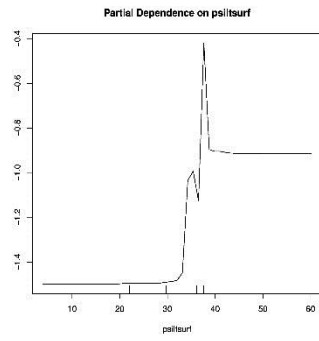
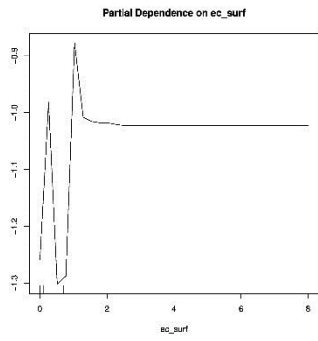
The graph below indicates the relative importance of predictors in modeling distribution for this species. “MeanDecreaseAccuracy” calculates importance by permuting (i.e., randomizing) values for the predictor and measuring the resulting decrease in model accuracy. This measure is typically a more reliable indicator of importance than “MeanDecreaseGini,” which measures improvement in a model due to splits based on the predictor. In both graphs, the further to the right the point falls on the graph, the higher the relative importance of the corresponding predictor. See Appendix 1 of this report for a detailed description of each predictor.



## Partial Plots

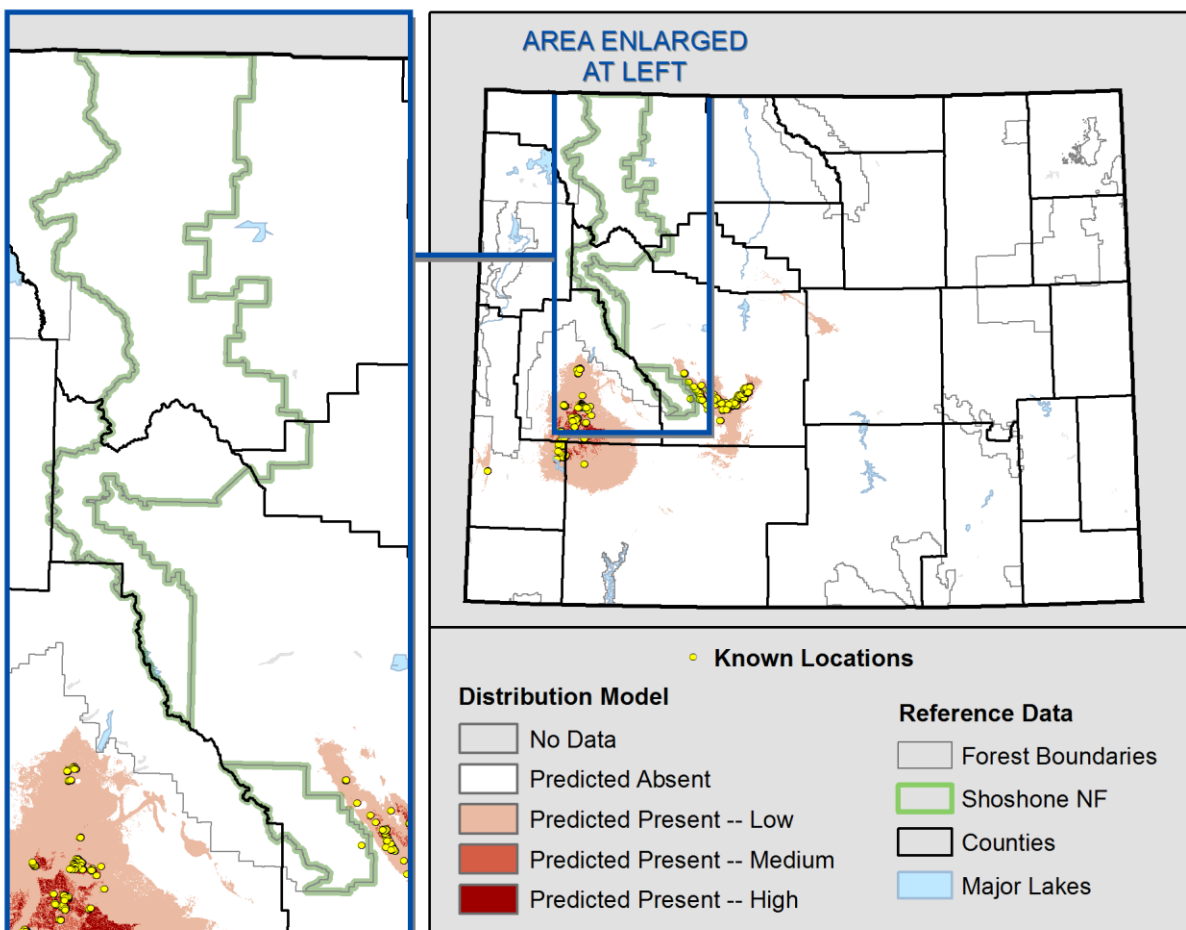
Partial plots show the relationship between a predictor variable and the predicted probability of occurrence, holding all other predictors at their average values. Probability values on the y-axis are unscaled; higher values on this axis indicate a higher relative probability of occurrence.





# Beaver Rim phlox (*Phlox pungens*)

Model version: 2016-06-24



## Model Information

- **Algorithm:** Random Forest
- **Software:** R version 3.3.0 (2016-05-03); randomForest package v. 4.6.12
- **Binary Threshold (MaxTSS):** 0.385
- **Reclassification Table for Four-Category Version:**

From	To	Becomes
0	0.320	Predicted Absent (0)
0.320	0.912	Low (1)
0.912	0.982	Medium (2)
0.982	1	High (3)

## Model Details

- **Number of Locations:** 225
- **Out-of-Bag Error:** 3.3%
- **TSS:** 93.4%
- **Kappa:** 91.3%
- **Sensitivity:** 96.8%
- **Specificity:** 96.6%

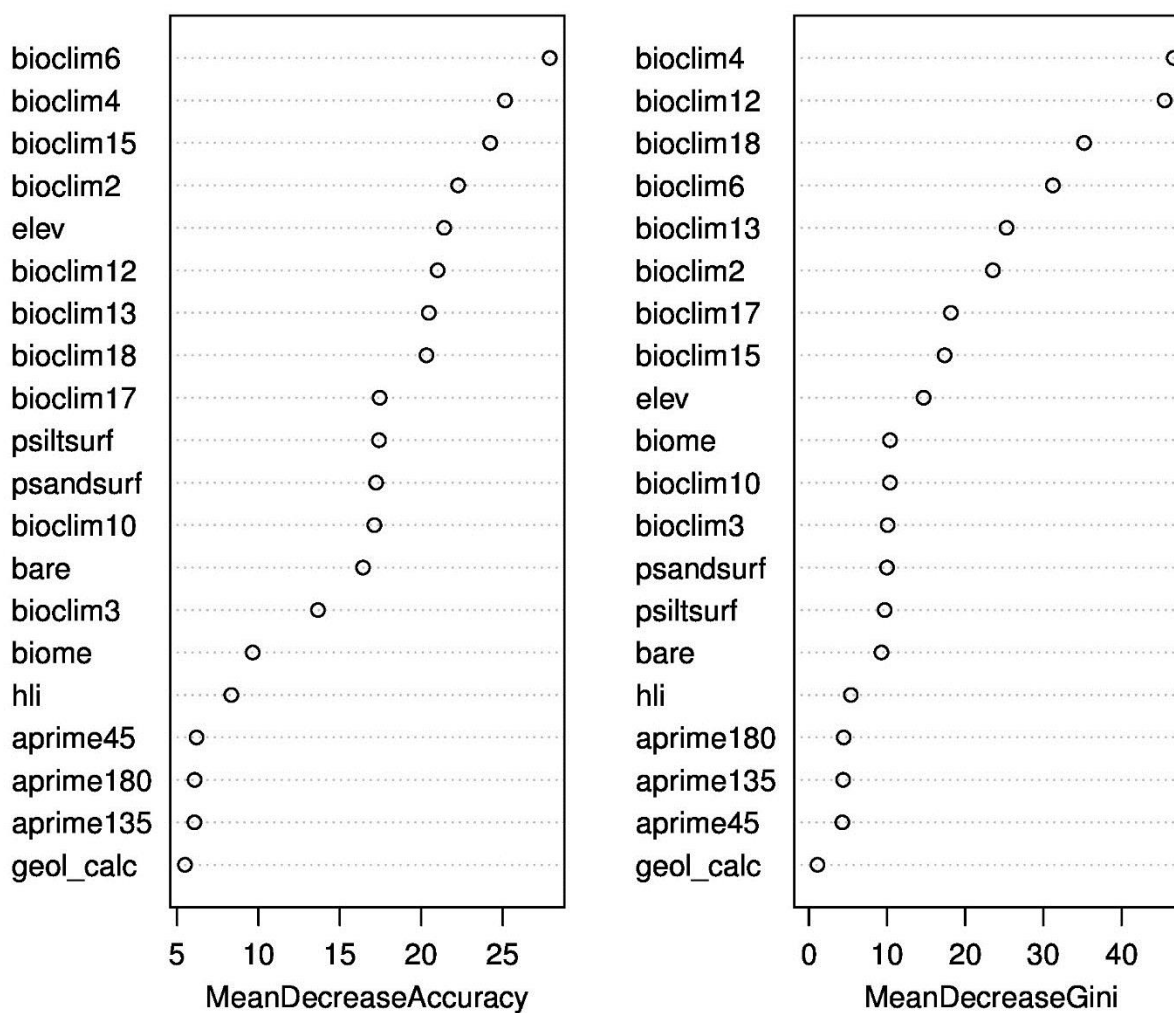
## Model Comments:

Endemic plant species that are restricted to specific soil conditions are difficult to model because statewide data are coarsely mapped and categorical. The statewide soils layer was parameterized to produce layers with gradients reflecting different soil properties. In addition, for calciphilic species such

as Beaver Rim phlox, a surrogate layer was developed from bedrock geology layers to reflect calcium carbonate content. There is taxonomic work evaluating whether Green River and Wind River area populations may represent two separate varieties but it was modeled in one set of positive data.

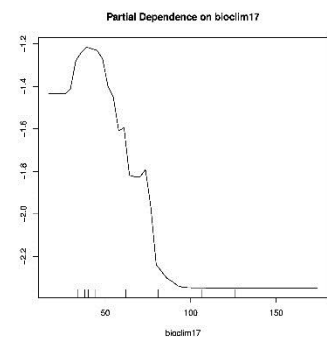
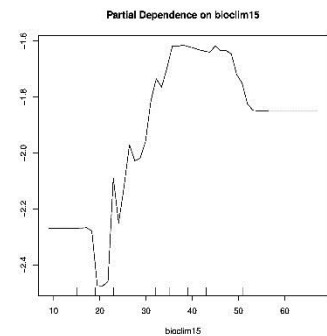
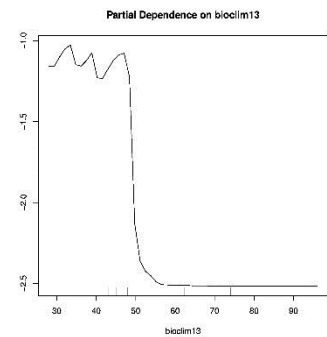
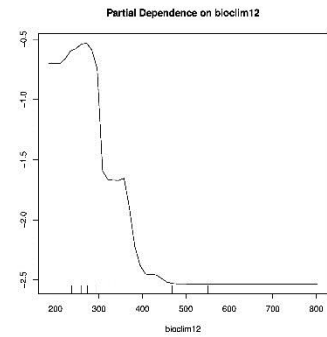
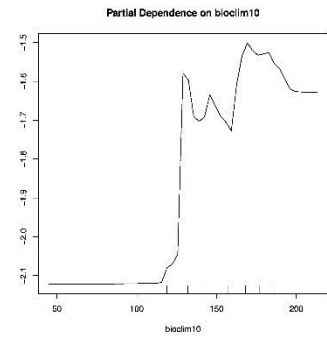
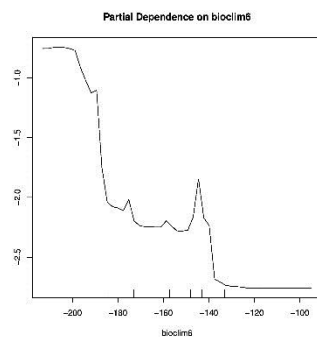
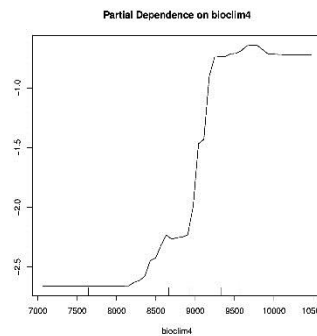
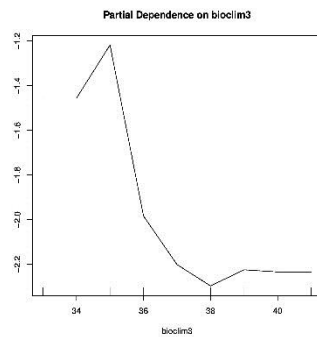
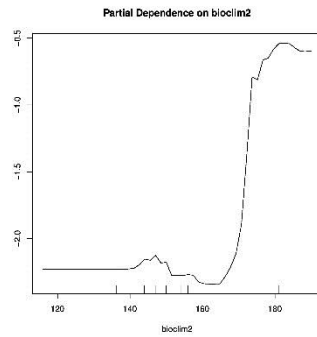
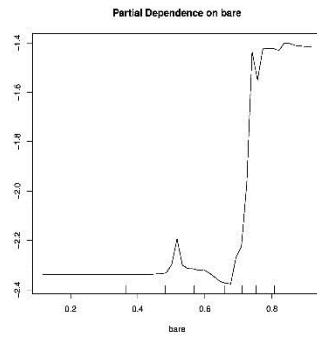
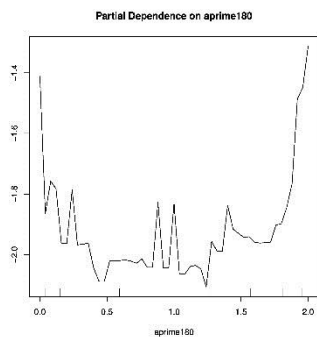
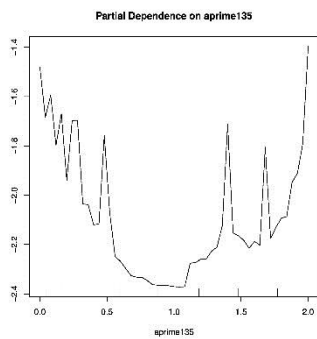
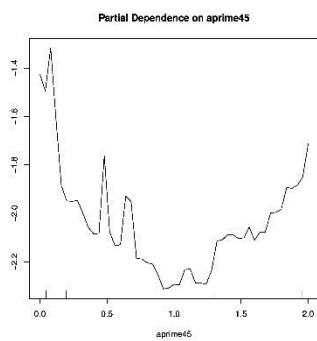
## Predictor Variable Importance:

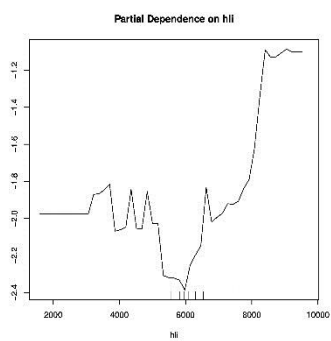
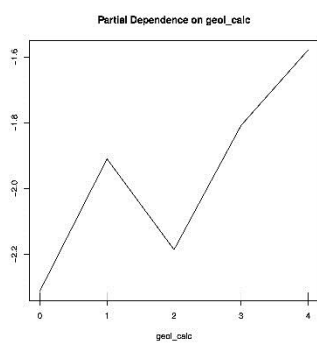
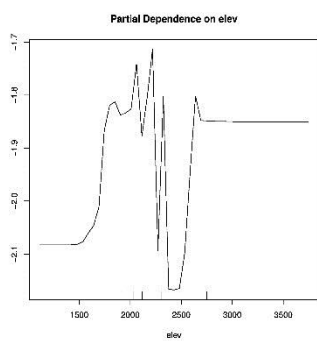
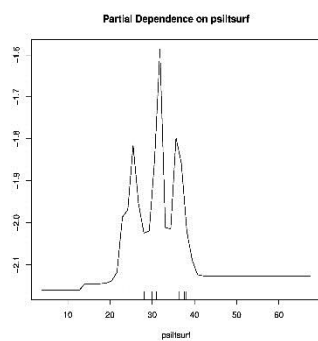
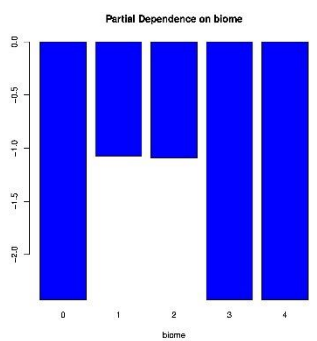
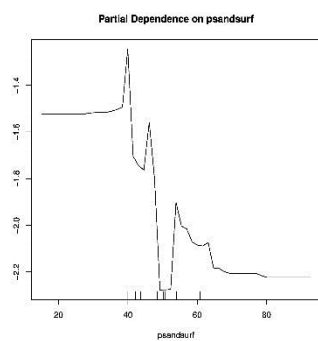
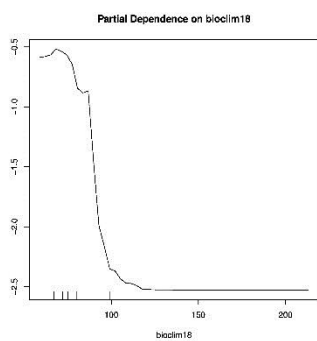
The graph below indicates the relative importance of predictors in modeling distribution for this species. “MeanDecreaseAccuracy” calculates importance by permuting (i.e., randomizing) values for the predictor and measuring the resulting decrease in model accuracy. This measure is typically a more reliable indicator of importance than “MeanDecreaseGini,” which measures improvement in a model due to splits based on the predictor. In both graphs, the further to the right the point falls on the graph, the higher the relative importance of the corresponding predictor. See Appendix 1 of this report for a detailed description of each predictor.



## Partial Plots

Partial plots show the relationship between a predictor variable and the predicted probability of occurrence, holding all other predictors at their average values. Probability values on the y-axis are unscaled; higher values on this axis indicate a higher relative probability of occurrence.

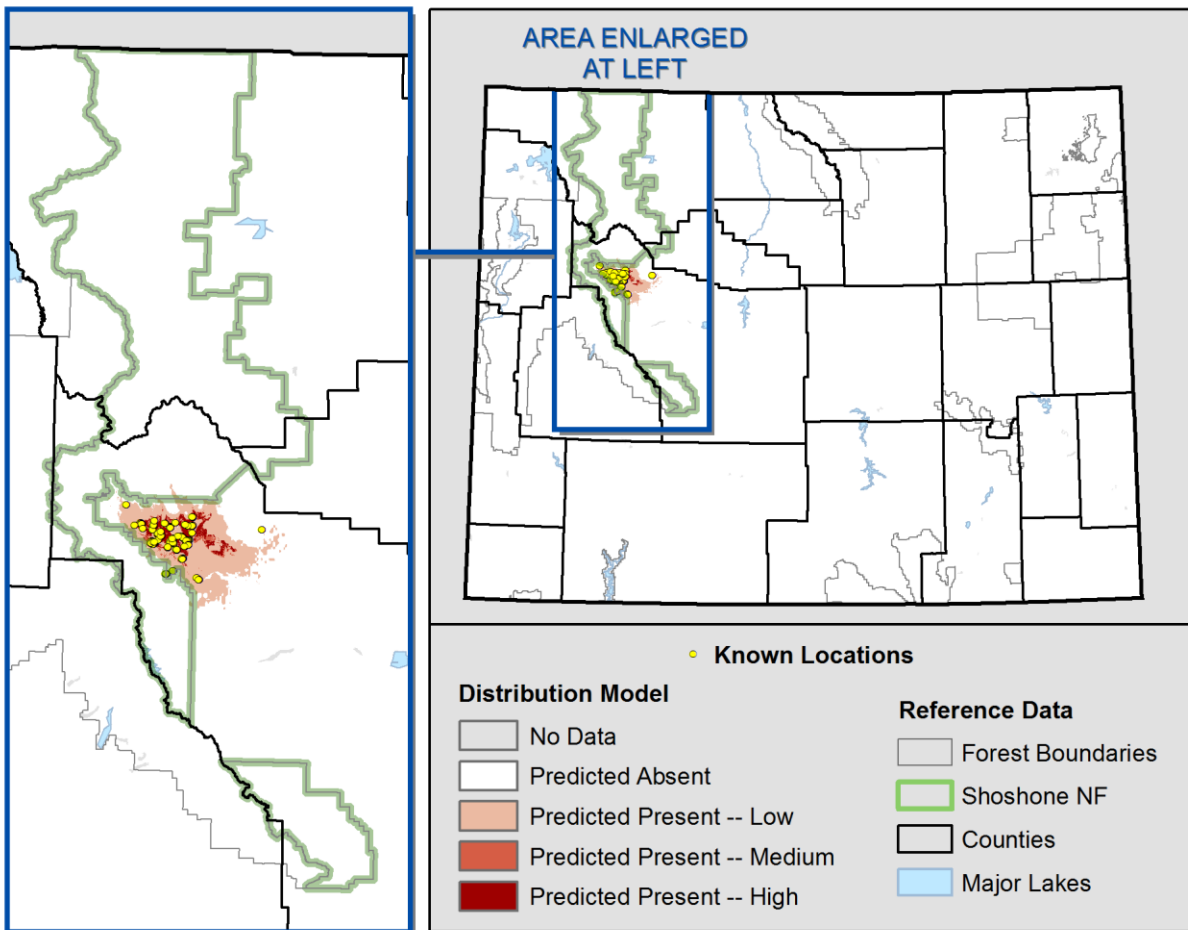






# Dubois milkvetch (*Astragalus gilviflorus* var. *purpureus*)

Model version: 2016-06-22



## Model Information

- **Algorithm:** Random Forest
- **Software:** R version 3.3.0 (2016-05-03); randomForest package v. 4.6.12
- **Binary Threshold (MaxTSS):** 0.572
- **Reclassification Table for Four-Category Version:**

From	To	Becomes
0	0.646	Predicted Absent (0)
0.646	0.972	Low (1)
0.972	0.996	Medium (2)
0.996	1	High (3)

## Model Details

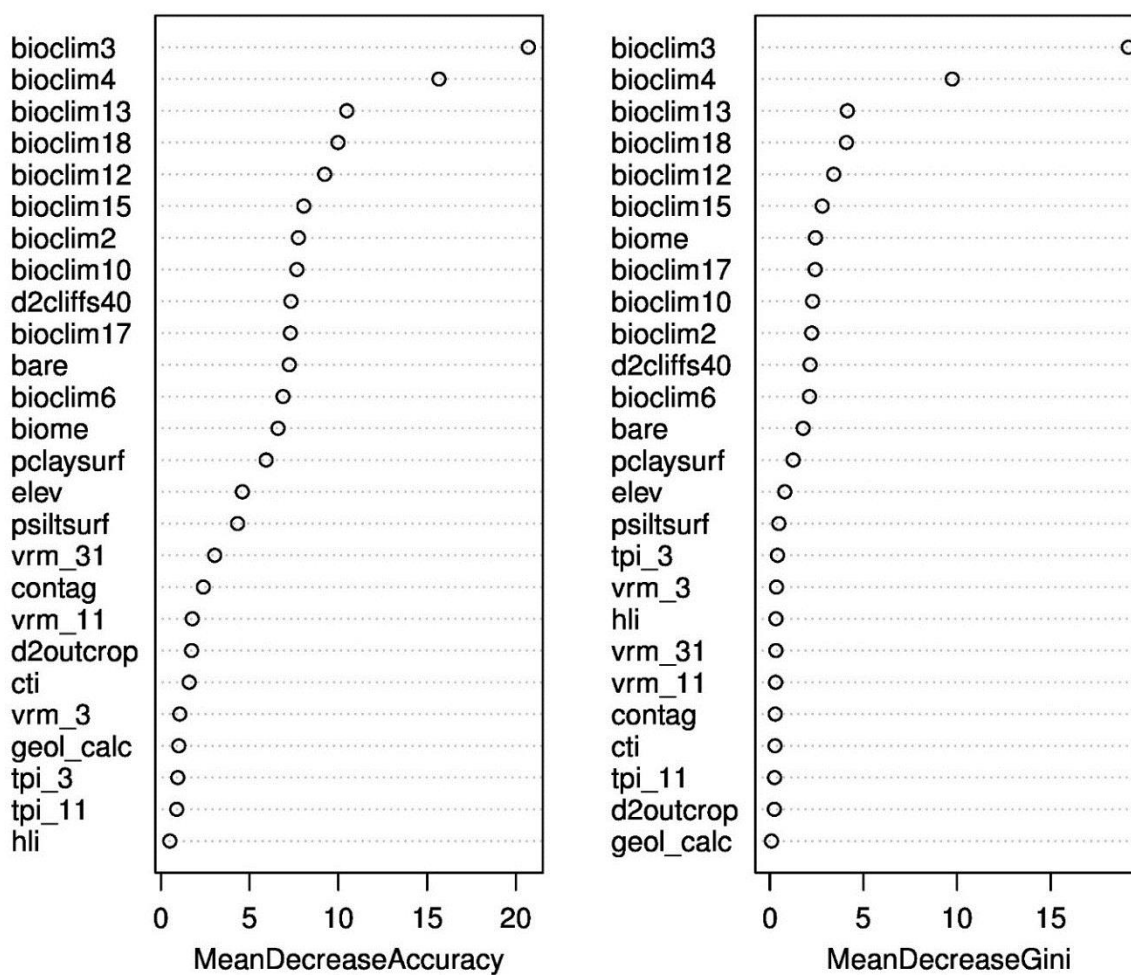
- **Number of Locations:** 43
- **Out-of-Bag Error:** 1.3%
- **TSS:** 95.5%
- **Kappa:** 96.6%
- **Sensitivity:** 95.7%
- **Specificity:** 99.8%

## Model Comments:

Endemic plant species that are restricted to specific soil conditions are difficult to model because statewide data are coarsely mapped and categorical. The statewide soils layer was parameterized to produce layers with gradients reflecting different soil properties. It was collected at a new location in 2016 that expanded the upper elevation limits and was close (but not in) SNF boundaries, but this positive data arrived after models were run. The positive data may be more limited by the near-absence of any surveys in the eastern portion of potential habitat, on Wind River Indian Reservation.

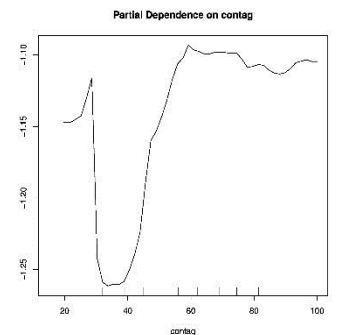
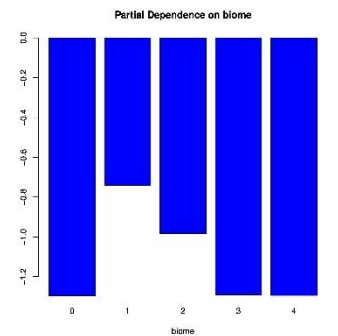
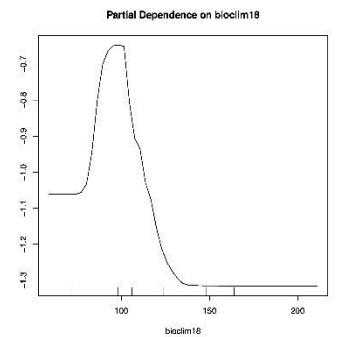
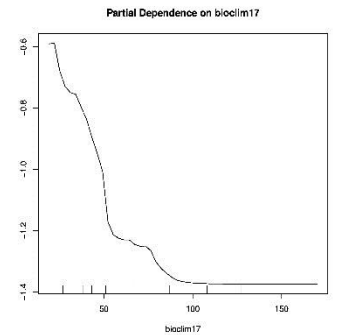
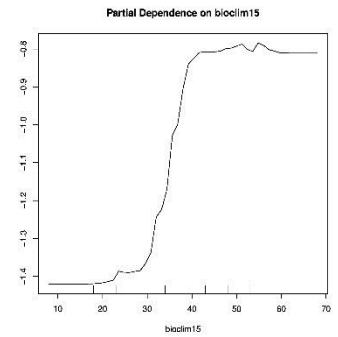
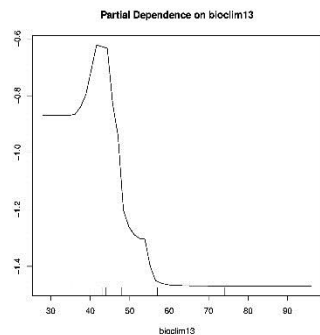
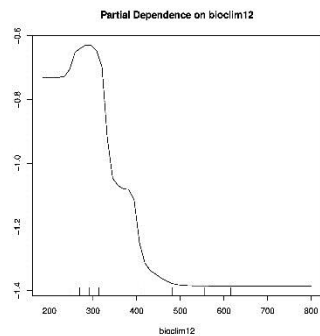
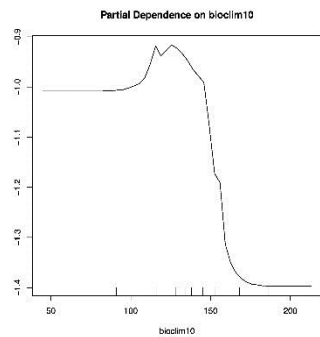
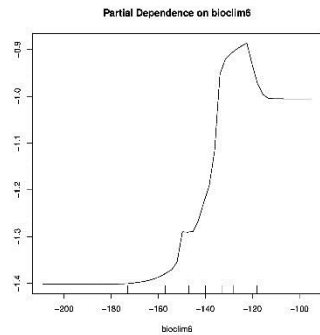
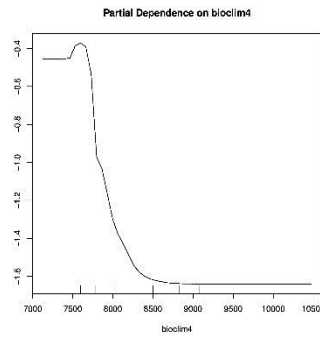
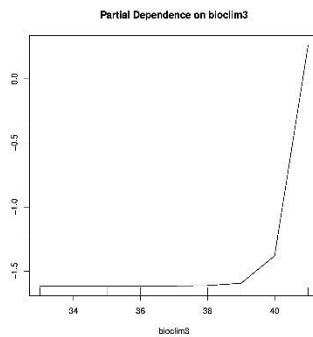
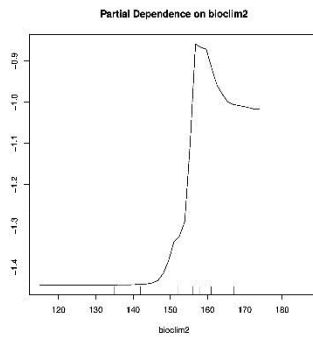
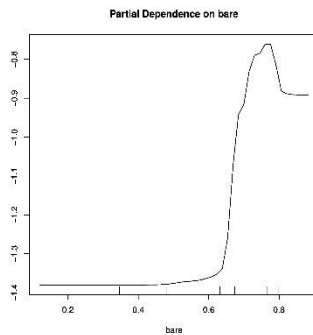
## Predictor Variable Importance:

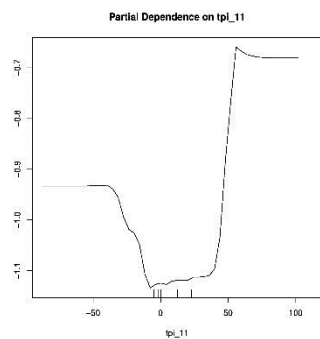
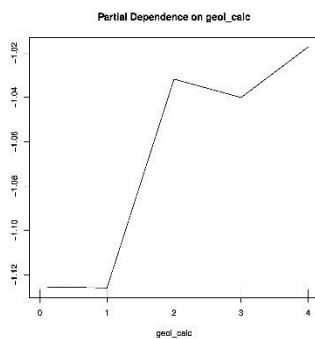
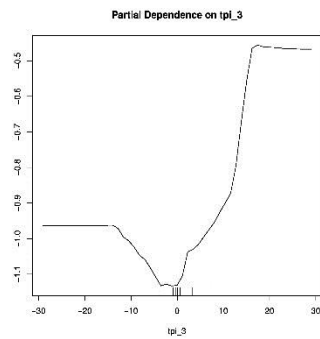
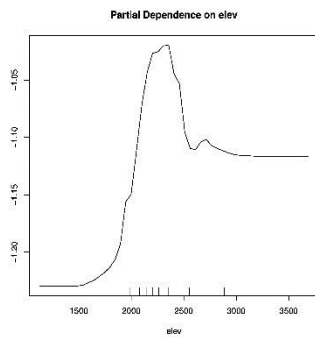
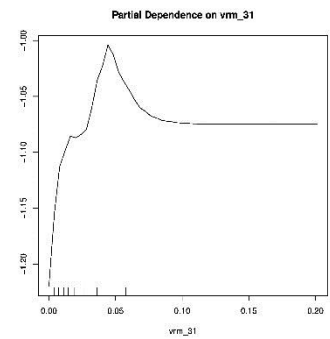
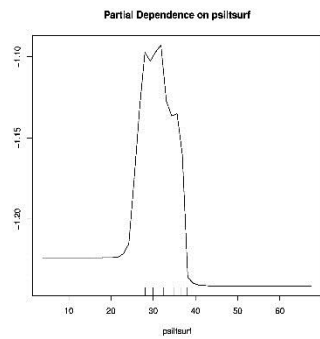
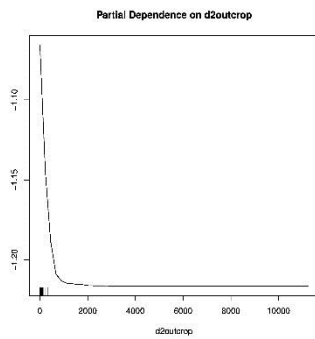
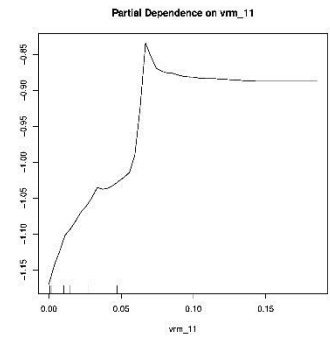
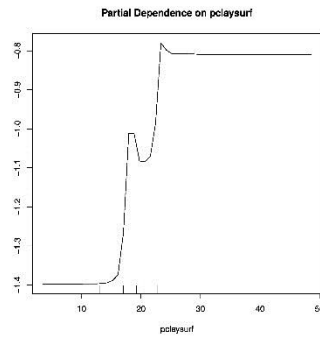
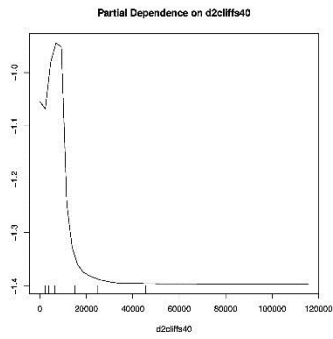
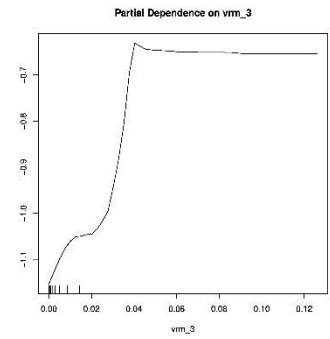
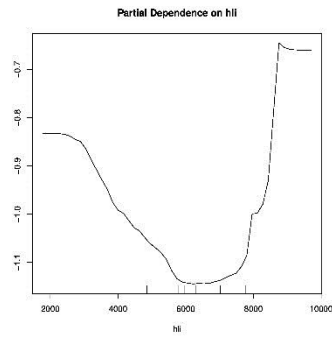
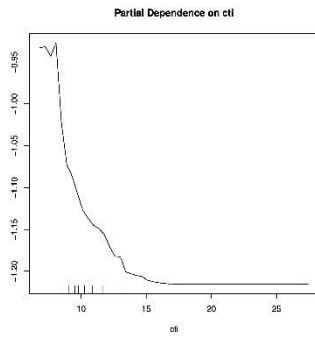
The graph below indicates the relative importance of predictors in modeling distribution for this species. “MeanDecreaseAccuracy” calculates importance by permuting (i.e., randomizing) values for the predictor and measuring the resulting decrease in model accuracy. This measure is typically a more reliable indicator of importance than “MeanDecreaseGini,” which measures improvement in a model due to splits based on the predictor. In both graphs, the further to the right the point falls on the graph, the higher the relative importance of the corresponding predictor. See Appendix 1 of this report for a detailed description of each predictor.



## Partial Plots

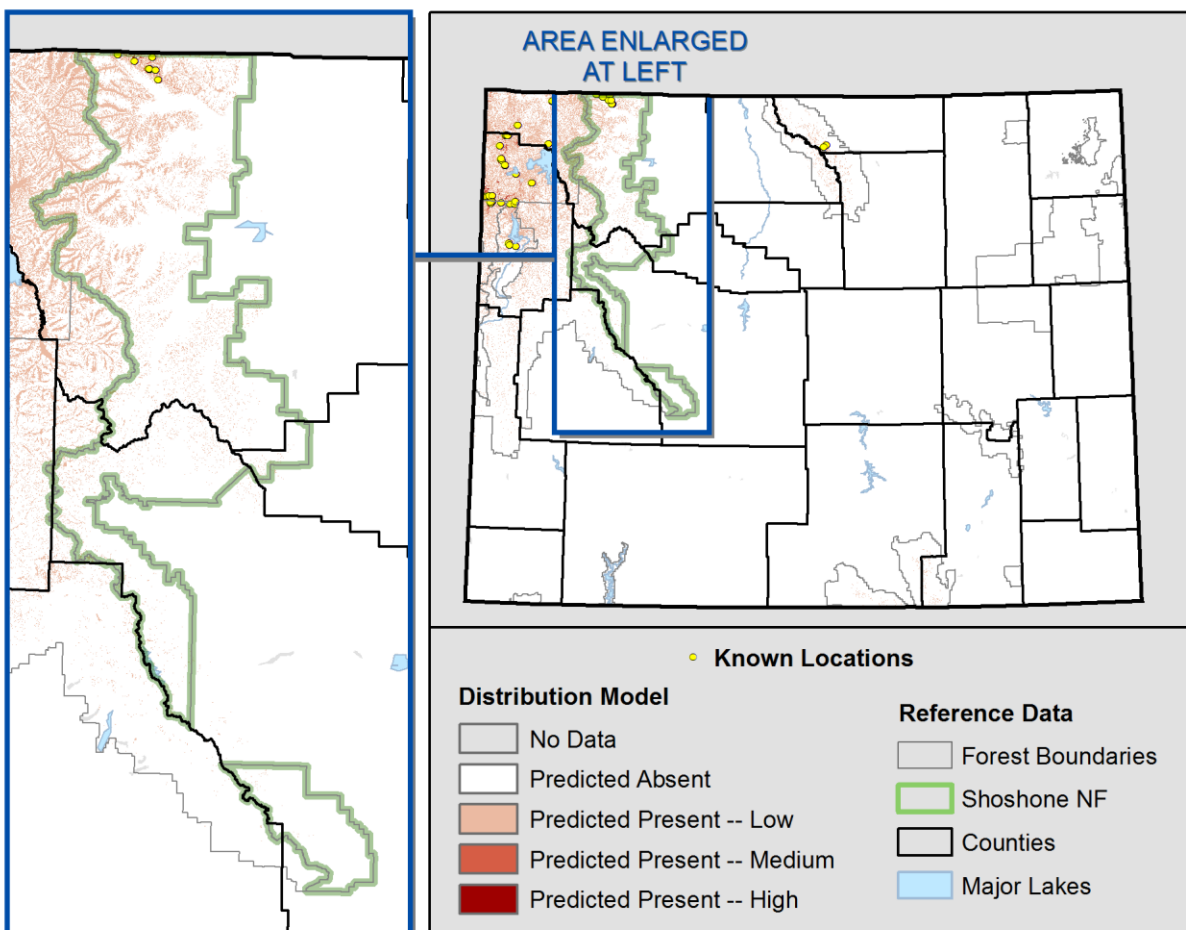
Partial plots show the relationship between a predictor variable and the predicted probability of occurrence, holding all other predictors at their average values. Probability values on the y-axis are unscaled; higher values on this axis indicate a higher relative probability of occurrence.





# English sundew (*Drosera anglica*)

Model version: 2016-06-23



## Model Information

- **Algorithm:** Random Forest
- **Software:** R version 3.3.0 (2016-05-03); randomForest package v. 4.6.12
- **Binary Threshold (MaxTSS):** 0.556
- **Reclassification Table for Four-Category Version:**

From	To	Becomes
0	0.236	Predicted Absent (0)
0.236	0.882	Low (1)
0.882	0.984	Medium (2)
0.984	1	High (3)

## Model Details

- **Number of Locations:** 46
- **Out-of-Bag Error:** 9.2%
- **TSS:** 75.4%
- **Kappa:** 75.5%
- **Sensitivity:** 81.5%
- **Specificity:** 93.9%

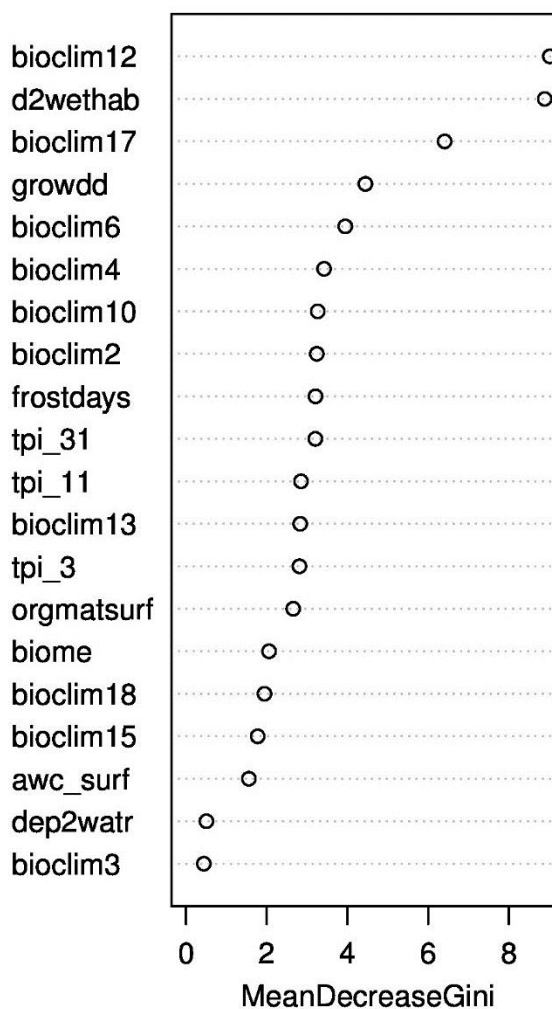
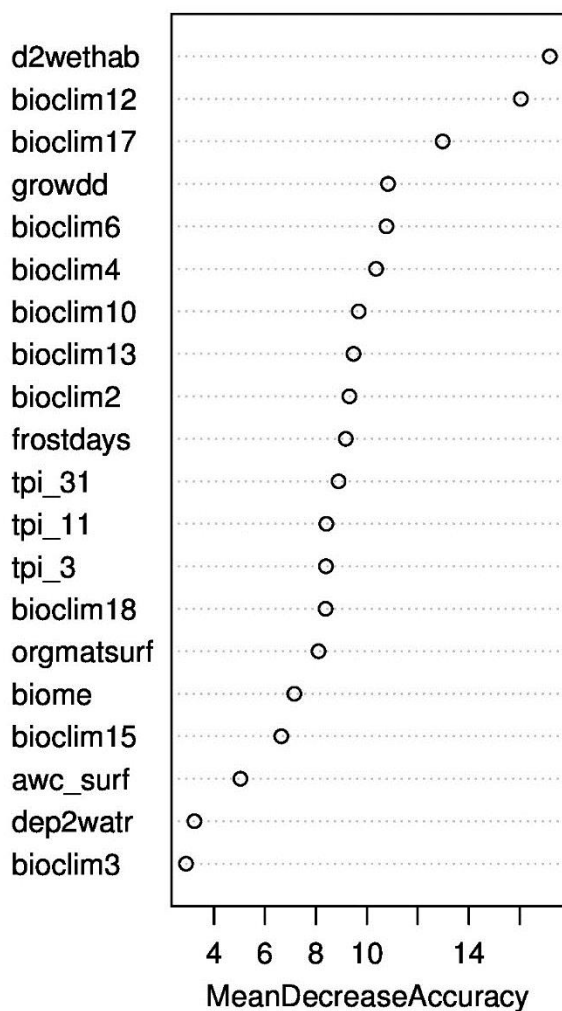
## Model Comments:

Rare wetland plant species that occupy microhabitat are difficult to model. A layer was developed that combines layers representing riverine and palustrine settings along a distance gradient. English sundew

also occupies relict habitat (organic soil accumulation) that is vestige of the geological past, beyond the scope of modeling. The output shows high probability locations in a highly pixelated pattern.

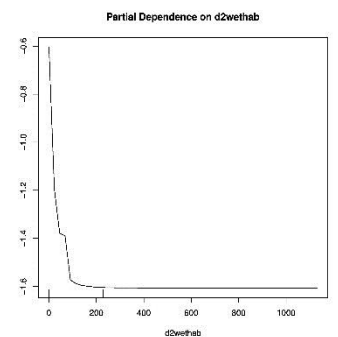
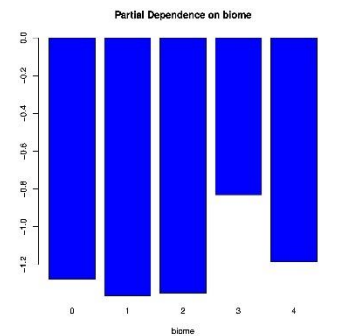
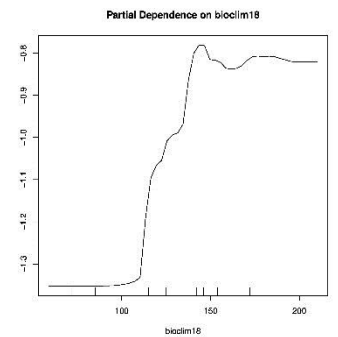
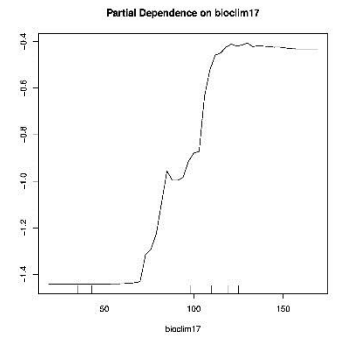
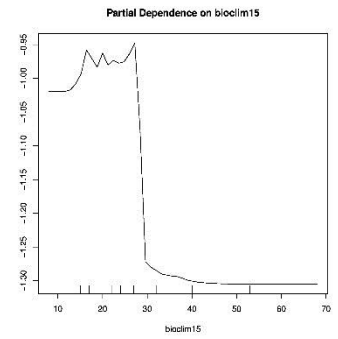
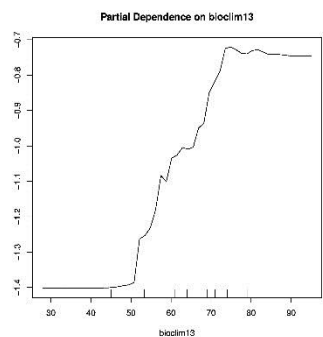
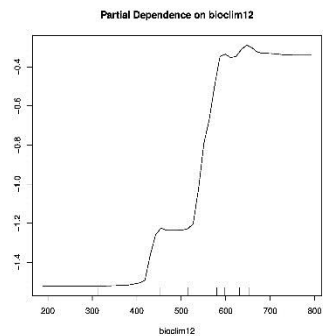
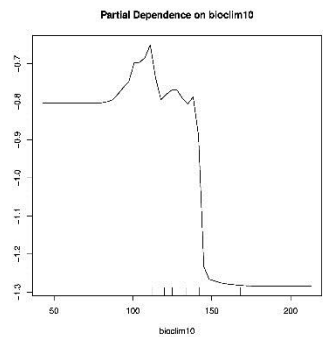
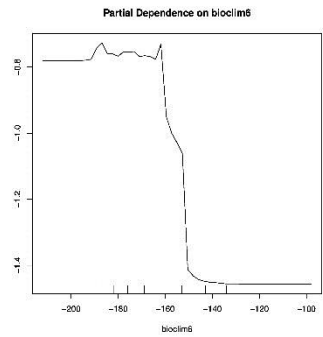
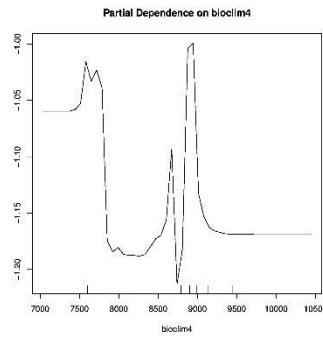
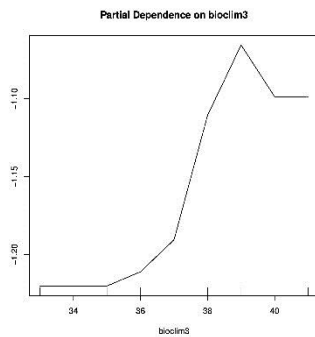
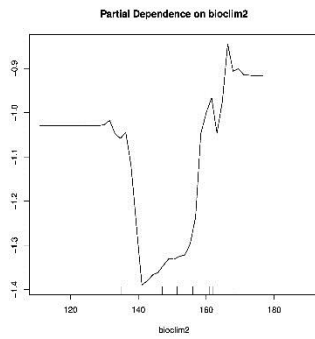
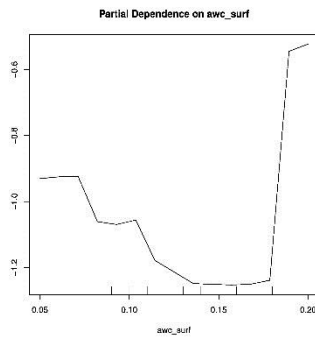
## Predictor Variable Importance:

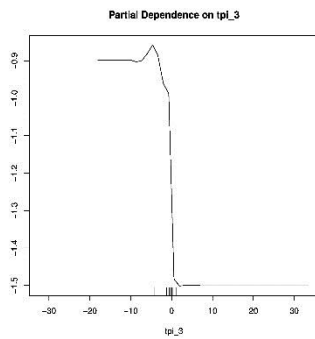
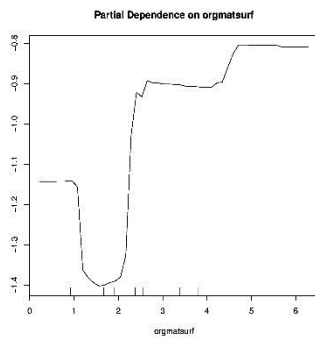
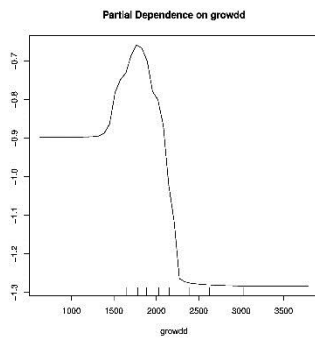
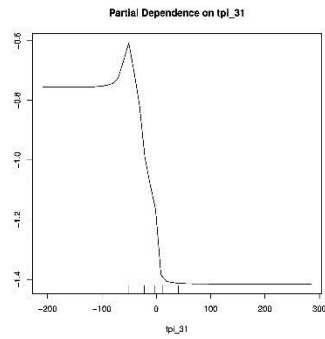
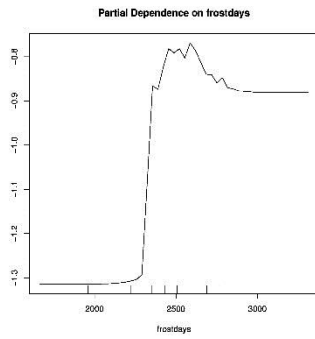
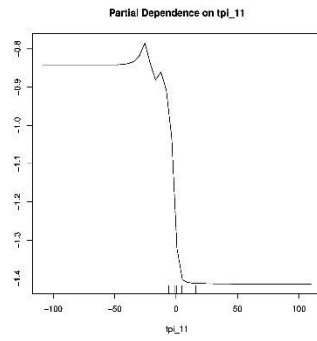
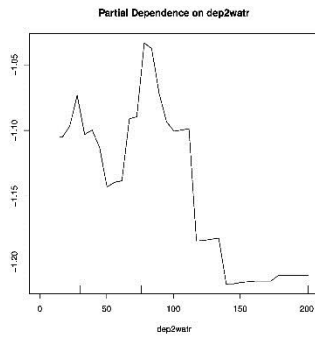
The graph below indicates the relative importance of predictors in modeling distribution for this species. “MeanDecreaseAccuracy” calculates importance by permuting (i.e., randomizing) values for the predictor and measuring the resulting decrease in model accuracy. This measure is typically a more reliable indicator of importance than “MeanDecreaseGini,” which measures improvement in a model due to splits based on the predictor. In both graphs, the further to the right the point falls on the graph, the higher the relative importance of the corresponding predictor. See Appendix 1 of this report for a detailed description of each predictor.



## Partial Plots

Partial plots show the relationship between a predictor variable and the predicted probability of occurrence, holding all other predictors at their average values. Probability values on the y-axis are unscaled; higher values on this axis indicate a higher relative probability of occurrence.

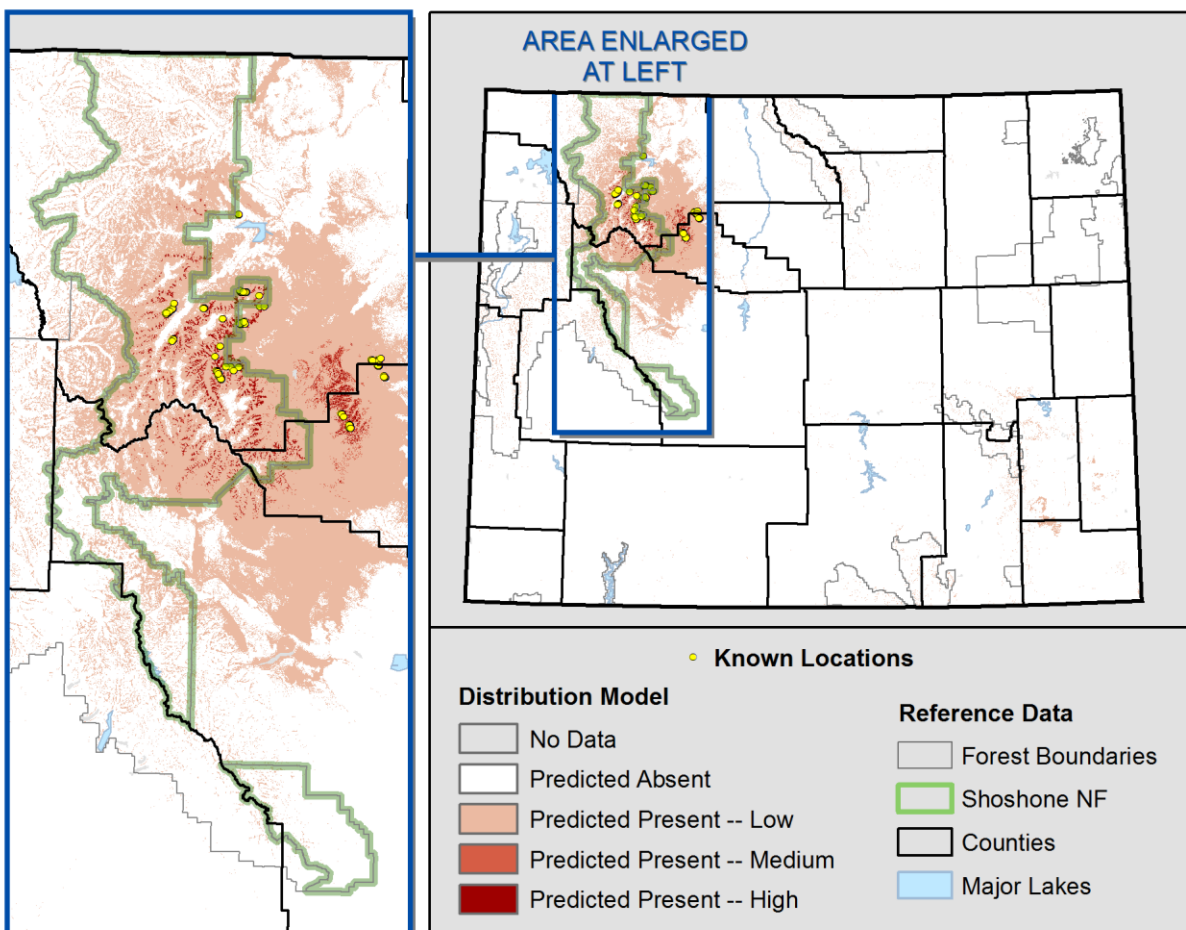






# Evert's waferparsnip (*Cymopterus evertii*)

Model version: 2016-06-22



## Model Information

- **Algorithm:** Random Forest
- **Software:** R version 3.3.0 (2016-05-03); randomForest package v. 4.6.12
- **Binary Threshold (MaxTSS):** 0.645
- **Reclassification Table for Four-Category Version:**

From	To	Becomes
0	0.304	Predicted Absent (0)
0.304	0.804	Low (1)
0.804	0.950	Medium (2)
0.950	1	High (3)

## Model Details

- **Number of Locations:** 37
- **Out-of-Bag Error:** 5.8%
- **TSS:** 83.0%
- **Kappa:** 84.2%
- **Sensitivity:** 86.1%
- **Specificity:** 96.9%

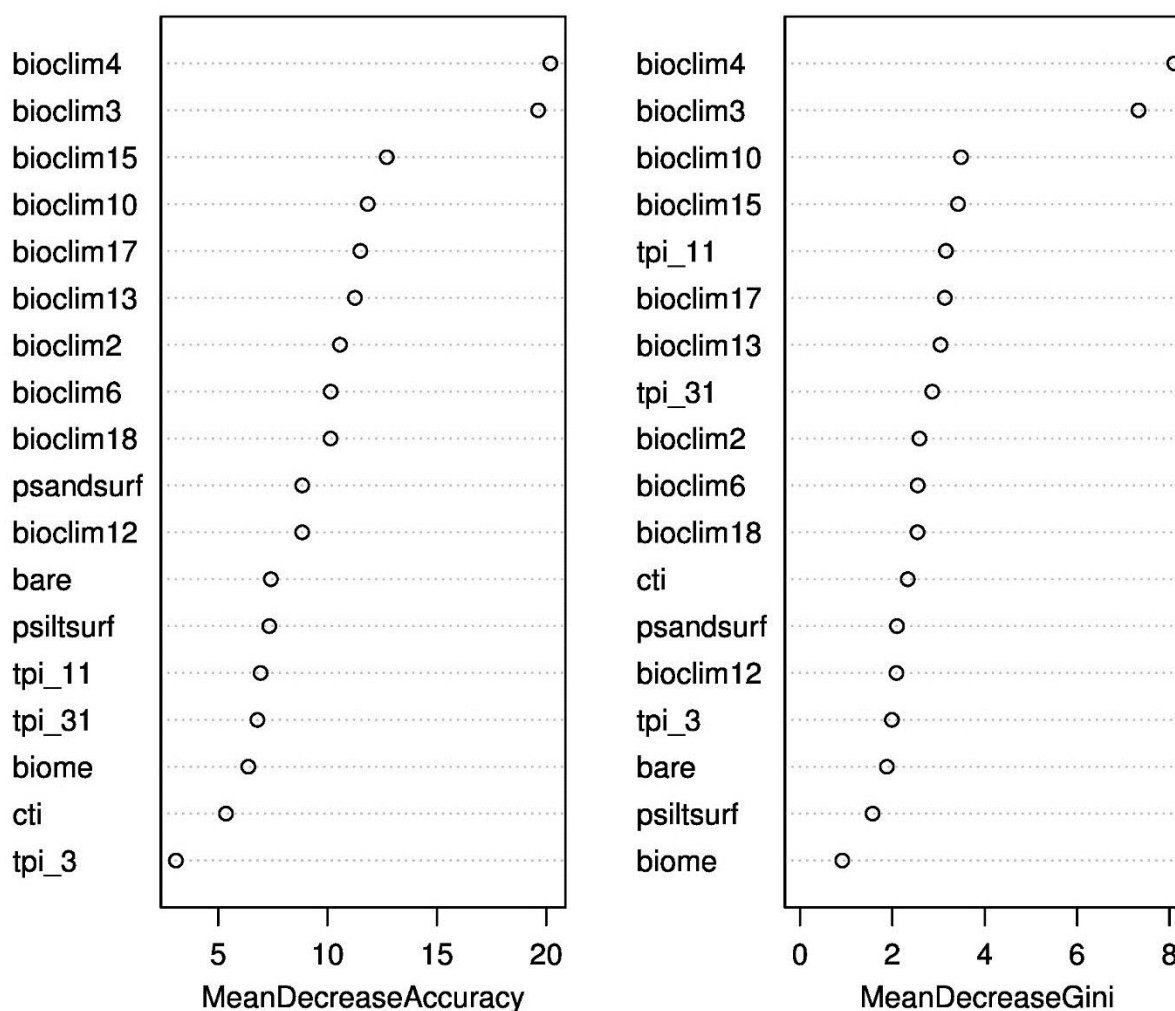
## Model Comments:

Regionally endemic plant species that are restricted to specific soil conditions are difficult to model because statewide data are coarsely mapped and categorical. The statewide soils layer was parameterized to produce layers with gradients reflecting different soil properties. This species is

primarily on volcanic soils and it is possible that addition of bedrock geology layers would constrain the mapping of large areas as low probability potential habitat. The geological complexity of settings where it does occur, and the crudeness of the surrogate layer might account for the breadth of low probability potential habitat.

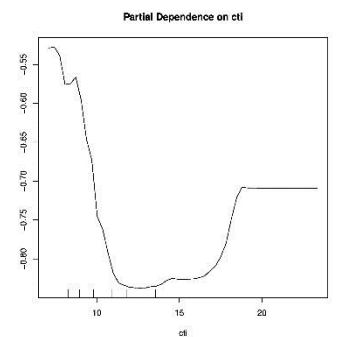
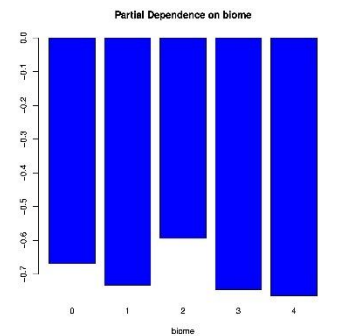
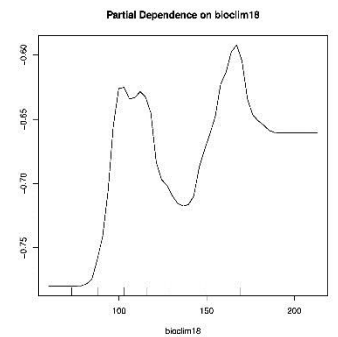
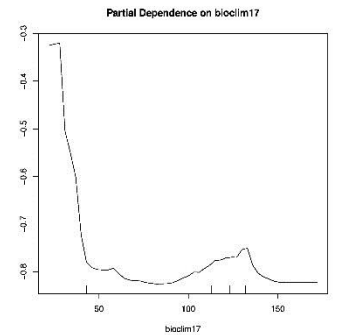
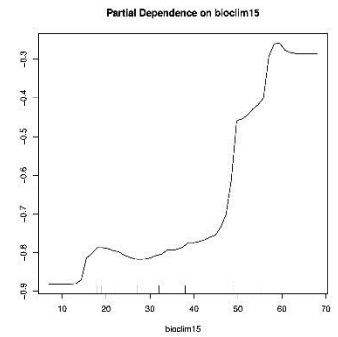
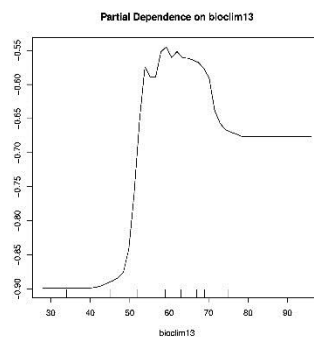
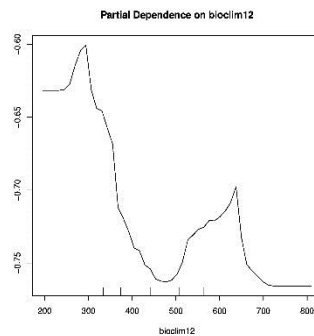
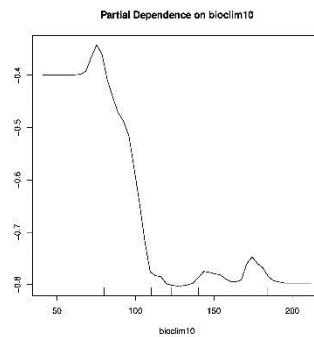
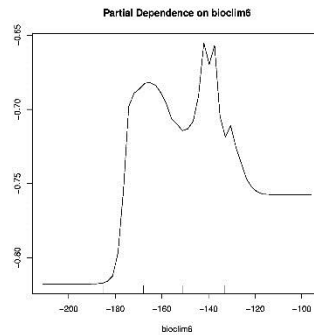
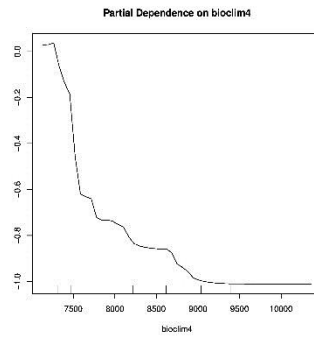
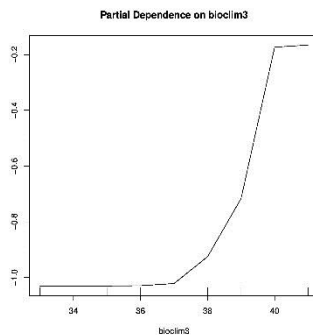
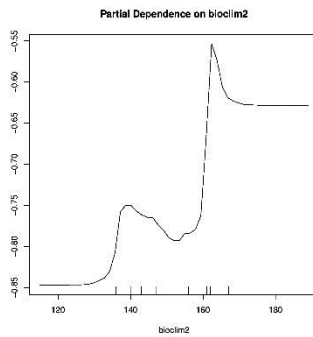
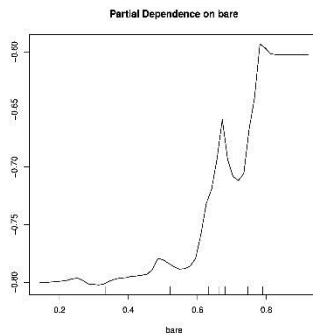
## Predictor Variable Importance:

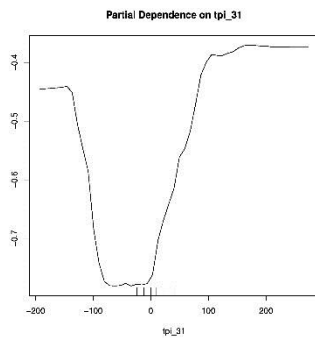
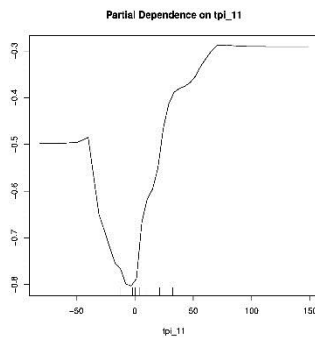
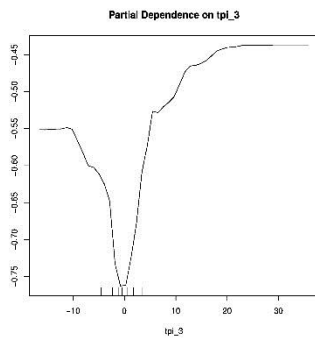
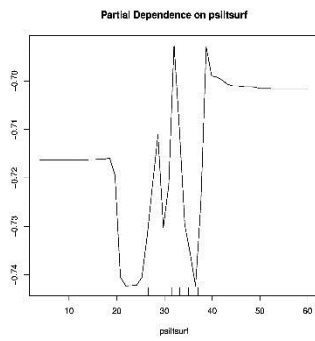
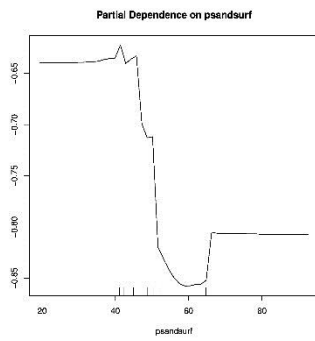
The graph below indicates the relative importance of predictors in modeling distribution for this species. “MeanDecreaseAccuracy” calculates importance by permuting (i.e., randomizing) values for the predictor and measuring the resulting decrease in model accuracy. This measure is typically a more reliable indicator of importance than “MeanDecreaseGini,” which measures improvement in a model due to splits based on the predictor. In both graphs, the further to the right the point falls on the graph, the higher the relative importance of the corresponding predictor. See Appendix 1 of this report for a detailed description of each predictor.



## Partial Plots

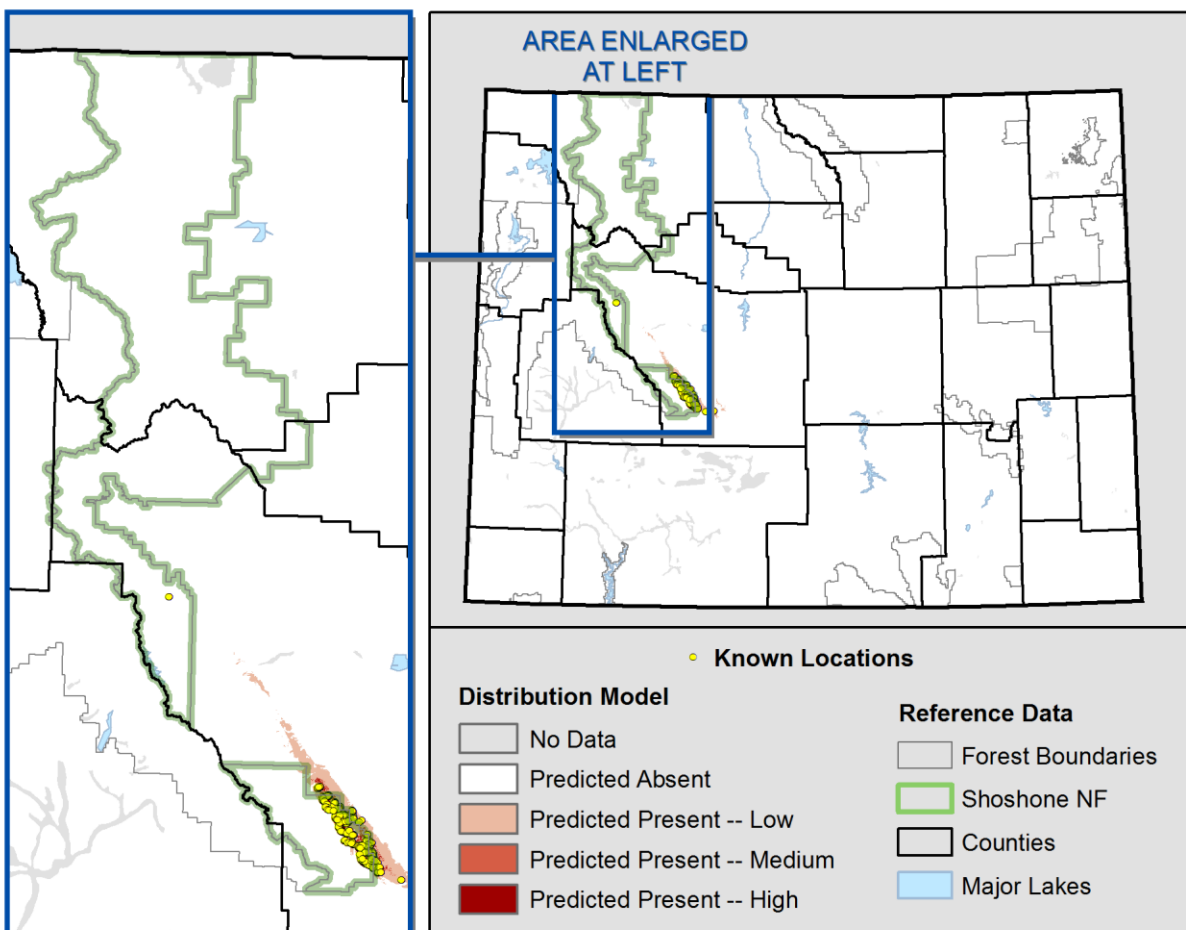
Partial plots show the relationship between a predictor variable and the predicted probability of occurrence, holding all other predictors at their average values. Probability values on the y-axis are unscaled; higher values on this axis indicate a higher relative probability of occurrence.





# Fremont bladderpod (*Lesquerella fremontii*)

Model version: 2016-06-23



## Model Information

- Algorithm:** Random Forest
- Software:** R version 3.3.0 (2016-05-03); randomForest package v. 4.6.12
- Binary Threshold (MaxTSS):** 0.633
- Reclassification Table for Four-Category Version:**

From	To	Becomes
0	0.628	Predicted Absent (0)
0.628	0.982	Low (1)
0.982	0.998	Medium (2)
0.998	1	High (3)

## Model Details

- Number of Locations:** 94
- Out-of-Bag Error:** 0.9%
- TSS:** 97.0%
- Kappa:** 97.6%
- Sensitivity:** 97.2%
- Specificity:** 99.8%

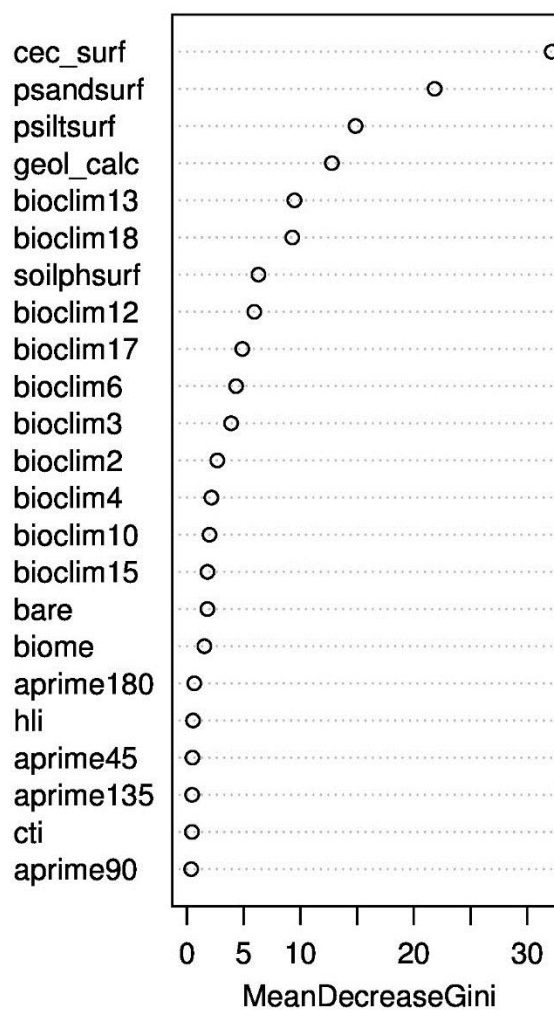
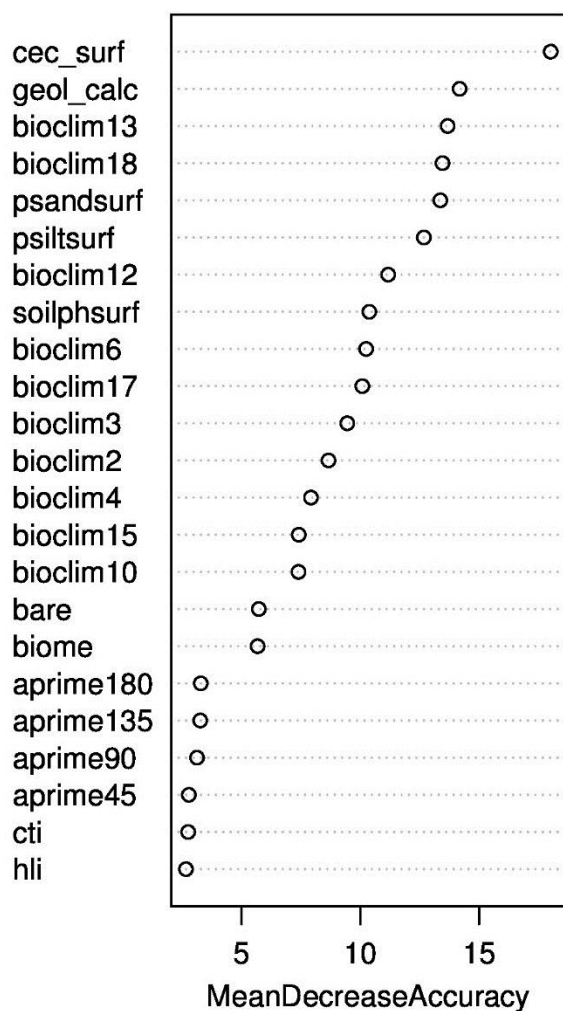
## Model Comments:

Endemic plant species that are restricted to specific soil conditions are difficult to model because statewide data are coarsely mapped and categorical. The statewide soils layer was parameterized to produce layers with gradients reflecting different soil properties. In addition, for calciphilic species such

as Fremont bladderpod, a surrogate layer was developed from bedrock geology layers to reflect calcium carbonate content.

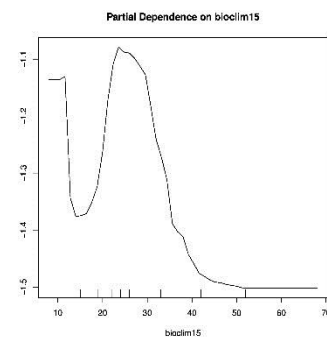
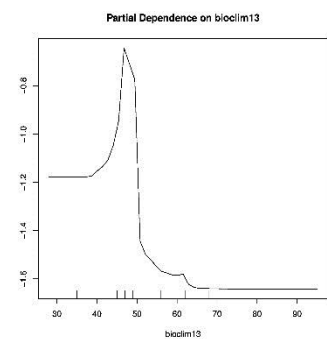
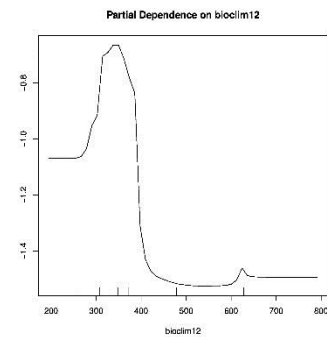
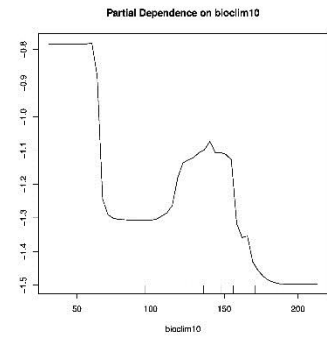
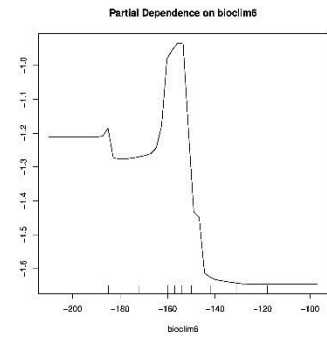
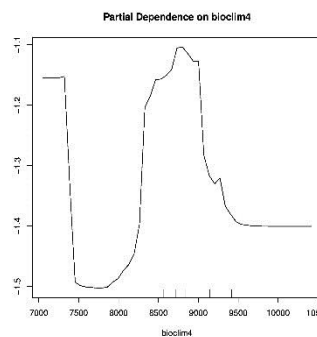
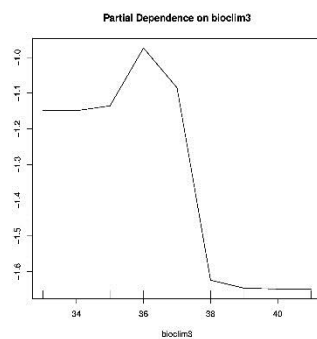
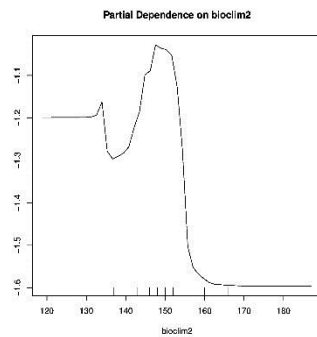
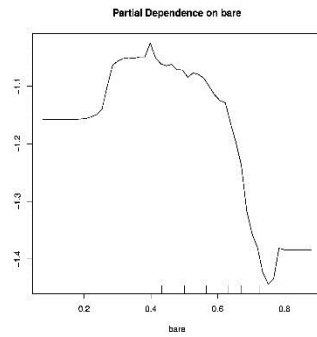
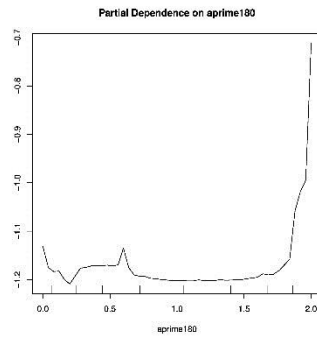
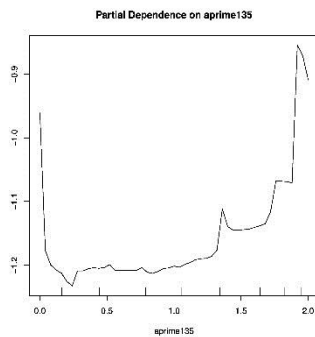
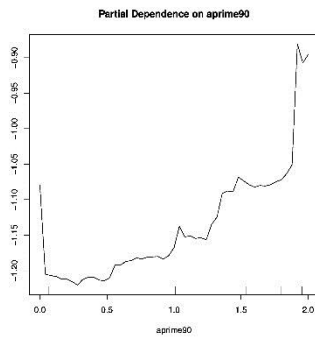
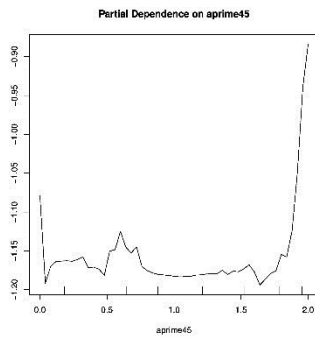
## Predictor Variable Importance:

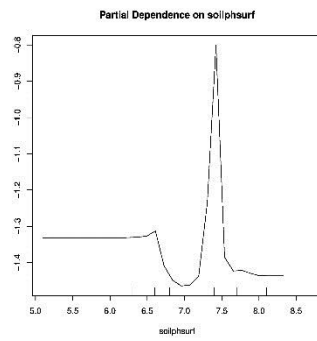
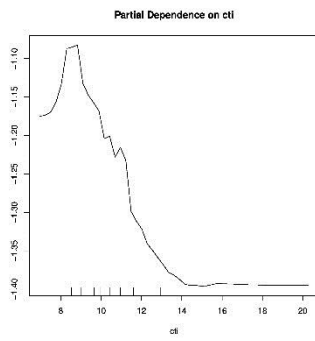
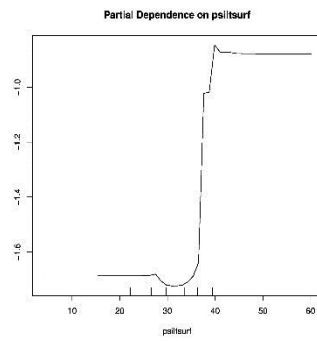
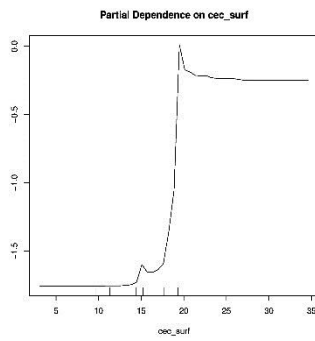
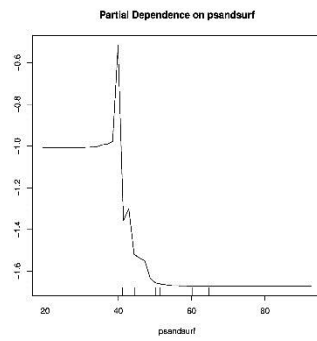
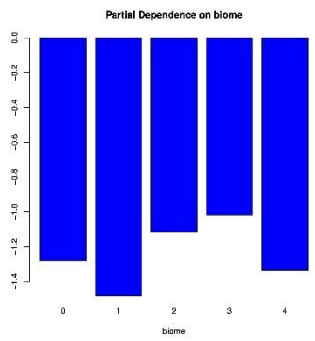
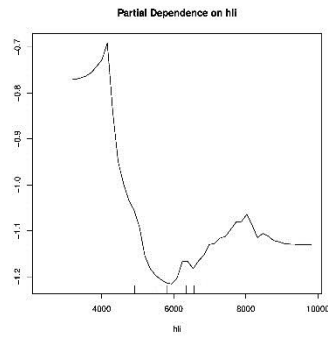
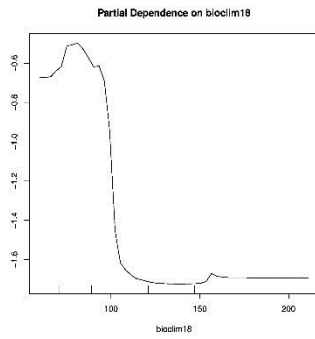
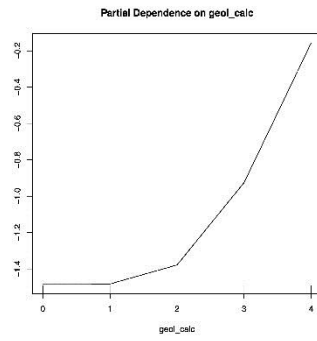
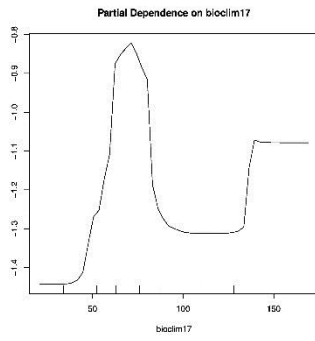
The graph below indicates the relative importance of predictors in modeling distribution for this species. “MeanDecreaseAccuracy” calculates importance by permuting (i.e., randomizing) values for the predictor and measuring the resulting decrease in model accuracy. This measure is typically a more reliable indicator of importance than “MeanDecreaseGini,” which measures improvement in a model due to splits based on the predictor. In both graphs, the further to the right the point falls on the graph, the higher the relative importance of the corresponding predictor. See Appendix 1 of this report for a detailed description of each predictor.



## Partial Plots

Partial plots show the relationship between a predictor variable and the predicted probability of occurrence, holding all other predictors at their average values. Probability values on the y-axis are unscaled; higher values on this axis indicate a higher relative probability of occurrence.

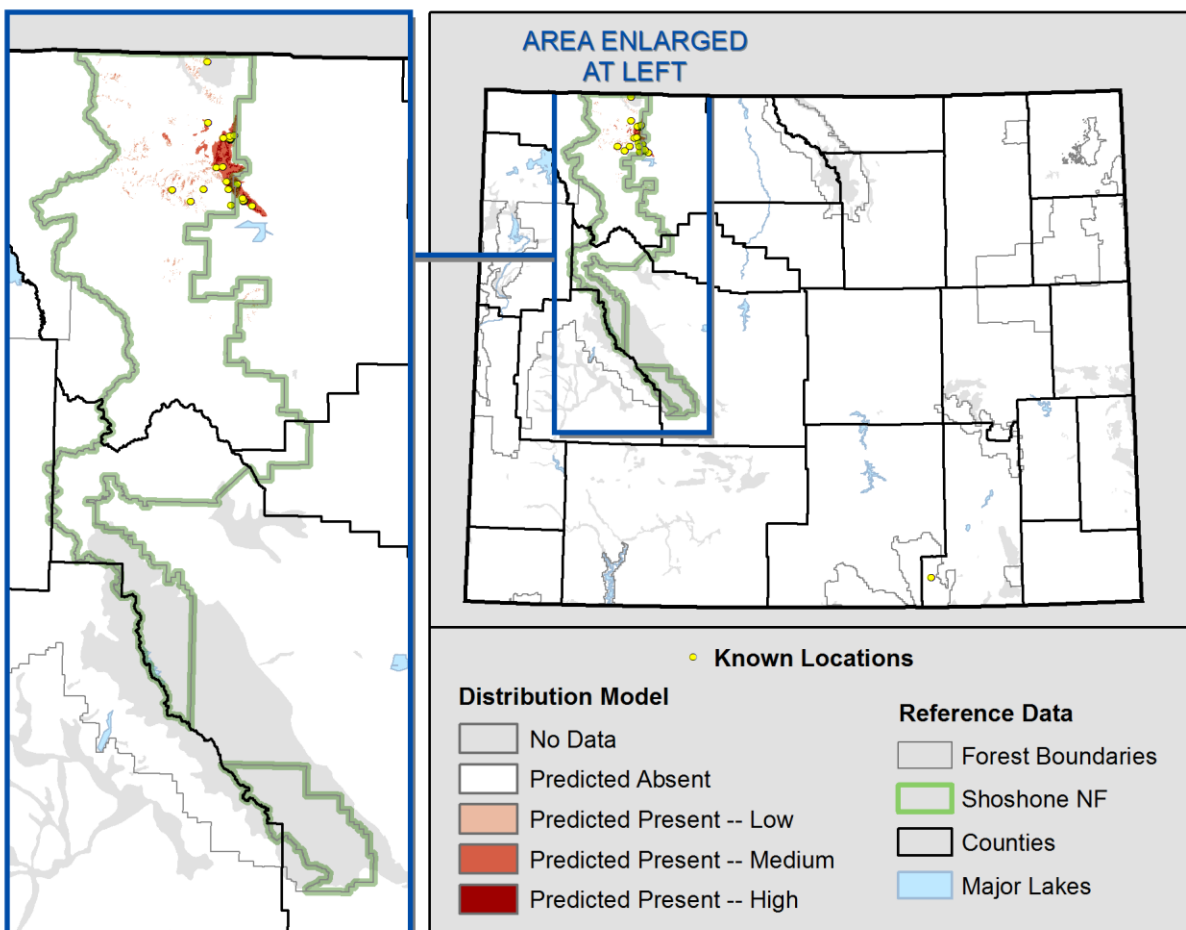






# Hall's fescue (*Festuca hallii*)

Model version: 2016-06-23



## Model Information

- Algorithm:** Random Forest
- Software:** R version 3.3.0 (2016-05-03); randomForest package v. 4.6.12
- Binary Threshold (MaxTSS):** 0.671
- Reclassification Table for Four-Category Version:**

From	To	Becomes
0	0.672	Predicted Absent (0)
0.672	0.748	Low (1)
0.748	0.960	Medium (2)
0.960	1	High (3)

## Model Details

- Number of Locations:** 19
- Out-of-Bag Error:** 12.1%
- TSS:** 63.3%
- Kappa:** 66.3%
- Sensitivity:** 69.2%
- Specificity:** 94.2%

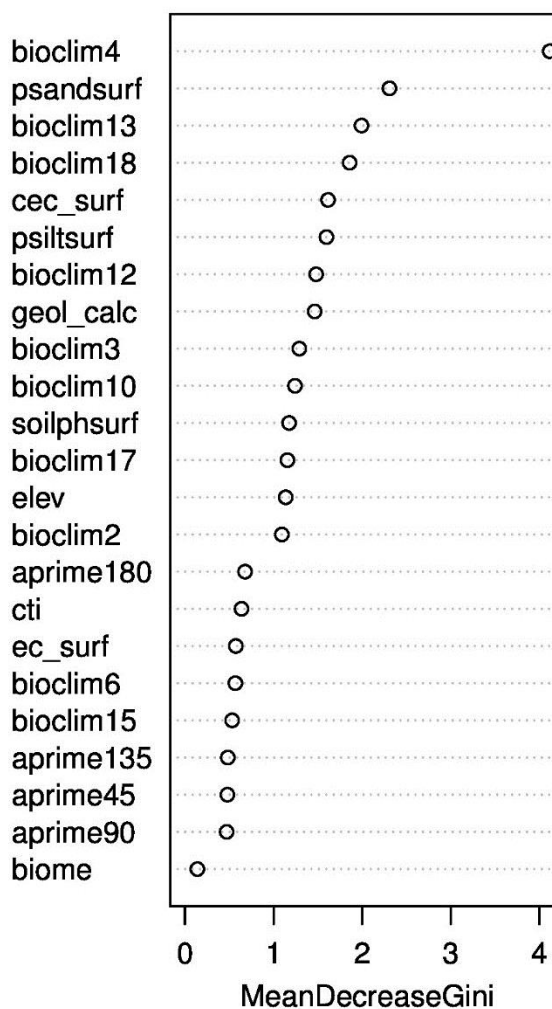
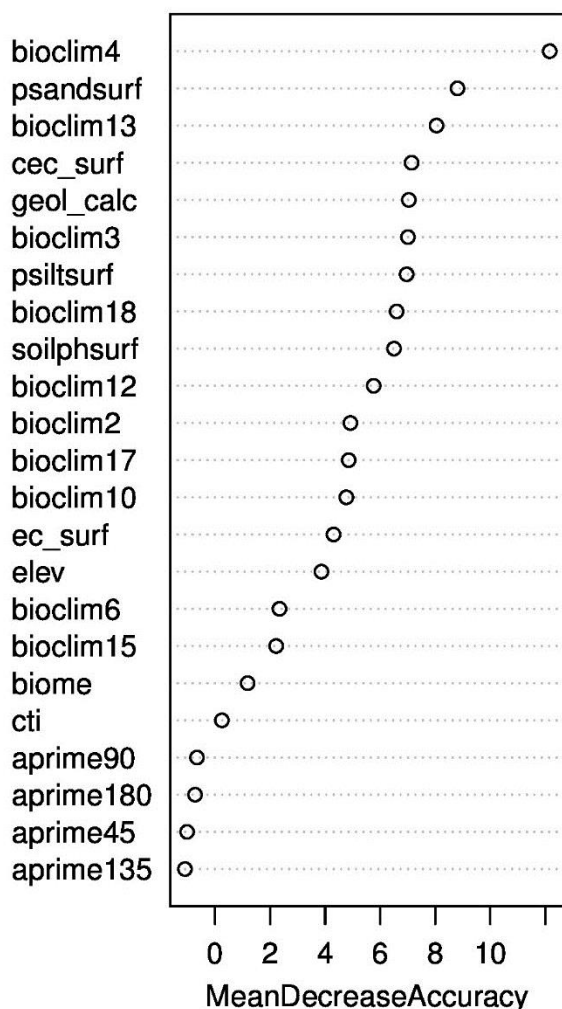
## Model Comments:

Rare plant species that are restricted to specific soil conditions are difficult to model because statewide data are coarsely mapped and categorical. The statewide soils layer was parameterized to produce layers with gradients reflecting different soil properties. In addition, for calciphilic species such as Hall's

fescue, a surrogate layer was developed from bedrock geology layers to reflect calcium carbonate content.

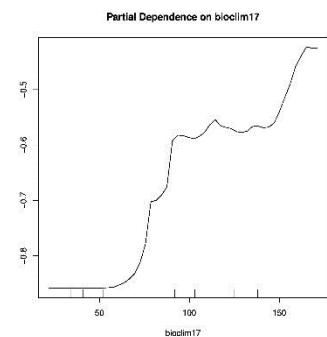
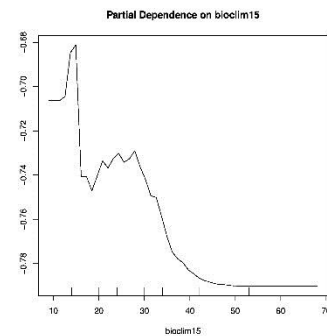
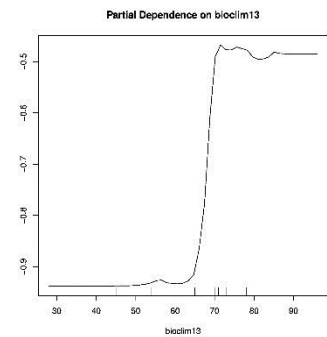
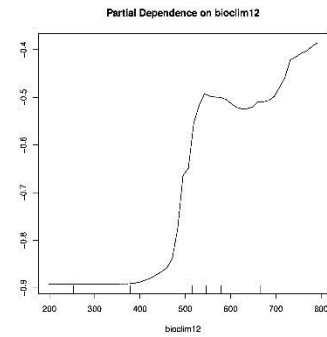
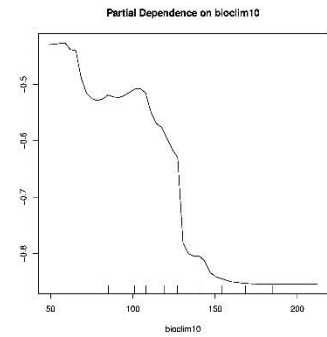
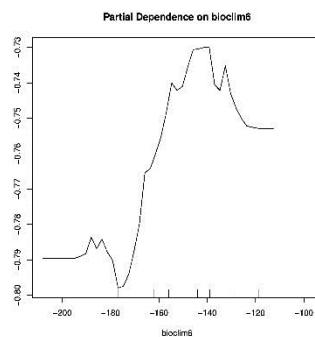
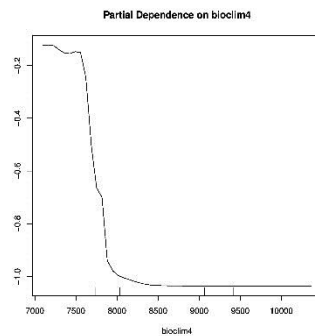
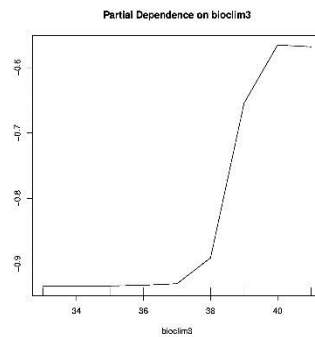
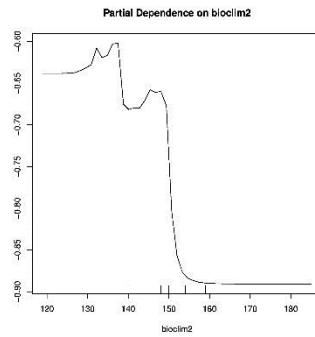
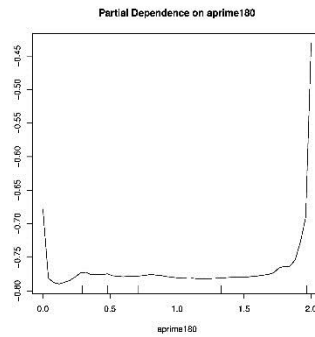
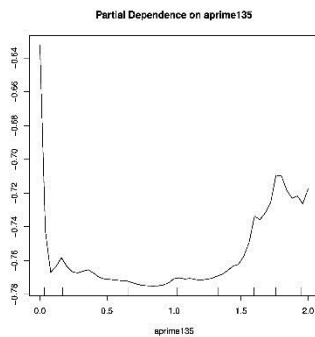
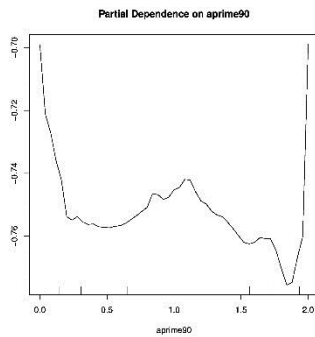
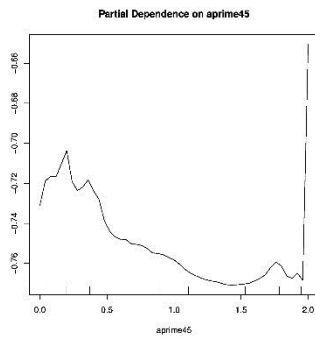
## Predictor Variable Importance:

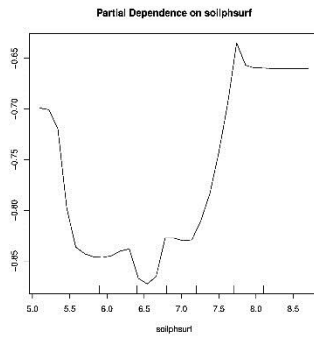
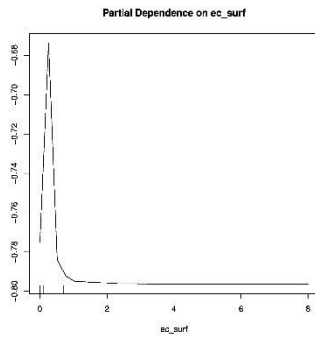
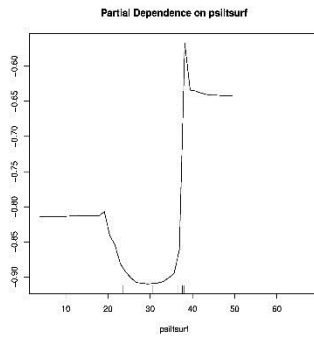
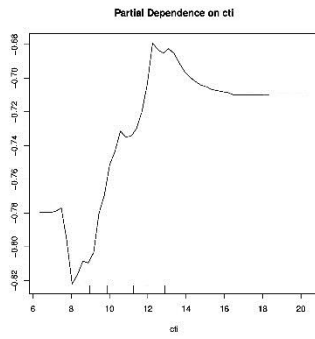
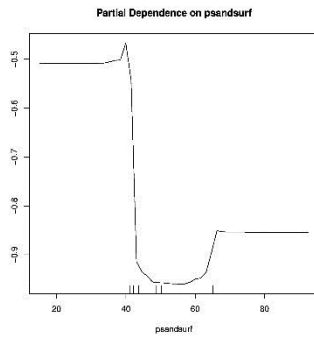
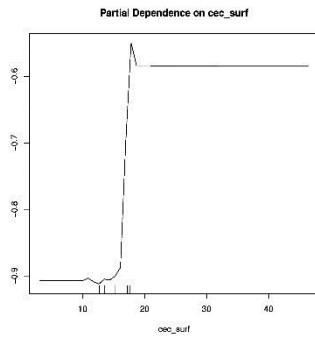
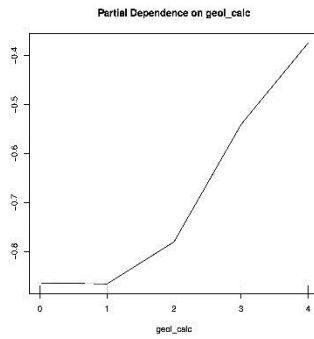
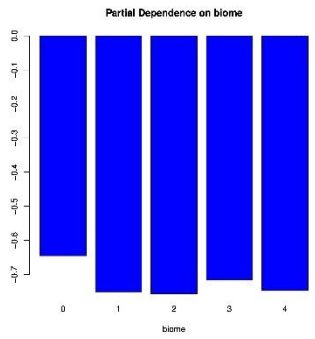
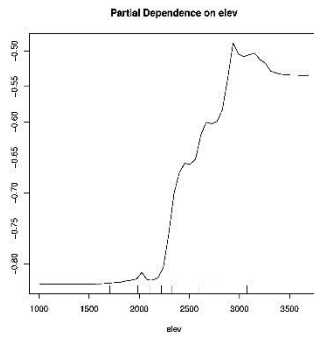
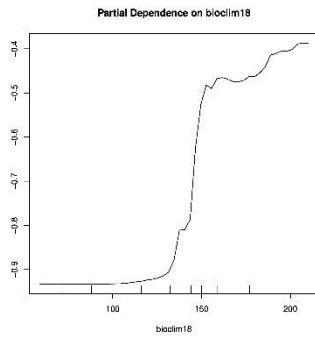
The graph below indicates the relative importance of predictors in modeling distribution for this species. “MeanDecreaseAccuracy” calculates importance by permuting (i.e., randomizing) values for the predictor and measuring the resulting decrease in model accuracy. This measure is typically a more reliable indicator of importance than “MeanDecreaseGini,” which measures improvement in a model due to splits based on the predictor. In both graphs, the further to the right the point falls on the graph, the higher the relative importance of the corresponding predictor. See Appendix 1 of this report for a detailed description of each predictor.



## Partial Plots

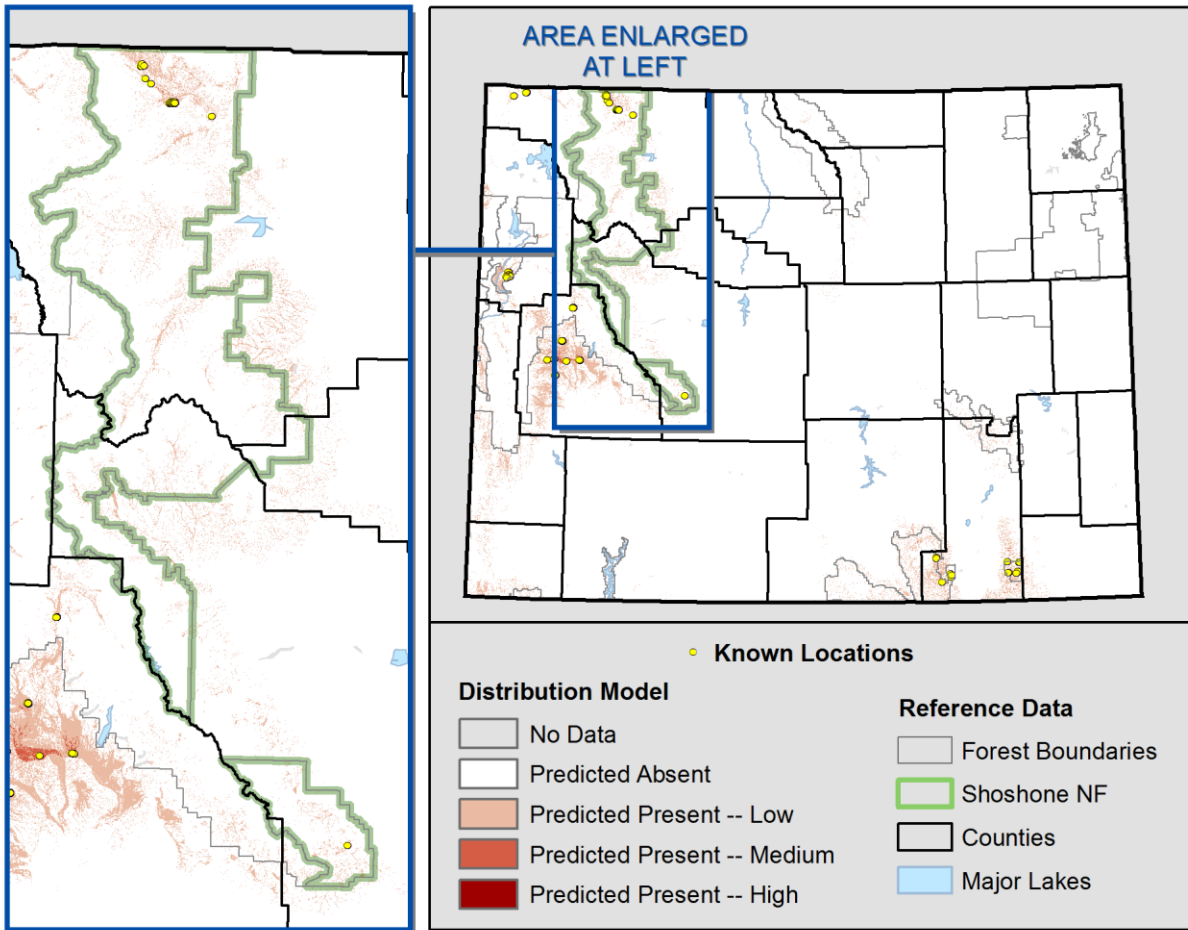
Partial plots show the relationship between a predictor variable and the predicted probability of occurrence, holding all other predictors at their average values. Probability values on the y-axis are unscaled; higher values on this axis indicate a higher relative probability of occurrence.





# Hoary willow (*Salix candida*)

Model version: 2016-06-24



## Model Information

- Algorithm:** Random Forest
- Software:** R version 3.3.0 (2016-05-03); randomForest package v. 4.6.12
- Binary Threshold (MaxTSS):** 0.562
- Reclassification Table for Four-Category Version:**

From	To	Becomes
0	0.284	Predicted Absent (0)
0.284	0.810	Low (1)
0.810	0.958	Medium (2)
0.958	1	High (3)

## Model Details

- Number of Locations:** 72
- Out-of-Bag Error:** 7.9%
- TSS:** 76.7%
- Kappa:** 78.6%
- Sensitivity:** 80.7%
- Specificity:** 96.0%

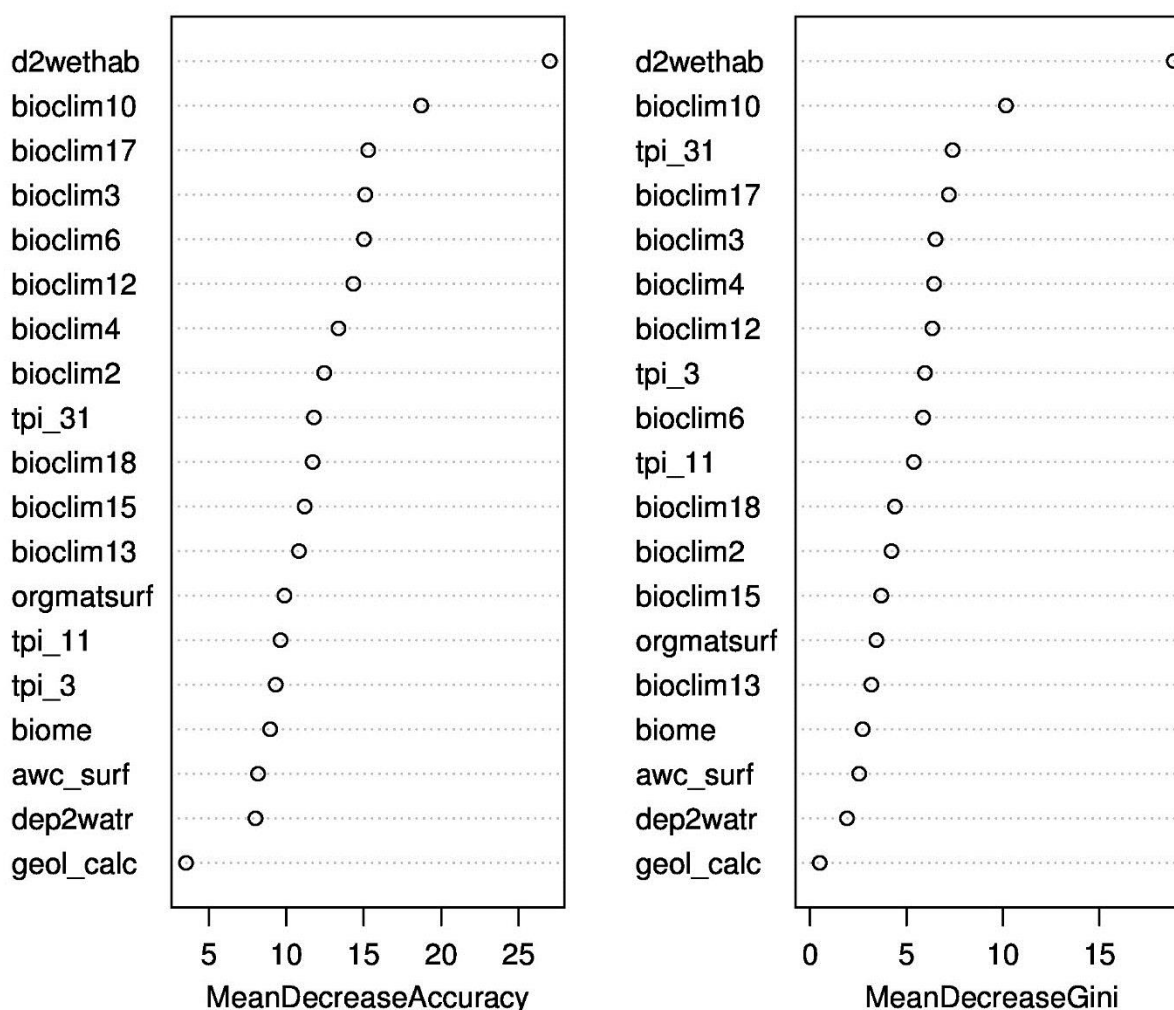
## Model Comments:

Rare wetland plant species that occupy microhabitat are difficult to model. A layer was developed that combines layers representing riverine and palustrine settings along a distance gradient. Hoary willow occupies relict habitat (organic soil accumulation) that is vestige of the geological past, beyond the

scope of modeling. It was only recently discovered in the Upper Green River Basin, a contrast with the rest of montane settings. This may contribute to an output that shows SNF potential habitat as low probability locations in a highly pixelated pattern.

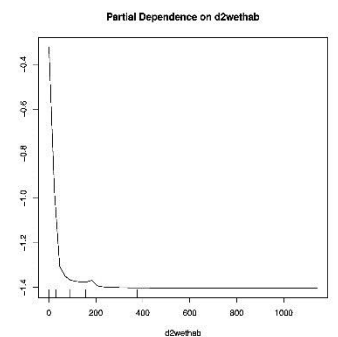
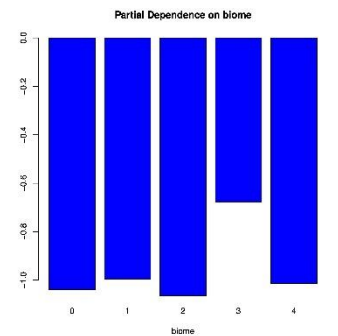
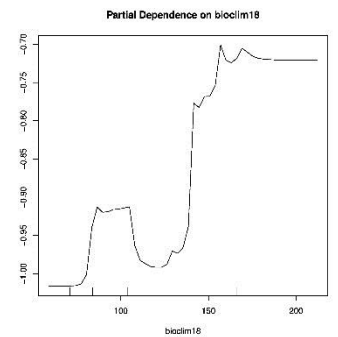
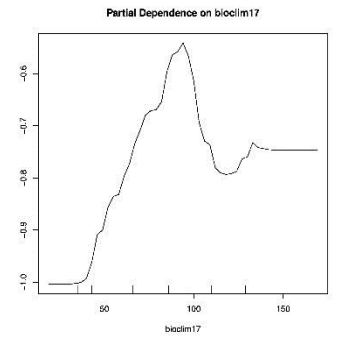
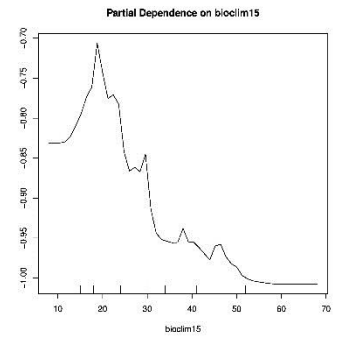
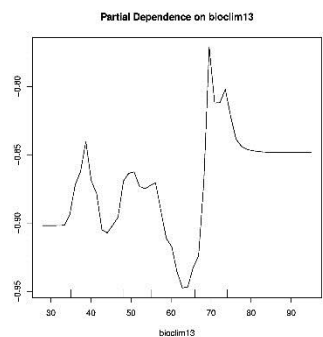
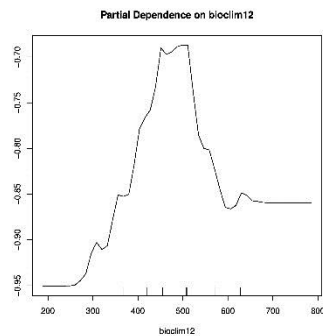
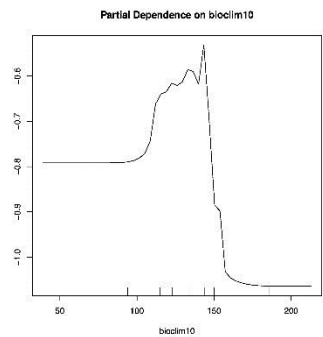
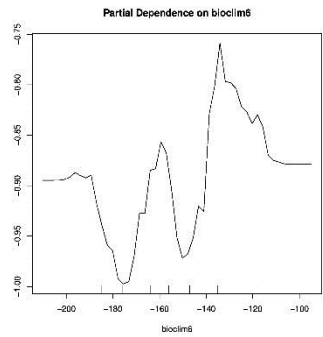
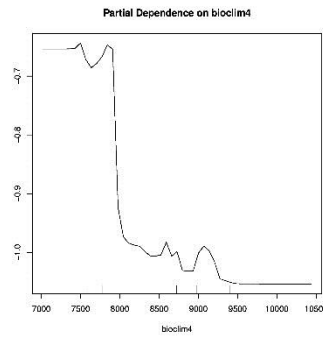
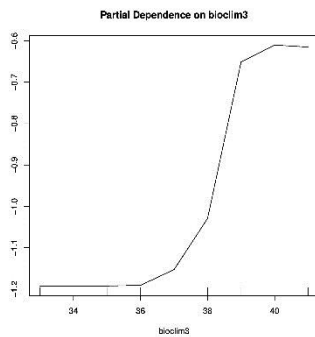
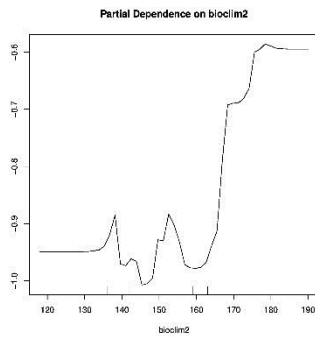
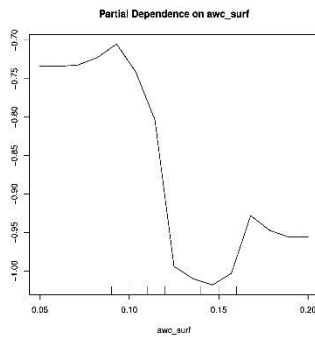
## Predictor Variable Importance:

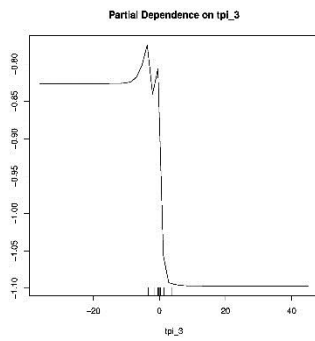
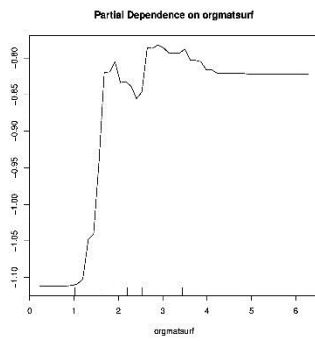
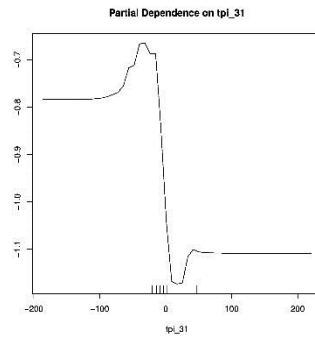
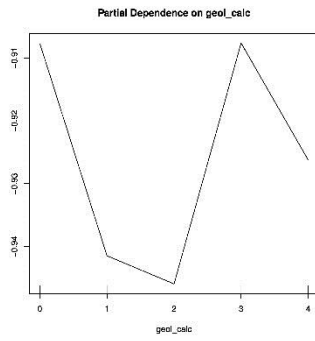
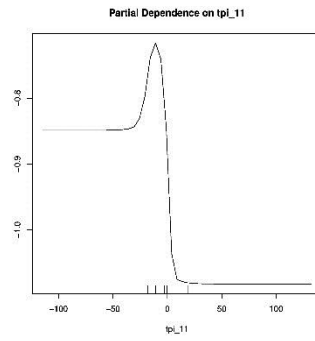
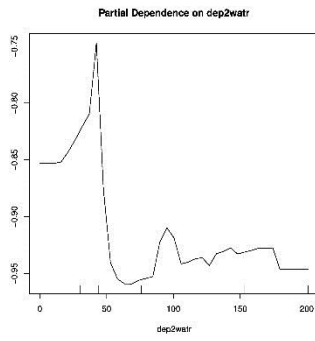
The graph below indicates the relative importance of predictors in modeling distribution for this species. “MeanDecreaseAccuracy” calculates importance by permuting (i.e., randomizing) values for the predictor and measuring the resulting decrease in model accuracy. This measure is typically a more reliable indicator of importance than “MeanDecreaseGini,” which measures improvement in a model due to splits based on the predictor. In both graphs, the further to the right the point falls on the graph, the higher the relative importance of the corresponding predictor. See Appendix 1 of this report for a detailed description of each predictor.



## Partial Plots

Partial plots show the relationship between a predictor variable and the predicted probability of occurrence, holding all other predictors at their average values. Probability values on the y-axis are unscaled; higher values on this axis indicate a higher relative probability of occurrence.

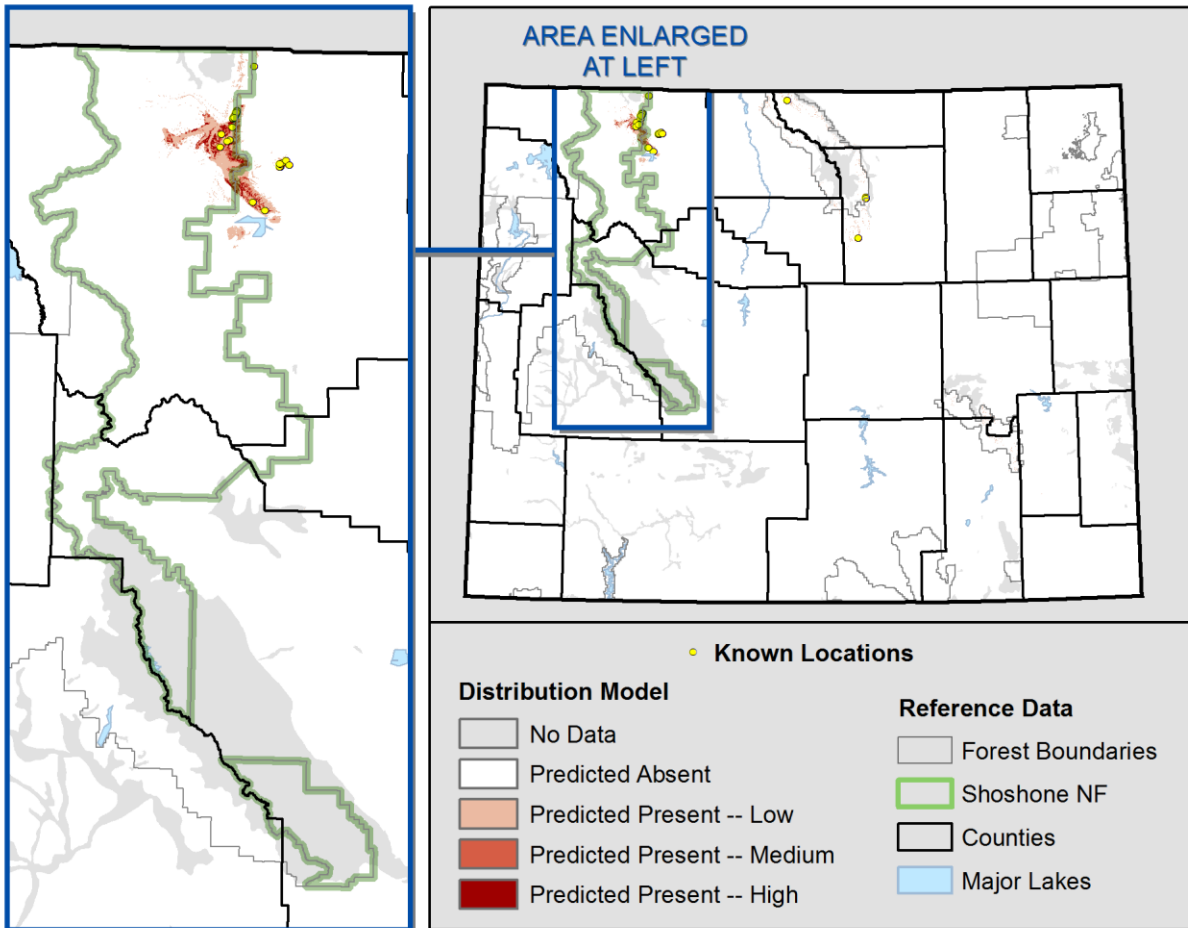






# Howard's forget-me-not (*Eritrichium howardii*)

Model version: 2016-06-23



## Model Information

- **Algorithm:** Random Forest
- **Software:** R version 3.3.0 (2016-05-03); randomForest package v. 4.6.12
- **Binary Threshold (MaxTSS):** 0.535
- **Reclassification Table for Four-Category Version:**

From	To	Becomes
0	0.554	Predicted Absent (0)
0.554	0.814	Low (1)
0.814	0.974	Medium (2)
0.974	1	High (3)

## Model Details

- **Number of Locations:** 20
- **Out-of-Bag Error:** 9.0%
- **TSS:** 70.5%
- **Kappa:** 74.6%
- **Sensitivity:** 73.8%
- **Specificity:** 96.7%

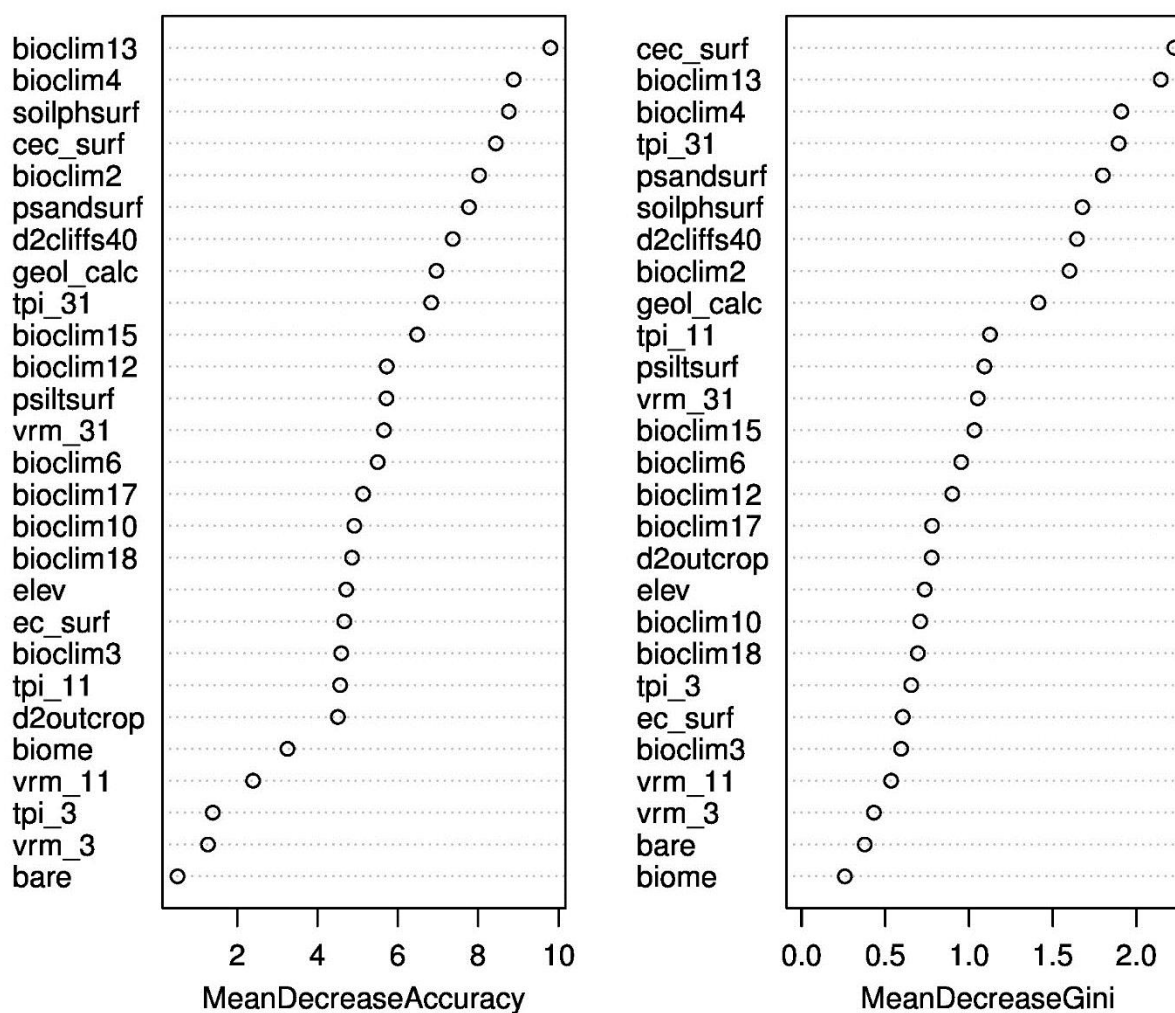
## Model Comments:

Regionally endemic plant species that are restricted to specific soil conditions are difficult to model because statewide data are coarsely mapped and categorical. The statewide soils layer was parameterized to produce layers with gradients reflecting different soil properties. In addition, for

calciphilic species such as Howard's forget-me-not, a surrogate layer was developed from bedrock geology layers to reflect calcium carbonate content. The geological complexity and crudeness of the surrogate layer might account for the breadth of low probability potential habitat.

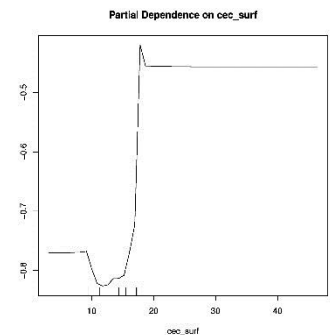
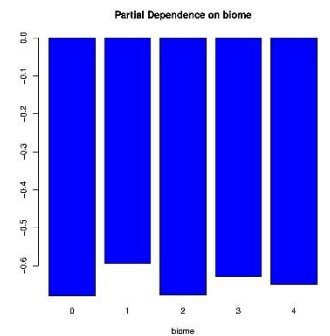
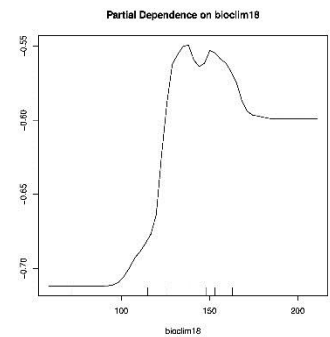
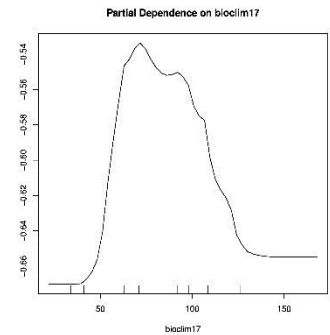
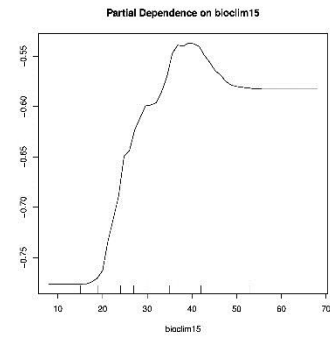
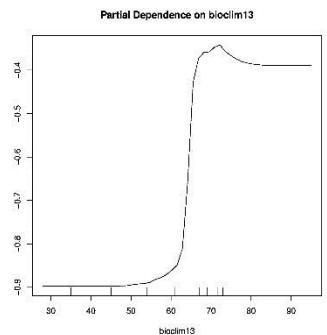
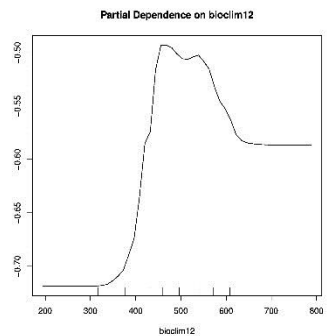
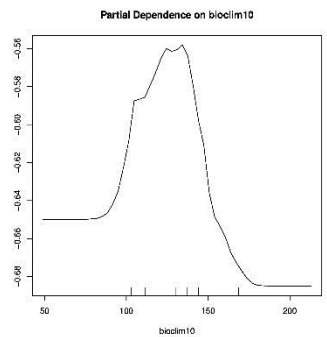
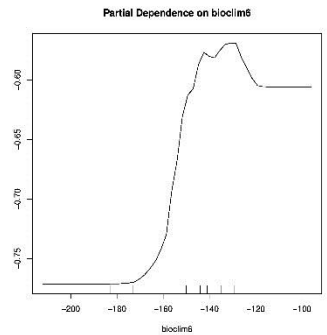
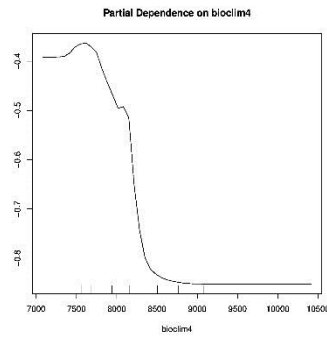
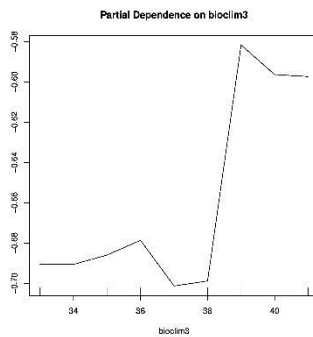
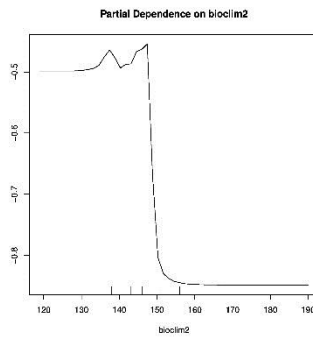
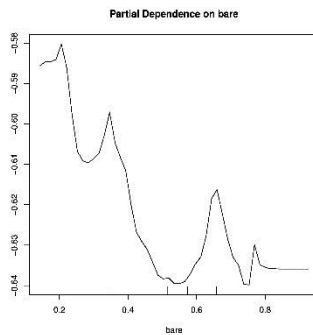
## Predictor Variable Importance:

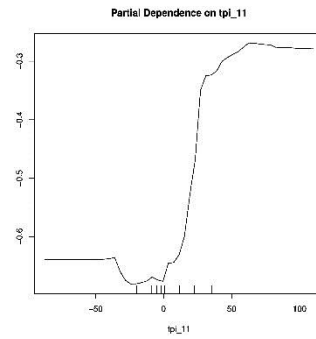
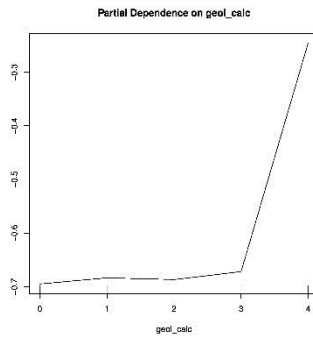
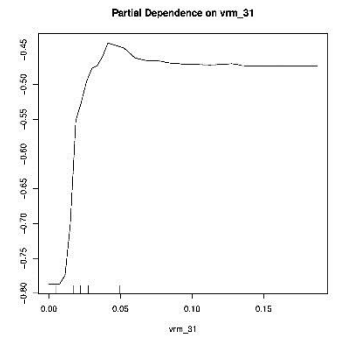
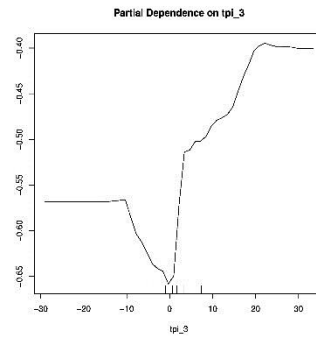
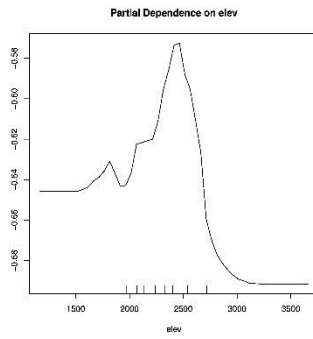
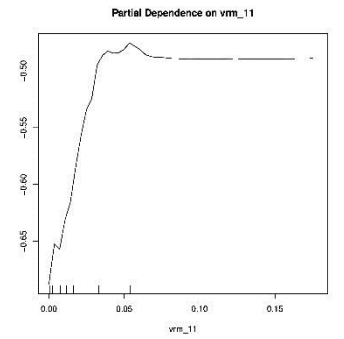
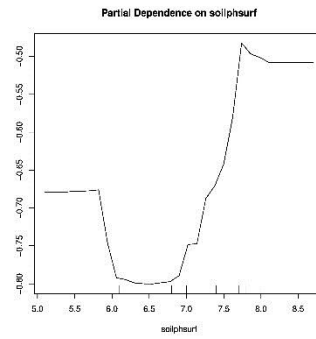
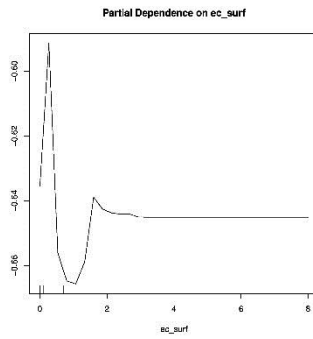
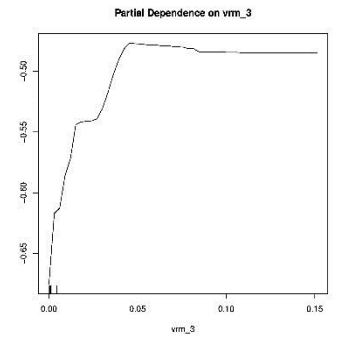
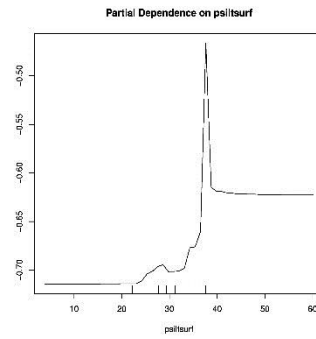
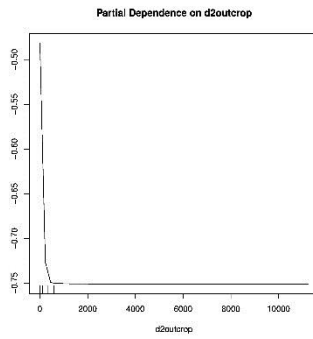
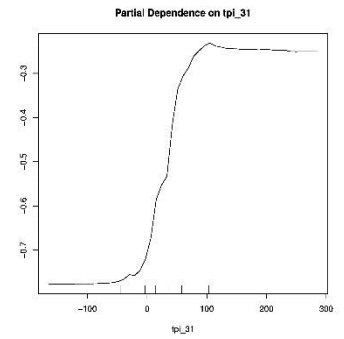
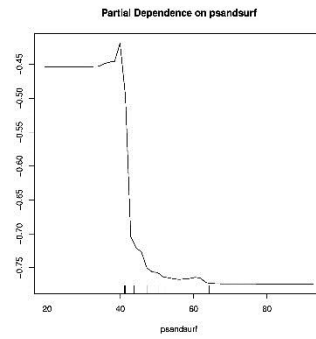
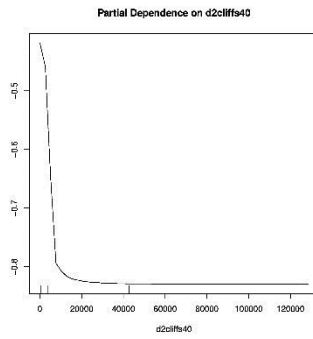
The graph below indicates the relative importance of predictors in modeling distribution for this species. “MeanDecreaseAccuracy” calculates importance by permuting (i.e., randomizing) values for the predictor and measuring the resulting decrease in model accuracy. This measure is typically a more reliable indicator of importance than “MeanDecreaseGini,” which measures improvement in a model due to splits based on the predictor. In both graphs, the further to the right the point falls on the graph, the higher the relative importance of the corresponding predictor. See Appendix 1 of this report for a detailed description of each predictor.



## Partial Plots

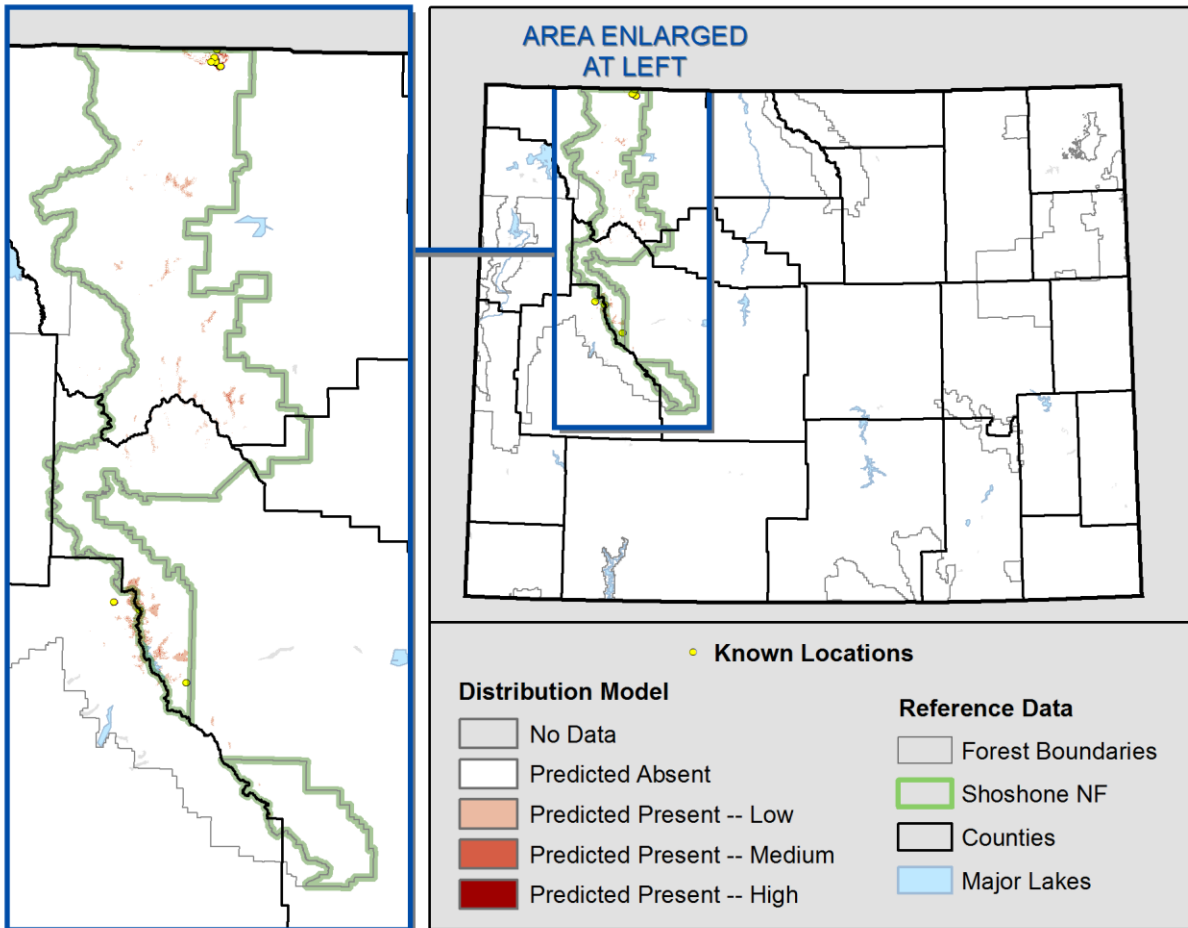
Partial plots show the relationship between a predictor variable and the predicted probability of occurrence, holding all other predictors at their average values. Probability values on the y-axis are unscaled; higher values on this axis indicate a higher relative probability of occurrence.





# Ice grass (*Phippsia algida*)

Model version: 2016-06-24



## Model Information

- **Algorithm:** Random Forest
- **Software:** R version 3.3.0 (2016-05-03); randomForest package v. 4.6.12
- **Binary Threshold (MaxTSS):** 0.771
- **Reclassification Table for Four-Category Version:**

From	To	Becomes
0	0.772	Predicted Absent (0)
0.772	0.856	Low (1)
0.856	0.918	Medium (2)
0.918	1	High (3)

## Model Details

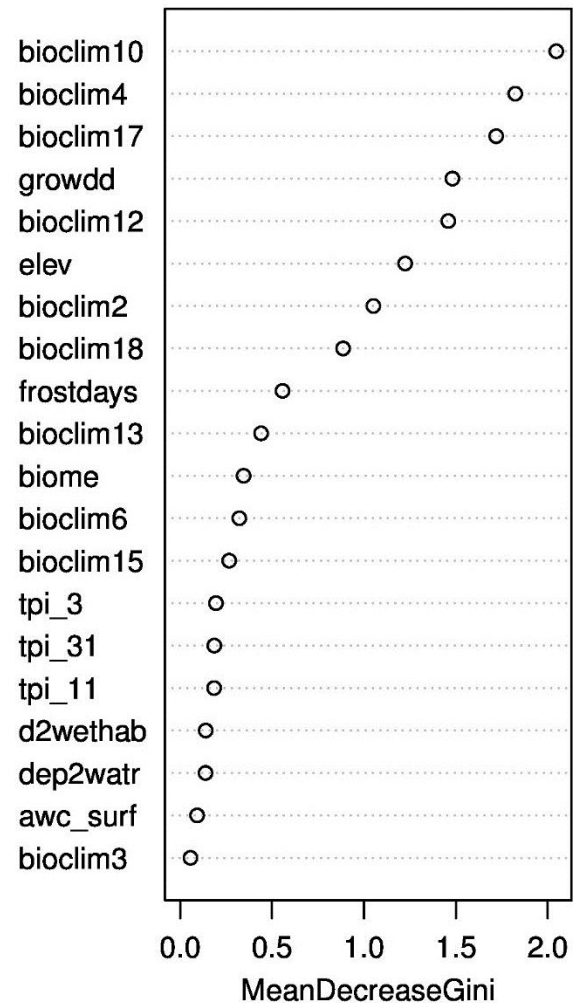
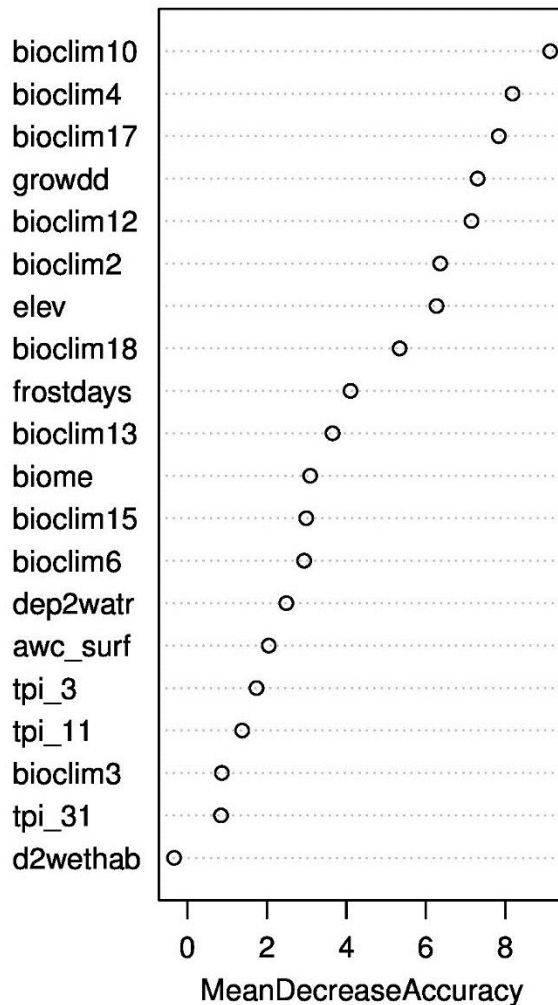
- **Number of Locations:** 10
- **Out-of-Bag Error:** 7.4%
- **TSS:** 82.8%
- **Kappa:** 80.8%
- **Sensitivity:** 88.9%
- **Specificity:** 93.9%

## Model Comments:

Rare alpine plant species that are restricted to narrow seep and snowmelt zones are difficult to model because statewide data are coarsely mapped and categorical. We tried using aspect and topography as indications of snow accumulation to refine the model, but the trial was rejected.

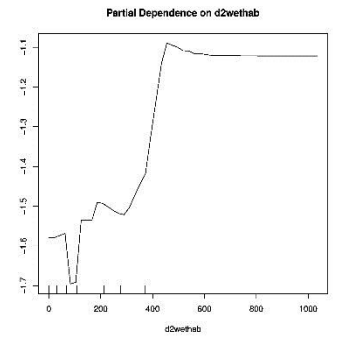
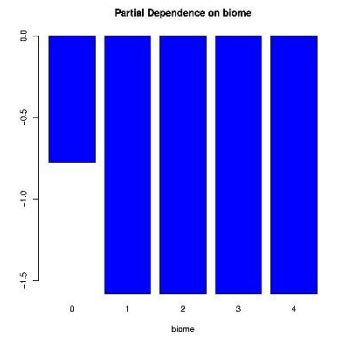
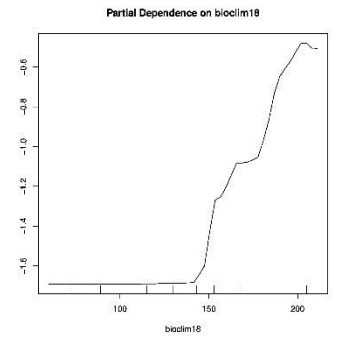
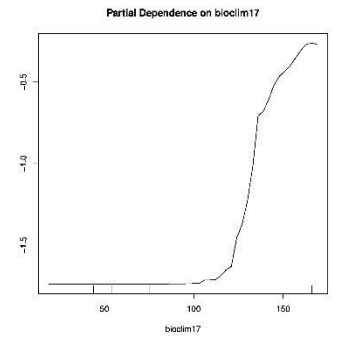
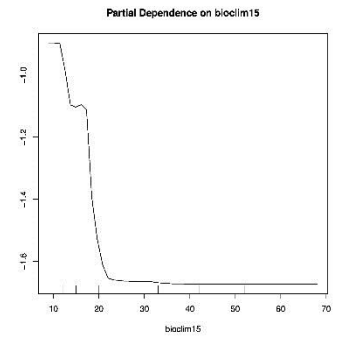
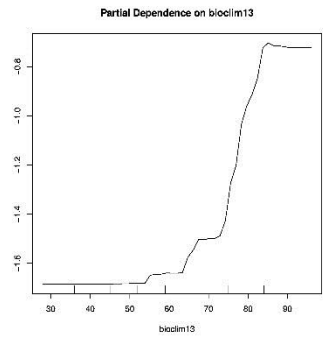
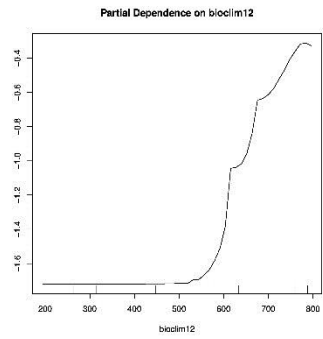
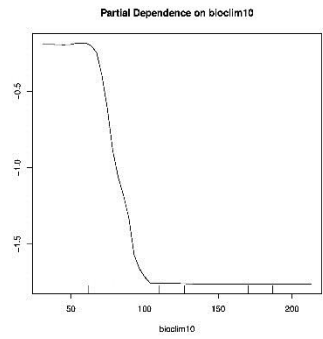
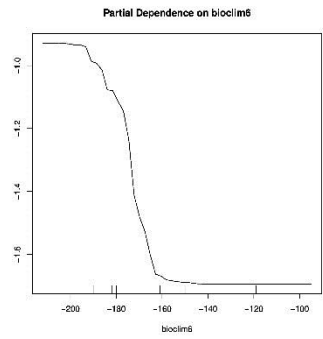
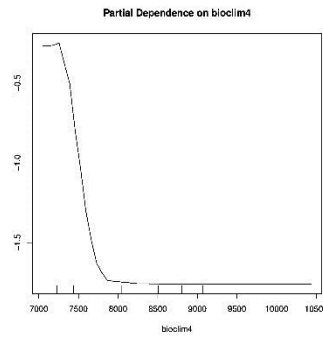
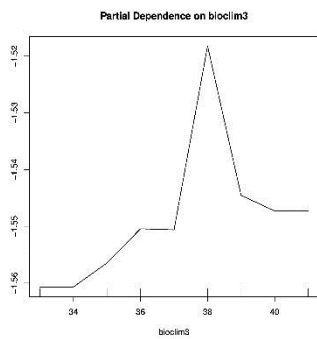
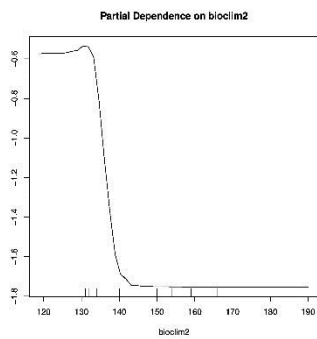
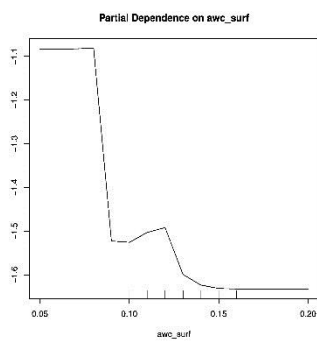
## Predictor Variable Importance:

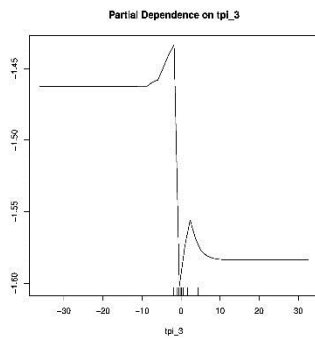
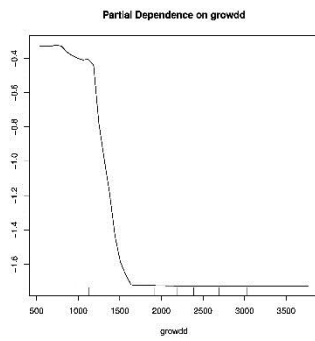
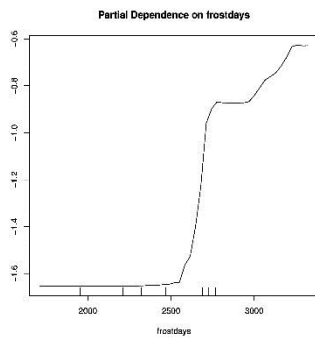
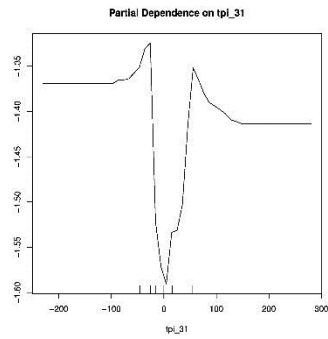
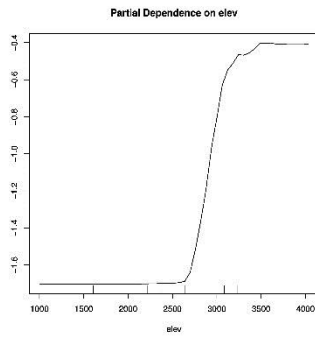
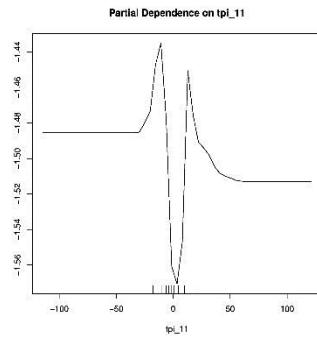
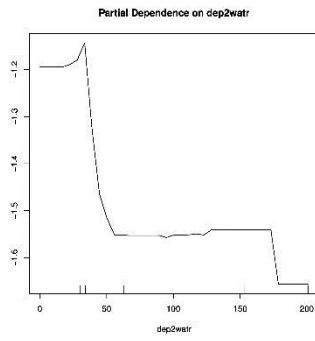
The graph below indicates the relative importance of predictors in modeling distribution for this species. “MeanDecreaseAccuracy” calculates importance by permuting (i.e., randomizing) values for the predictor and measuring the resulting decrease in model accuracy. This measure is typically a more reliable indicator of importance than “MeanDecreaseGini,” which measures improvement in a model due to splits based on the predictor. In both graphs, the further to the right the point falls on the graph, the higher the relative importance of the corresponding predictor. See Appendix 1 of this report for a detailed description of each predictor.



## Partial Plots

Partial plots show the relationship between a predictor variable and the predicted probability of occurrence, holding all other predictors at their average values. Probability values on the y-axis are unscaled; higher values on this axis indicate a higher relative probability of occurrence.

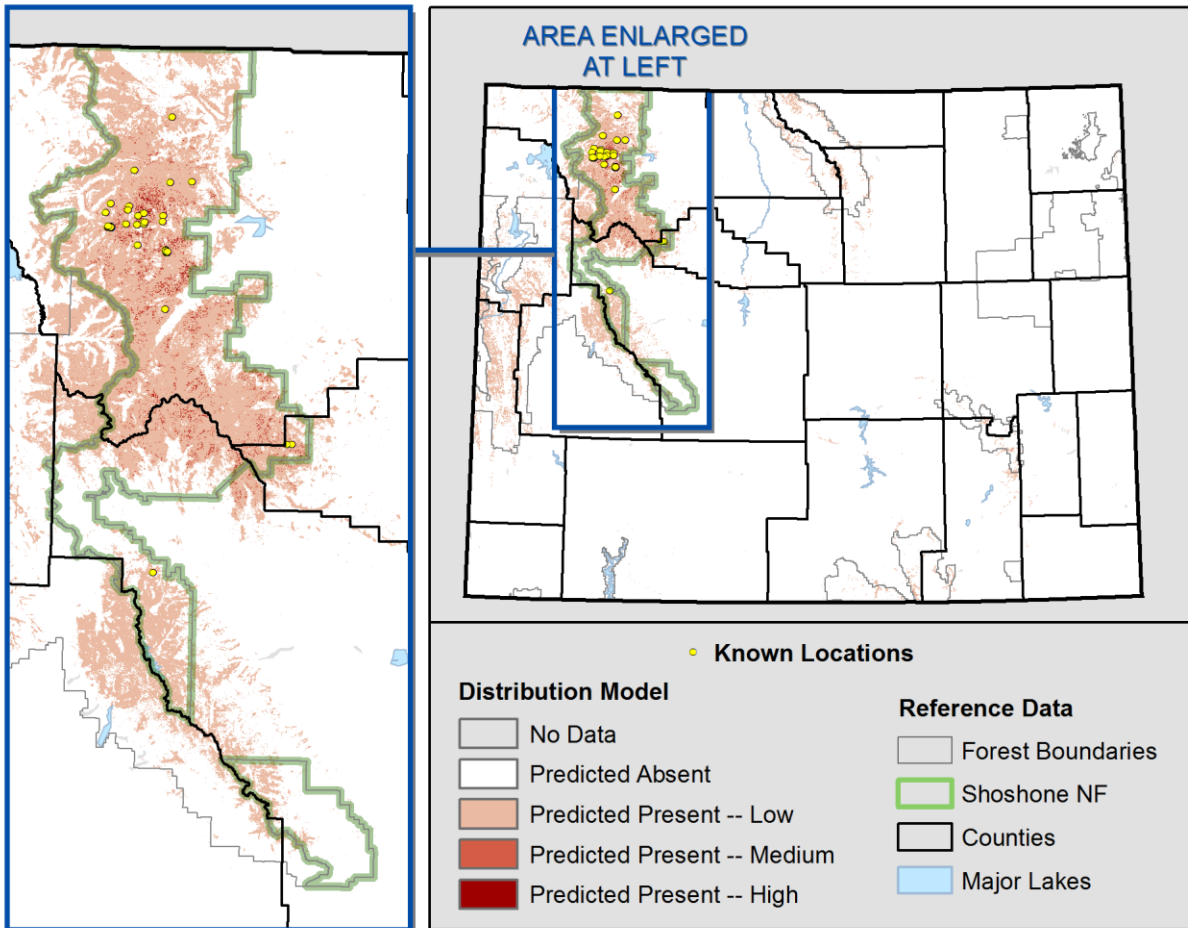






# Kirkpatrick's ipomopsis (*Ipomopsis spicata* var. *robruthii*)

Model version: 2016-06-23



## Model Information

- **Algorithm:** Random Forest
- **Software:** R version 3.3.0 (2016-05-03); randomForest package v. 4.6.12
- **Binary Threshold (MaxTSS):** 0.636
- **Reclassification Table for Four-Category Version:**

From	To	Becomes
0	0.338	Predicted Absent (0)
0.338	0.808	Low (1)
0.808	0.884	Medium (2)
0.884	1	High (3)

## Model Details

- **Number of Locations:** 26
- **Out-of-Bag Error:** 12.7%
- **TSS:** 67.0%
- **Kappa:** 66.5%
- **Sensitivity:** 75.9%
- **Specificity:** 91.1%

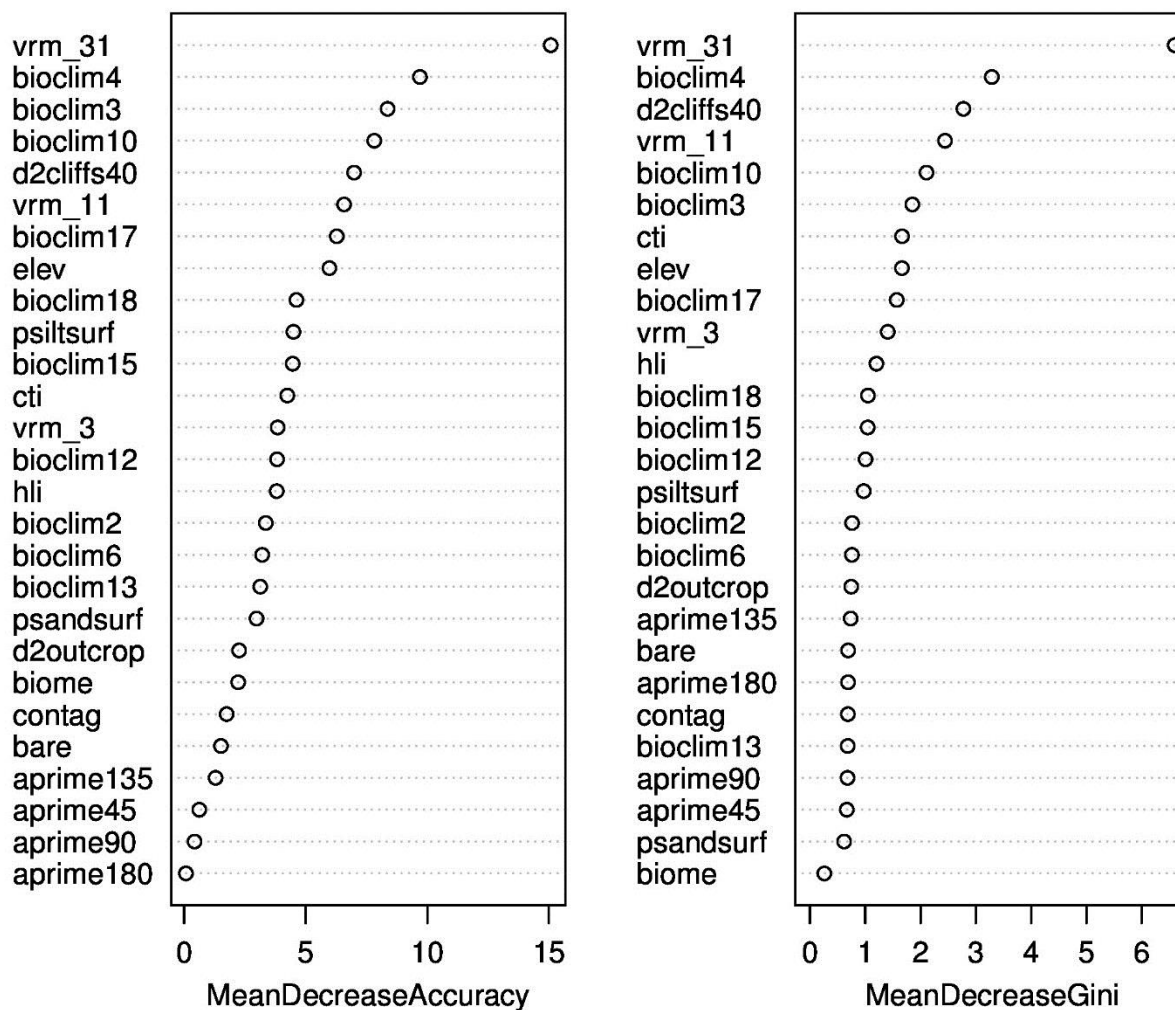
## Model Comments:

Endemic plant species that are restricted to specific soil conditions are difficult to model because statewide data are coarsely mapped and categorical. The statewide soils layer was parameterized to produce layers with gradients reflecting different soil properties. The difficulty is compounded when

there are questions about the positive data. There is only one report of the species in the Wind River Range and data that became available in 2016 suggests that it may be misidentified. This remains to be resolved and the models had already been run using positive data from the Wind River Range. The geological complexity of the settings where it occurs and the crudeness of the surrogate layer might further account for the breadth of low probability potential habitat.

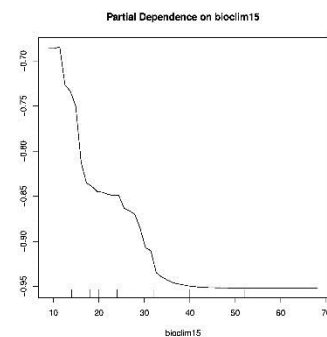
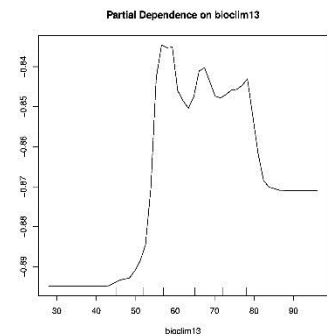
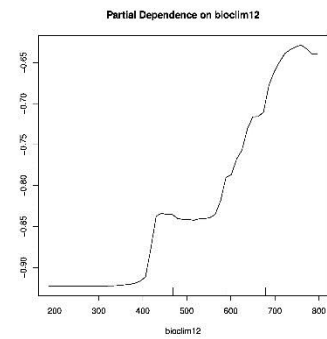
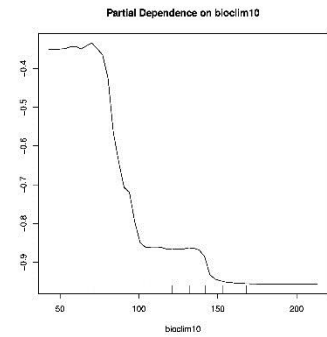
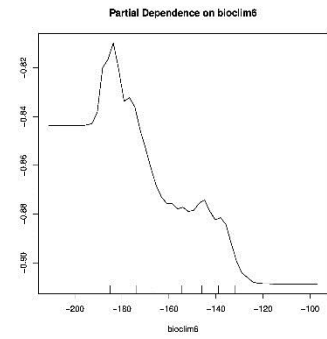
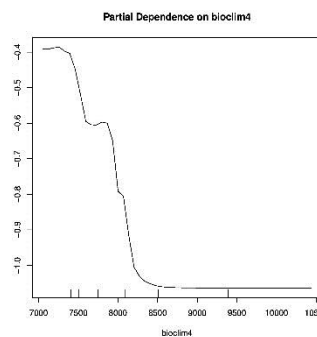
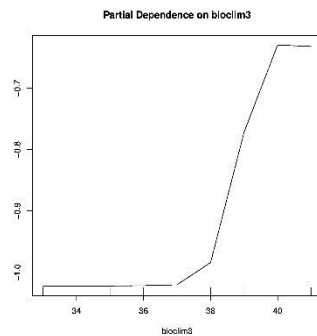
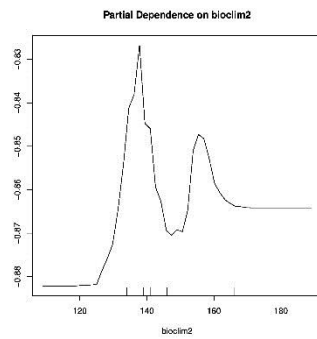
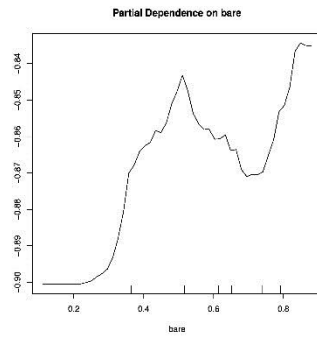
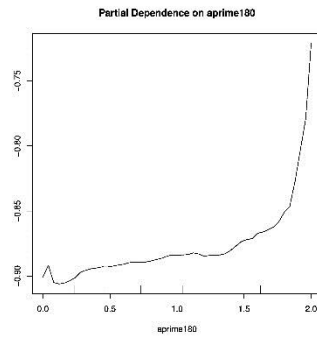
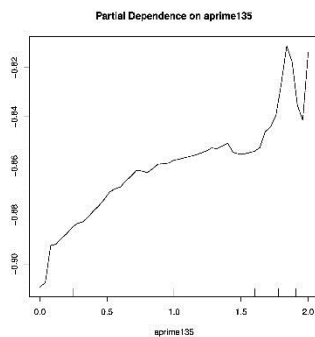
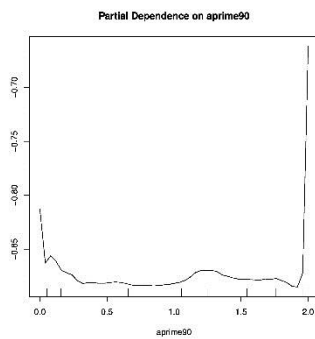
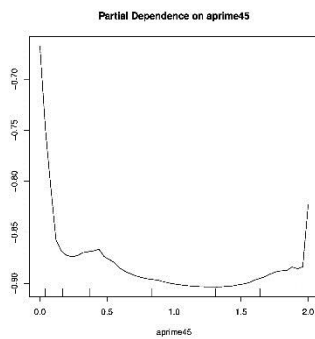
## Predictor Variable Importance:

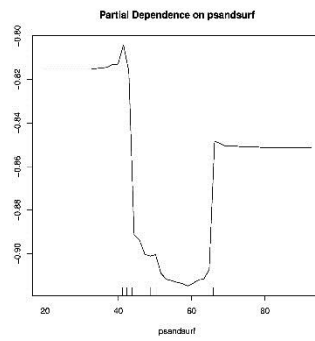
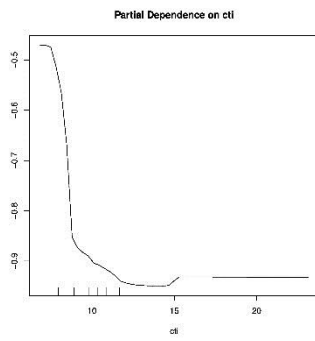
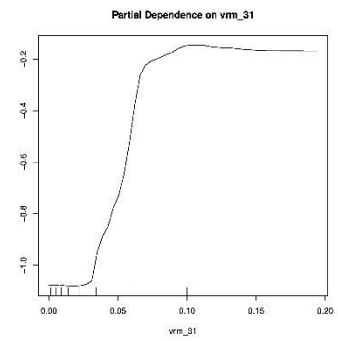
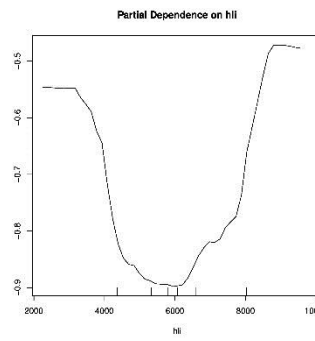
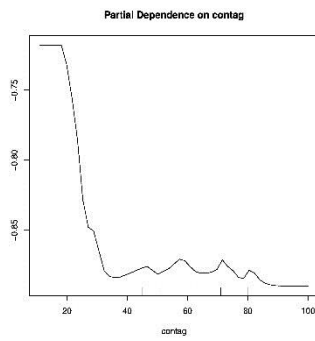
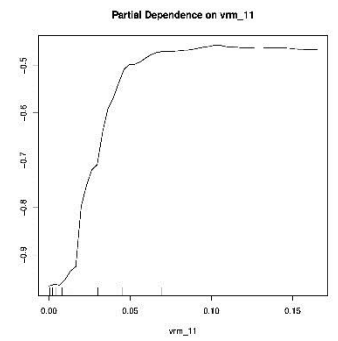
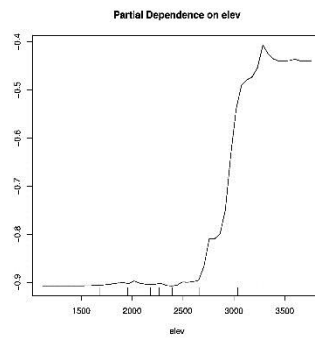
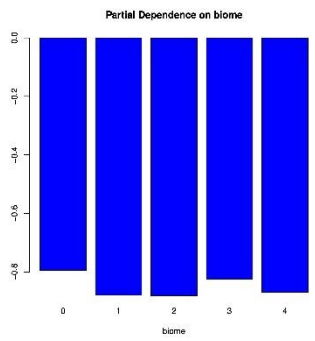
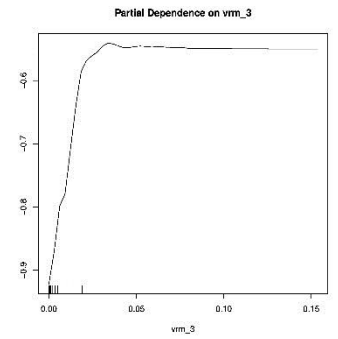
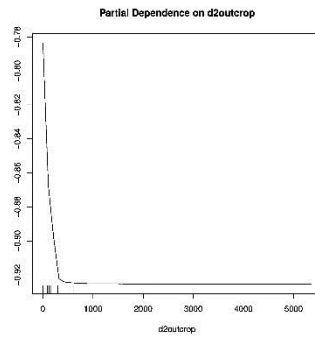
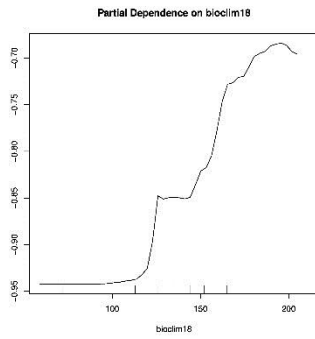
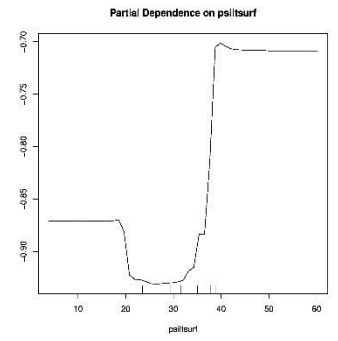
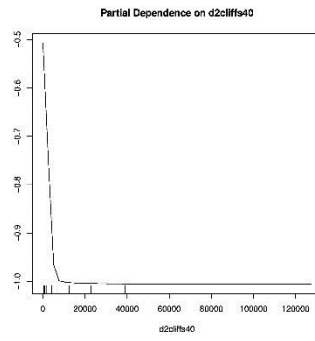
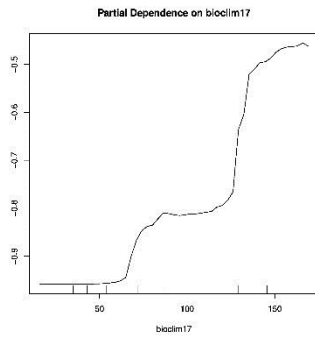
The graph below indicates the relative importance of predictors in modeling distribution for this species. “MeanDecreaseAccuracy” calculates importance by permuting (i.e., randomizing) values for the predictor and measuring the resulting decrease in model accuracy. This measure is typically a more reliable indicator of importance than “MeanDecreaseGini,” which measures improvement in a model due to splits based on the predictor. In both graphs, the further to the right the point falls on the graph, the higher the relative importance of the corresponding predictor. See Appendix 1 of this report for a detailed description of each predictor.



## Partial Plots

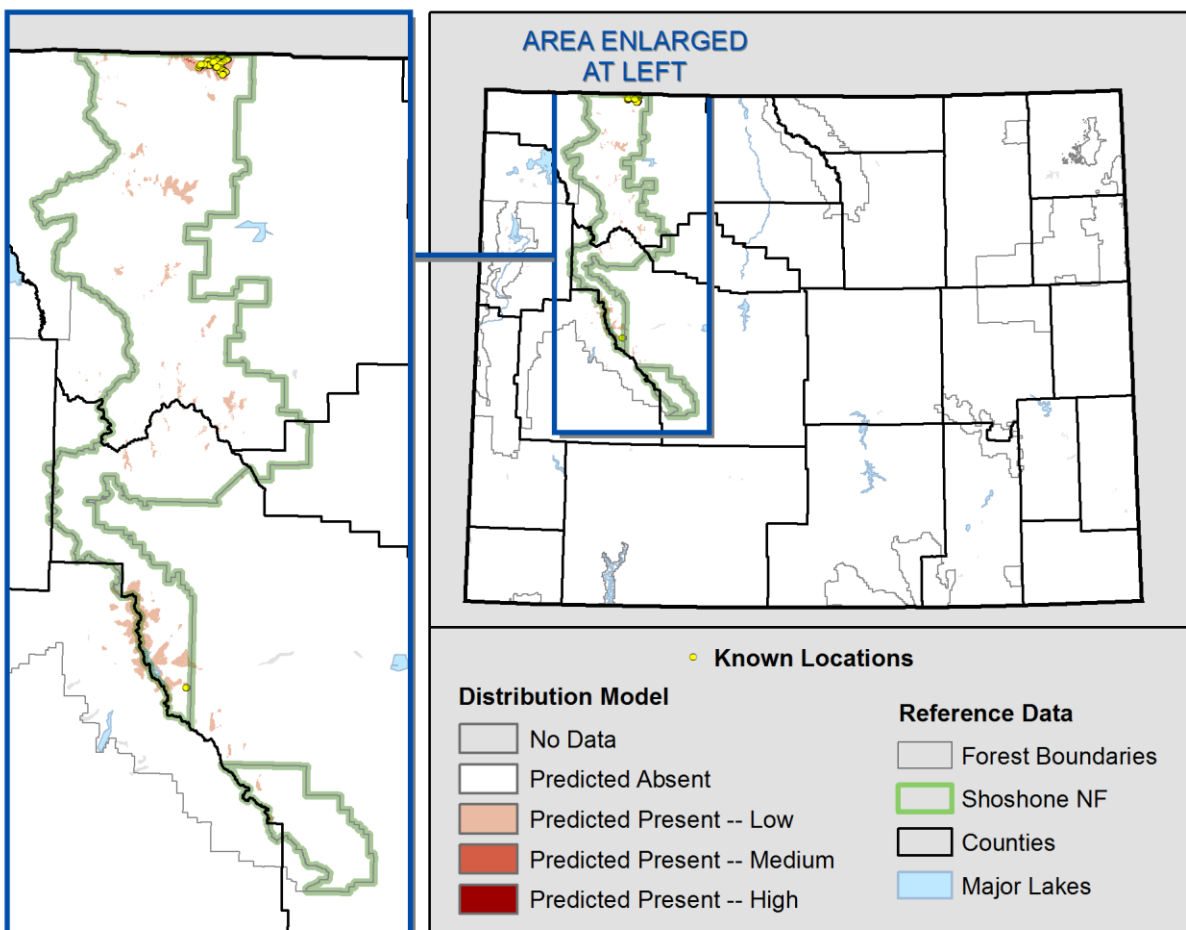
Partial plots show the relationship between a predictor variable and the predicted probability of occurrence, holding all other predictors at their average values. Probability values on the y-axis are unscaled; higher values on this axis indicate a higher relative probability of occurrence.





# Koenigia (*Koenigia islandica*)

Model version: 2016-06-23



## Model Information

- **Algorithm:** Random Forest
- **Software:** R version 3.3.0 (2016-05-03); randomForest package v. 4.6.12
- **Binary Threshold (MaxTSS):** 0.490
- **Reclassification Table for Four-Category Version:**

From	To	Becomes
0	0.394	Predicted Absent (0)
0.394	0.968	Low (1)
0.968	0.996	Medium (2)
0.996	1	High (3)

## Model Details

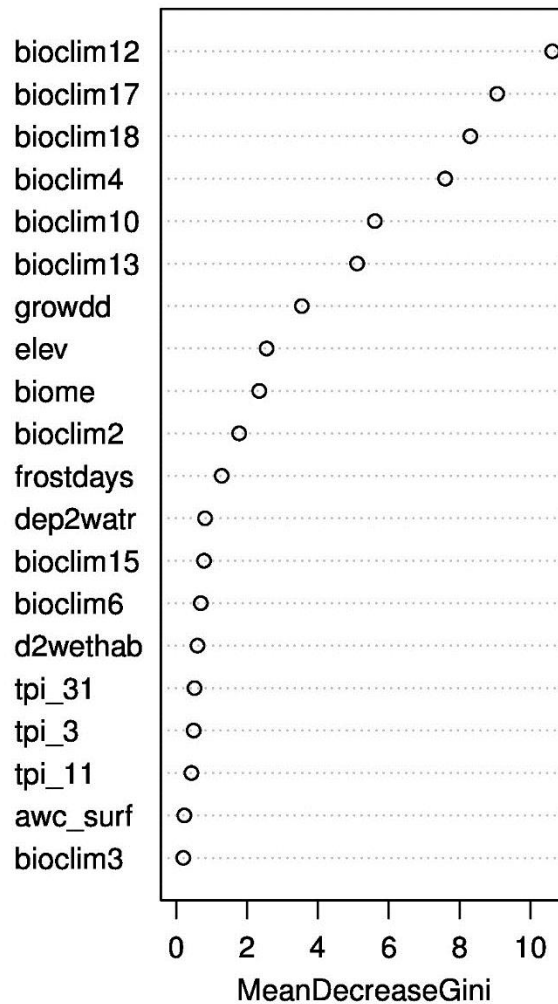
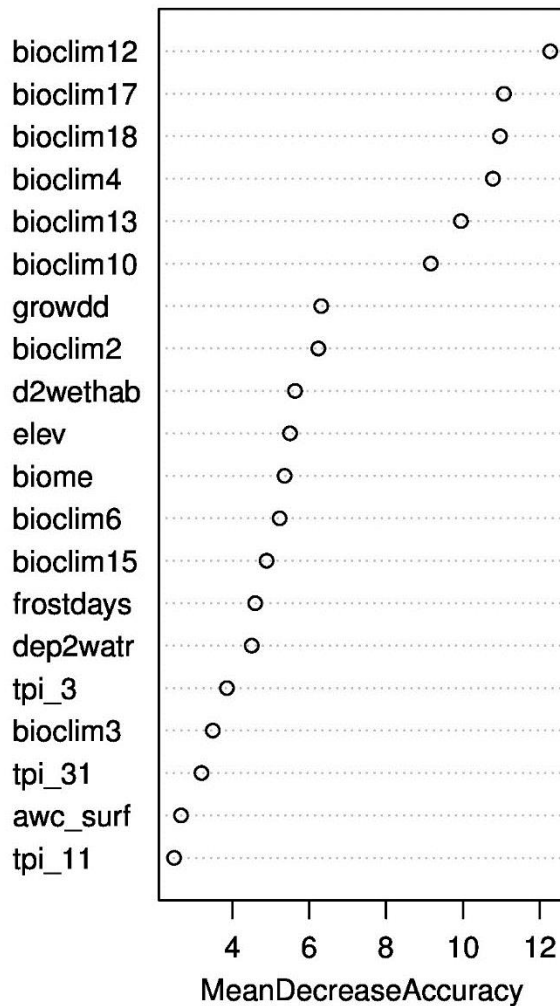
- **Number of Locations:** 42
- **Out-of-Bag Error:** 2.4%
- **TSS:** 94.6%
- **Kappa:** 93.6%
- **Sensitivity:** 96.8%
- **Specificity:** 97.9%

## Model Comments:

Rare alpine plant species that are restricted to narrow seep and snowmelt zones are difficult to model because statewide data are coarsely mapped and categorical. We tried using aspect and topography as indications of snow accumulation to refine the model, but the trial was rejected.

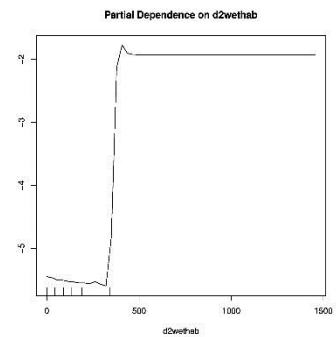
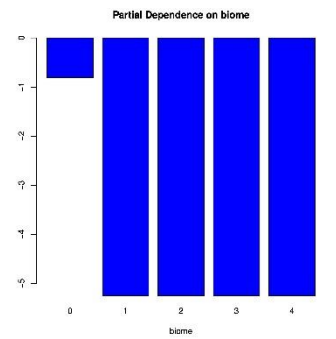
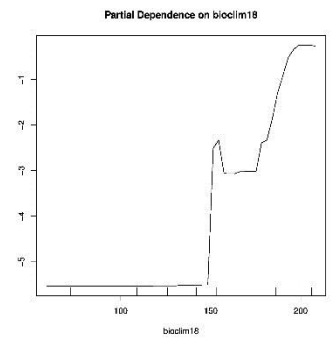
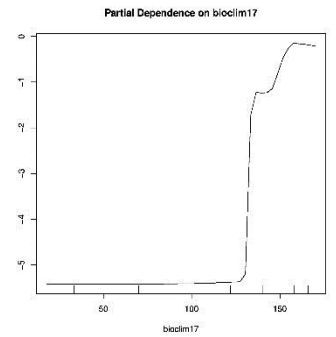
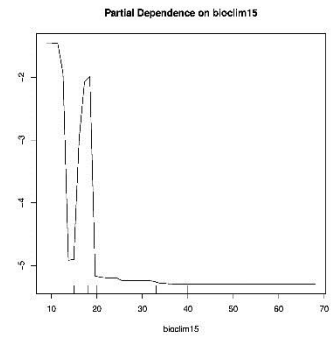
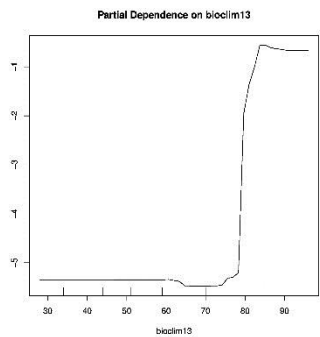
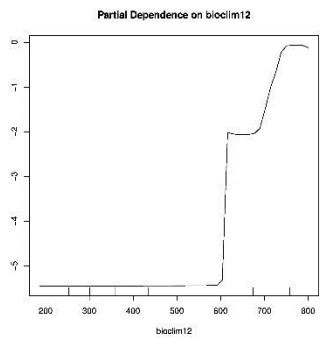
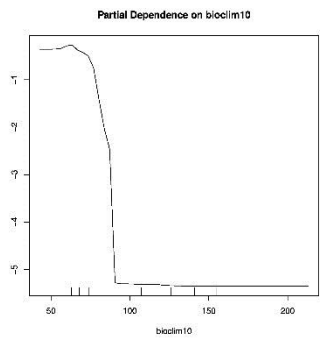
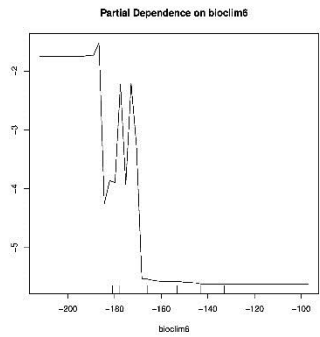
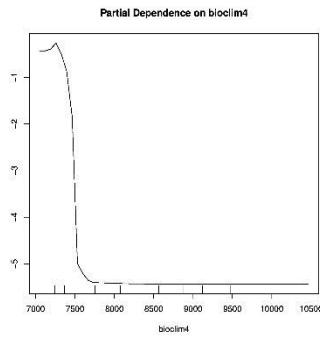
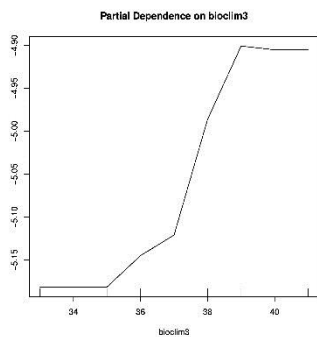
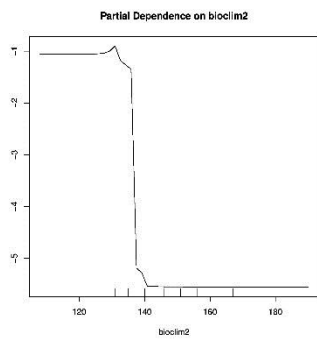
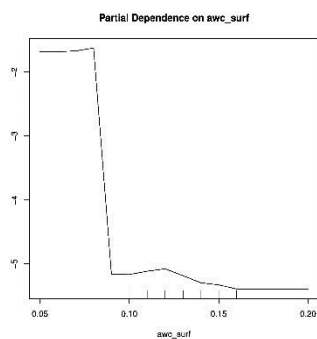
## Predictor Variable Importance:

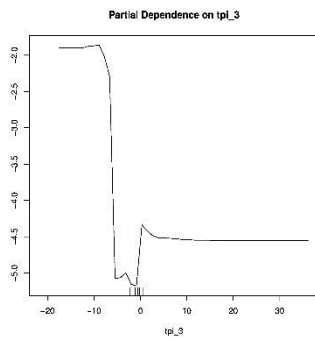
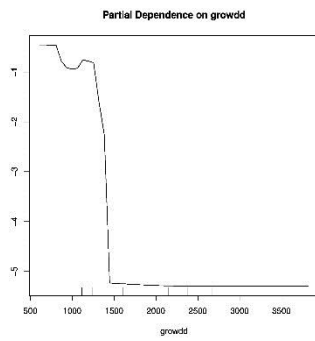
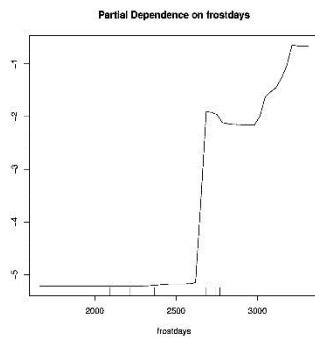
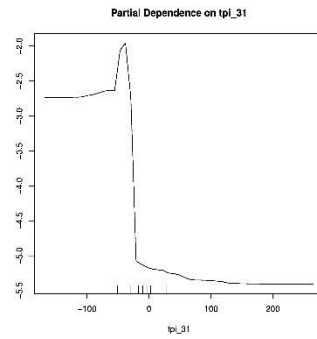
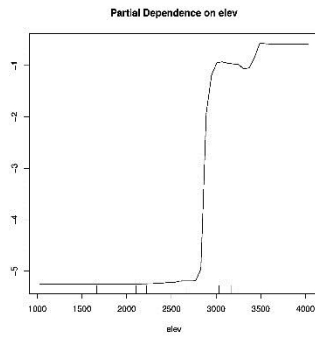
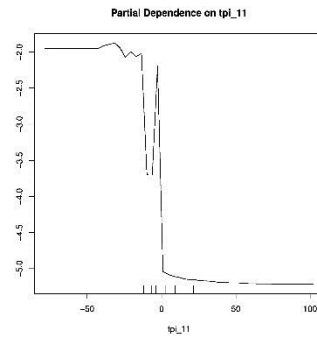
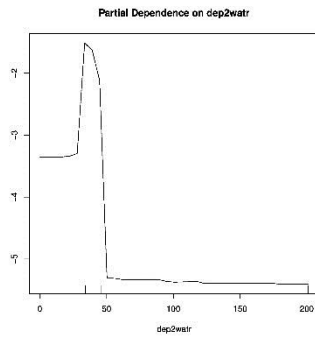
The graph below indicates the relative importance of predictors in modeling distribution for this species. “MeanDecreaseAccuracy” calculates importance by permuting (i.e., randomizing) values for the predictor and measuring the resulting decrease in model accuracy. This measure is typically a more reliable indicator of importance than “MeanDecreaseGini,” which measures improvement in a model due to splits based on the predictor. In both graphs, the further to the right the point falls on the graph, the higher the relative importance of the corresponding predictor. See Appendix 1 of this report for a detailed description of each predictor.



## Partial Plots

Partial plots show the relationship between a predictor variable and the predicted probability of occurrence, holding all other predictors at their average values. Probability values on the y-axis are unscaled; higher values on this axis indicate a higher relative probability of occurrence.

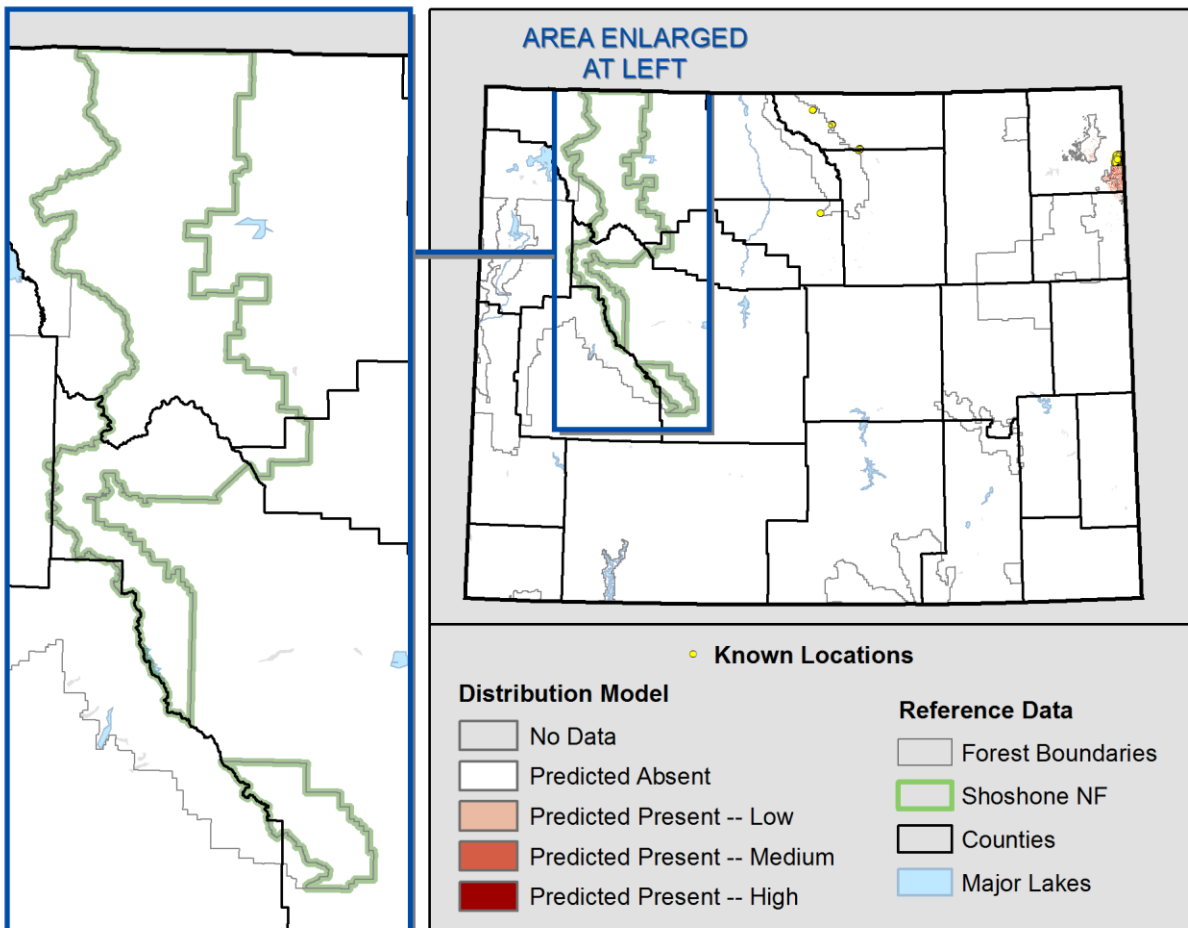






# Large yellow lady-slipper (*Cypripedium parviflorum* var. *pubescens*)

Model version: 2016-06-22



## Model Information

- **Algorithm:** Random Forest
- **Software:** R version 3.3.0 (2016-05-03); randomForest package v. 4.6.12
- **Binary Threshold (MaxTSS):** 0.643
- **Reclassification Table for Four-Category Version:**

From	To	Becomes
0	0.664	Predicted Absent (0)
0.664	0.778	Low (1)
0.778	0.934	Medium (2)
0.934	1	High (3)

## Model Details

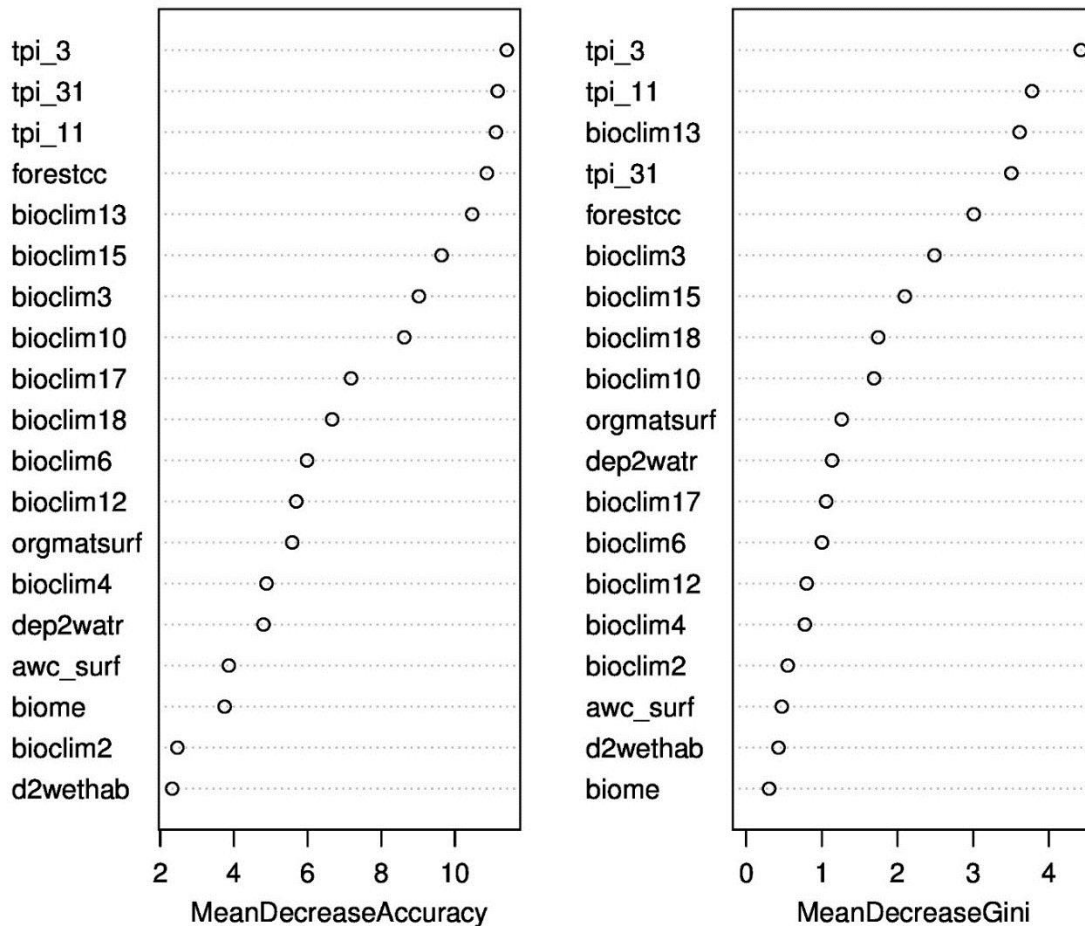
- **Number of Locations:** 23
- **Out-of-Bag Error:** 7.7%
- **TSS:** 77.6%
- **Kappa:** 79.0%
- **Sensitivity:** 81.8%
- **Specificity:** 95.8%

## Model Comments:

Rare wetland plant species that occupy microhabitat are difficult to model. A layer was developed that combines layers representing riverine and palustrine settings along a distance gradient. The difficulty is compounded when there are questions about positive data. There is only one report of the species in the Wind River Range, apparently just below SNF boundaries, and there are reports that it might actually represent a new species addition to the state flora rather than Large yellow lady's-slipper, so it was debated whether or not to use it in the model. In the end, it was not used in the modelling.

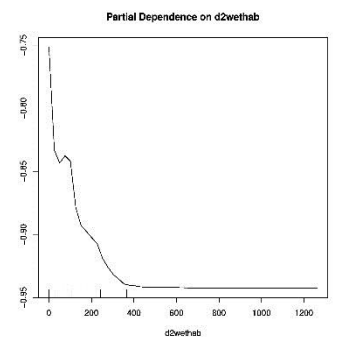
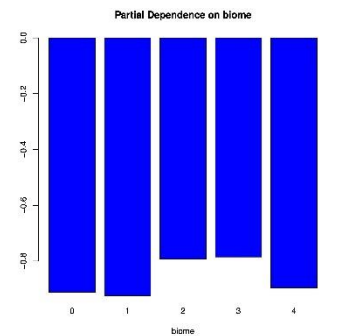
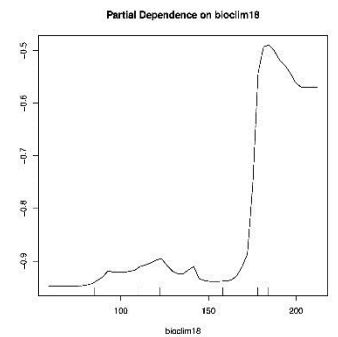
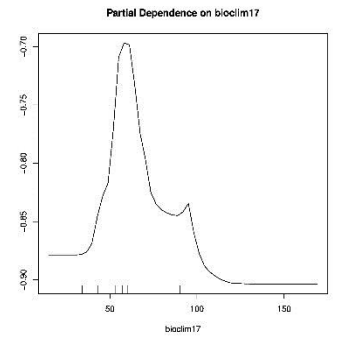
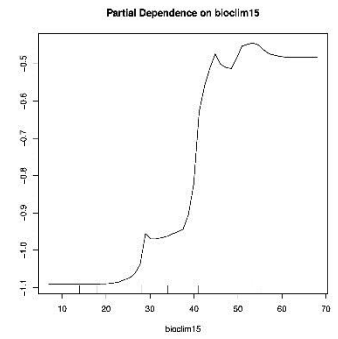
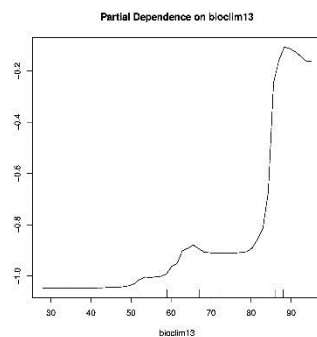
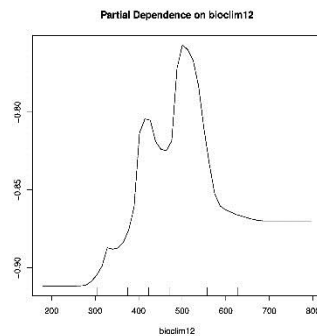
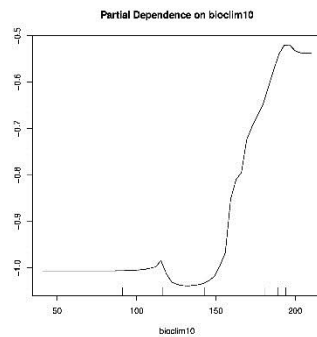
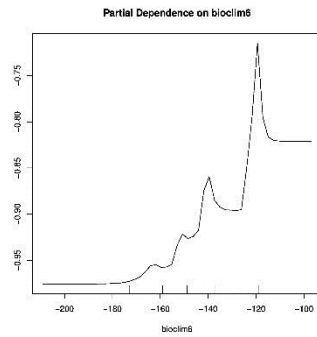
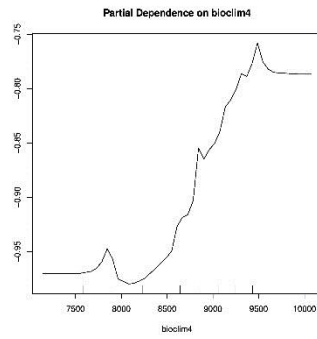
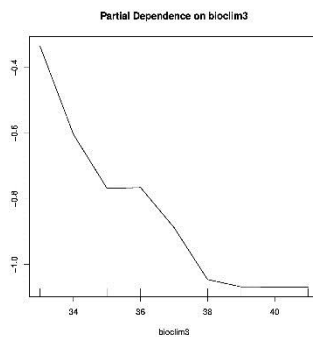
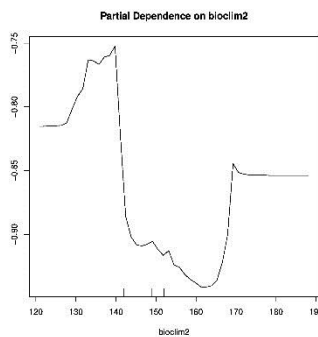
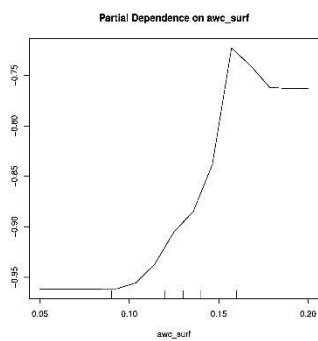
## Predictor Variable Importance:

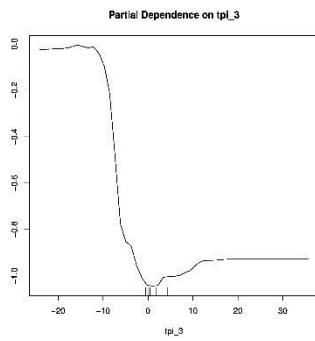
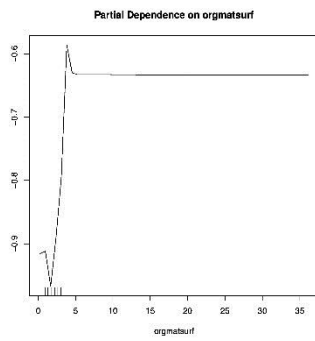
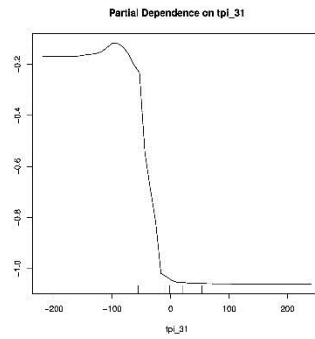
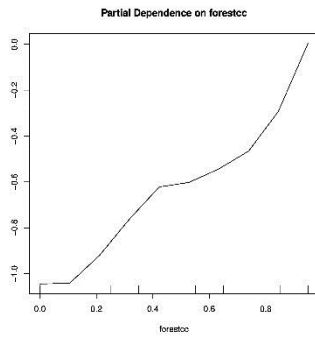
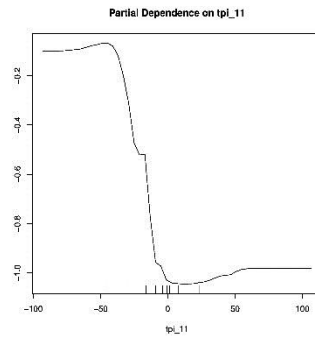
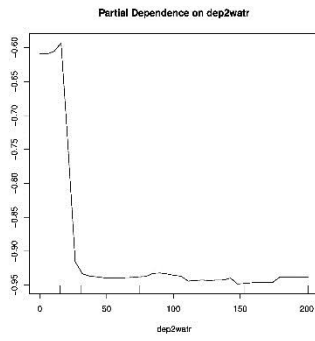
The graph below indicates the relative importance of predictors in modeling distribution for this species. "MeanDecreaseAccuracy" calculates importance by permuting (i.e., randomizing) values for the predictor and measuring the resulting decrease in model accuracy. This measure is typically a more reliable indicator of importance than "MeanDecreaseGini," which measures improvement in a model due to splits based on the predictor. In both graphs, the further to the right the point falls on the graph, the higher the relative importance of the corresponding predictor. See Appendix 1 of this report for a detailed description of each predictor.



## Partial Plots

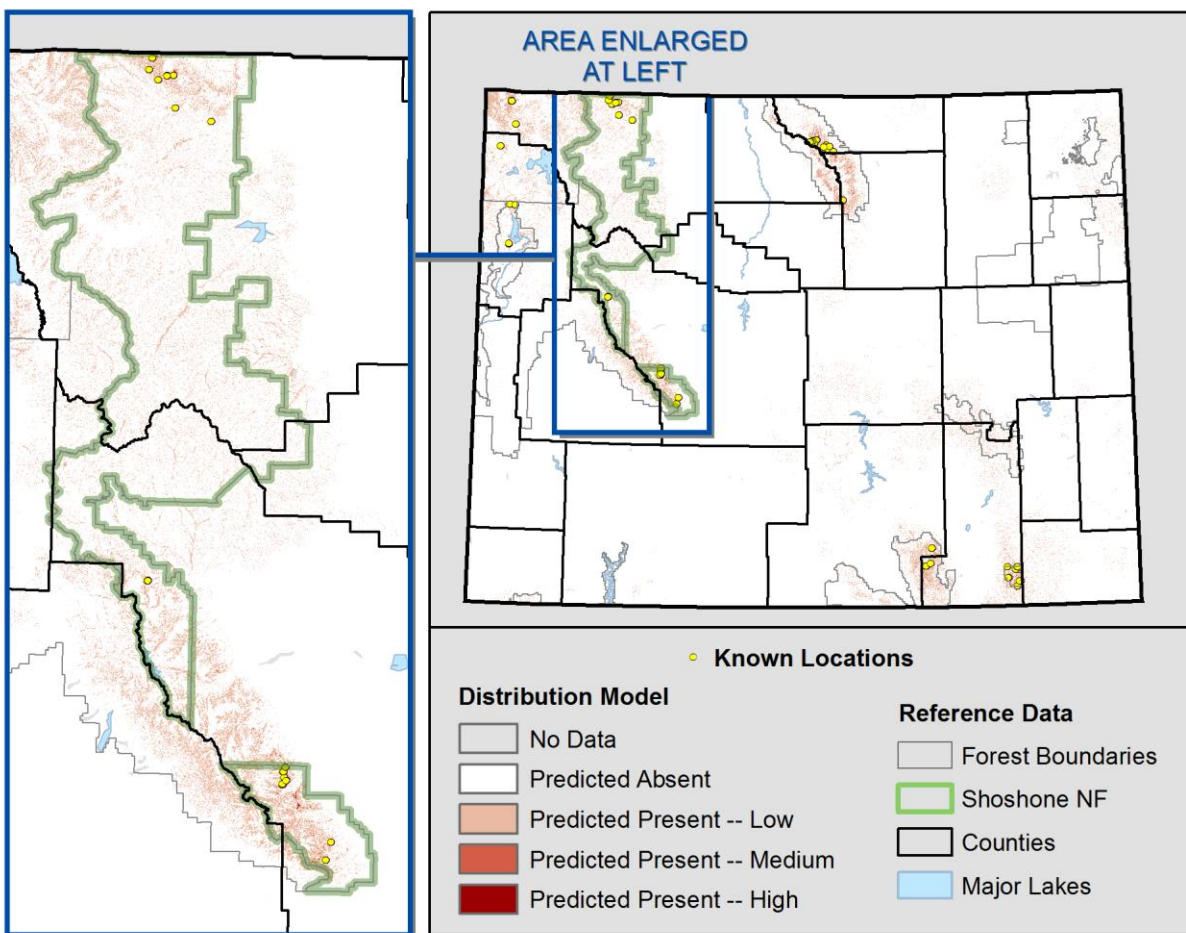
Partial plots show the relationship between a predictor variable and the predicted probability of occurrence, holding all other predictors at their average values. Probability values on the y-axis are unscaled; higher values on this axis indicate a higher relative probability of occurrence.





# Lesser bladderwort (*Utricularia minor*)

Model version: 2016-06-24



## Model Information

- Algorithm:** Random Forest
- Software:** R version 3.3.0 (2016-05-03); randomForest package v. 4.6.12
- Binary Threshold (MaxTSS):** 0.661
- Reclassification Table for Four-Category Version:**

From	To	Becomes
0	0.172	Predicted Absent (0)
0.172	0.892	Low (1)
0.892	0.988	Medium (2)
0.988	1	High (3)

## Model Details

- Number of Locations:** 66
- Out-of-Bag Error:** 7.0%
- TSS:** 80.4%
- Kappa:** 81.1%
- Sensitivity:** 84.7%
- Specificity:** 95.7%

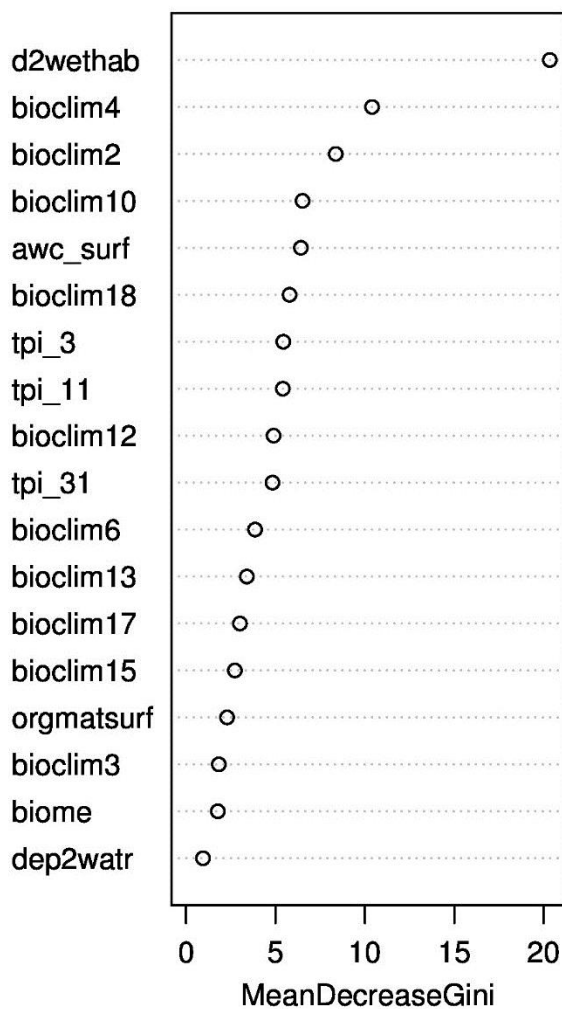
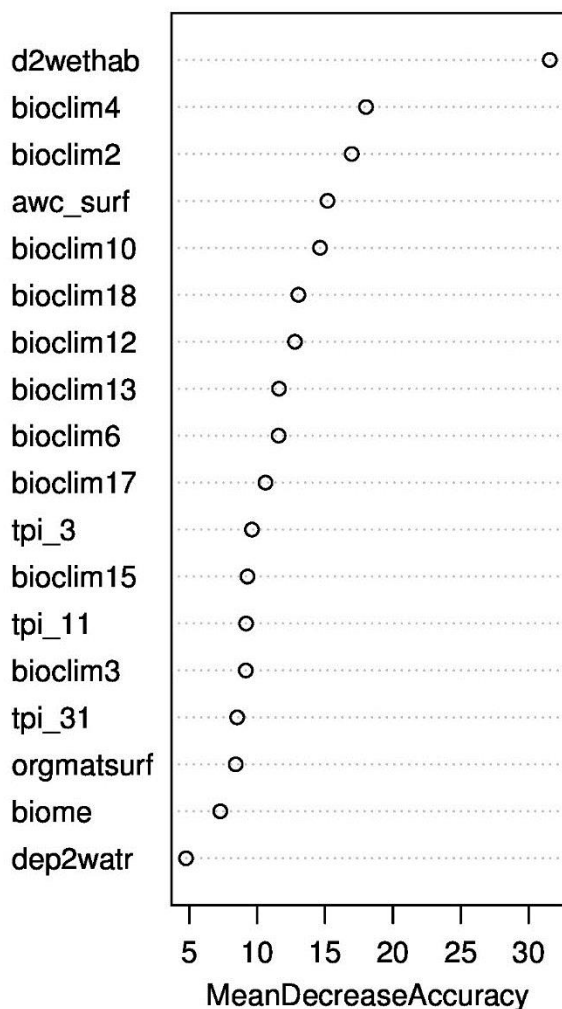
## Model Comments:

Rare wetland plant species that occupy microhabitat are difficult to model. A layer was developed that combines layers representing riverine and palustrine settings along a distance gradient. Lesser bladderwort also occupies relict habitat (organic soil accumulation) that is vestige of the geological past,

beyond the scope of modeling. The output shows potential habitat locations in a highly pixelated pattern.

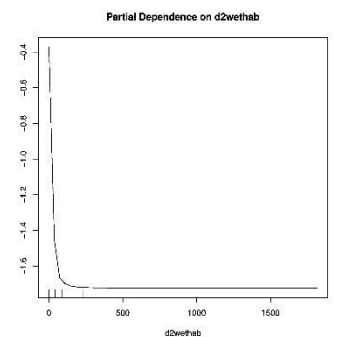
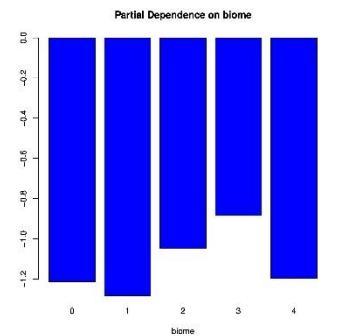
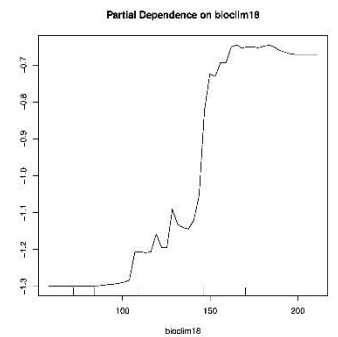
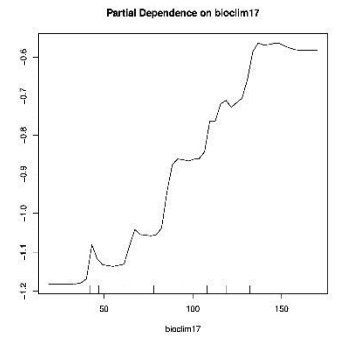
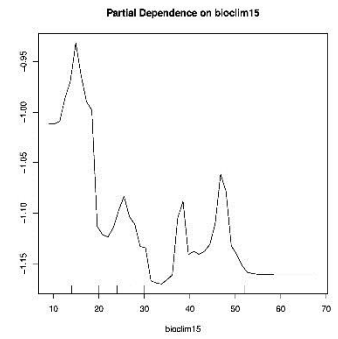
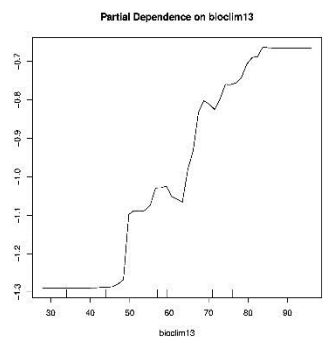
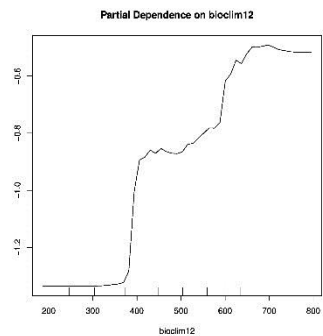
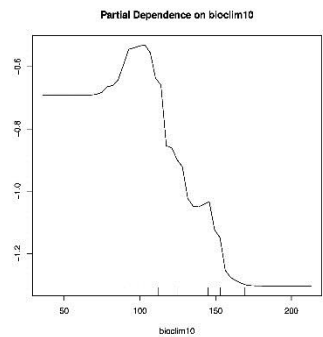
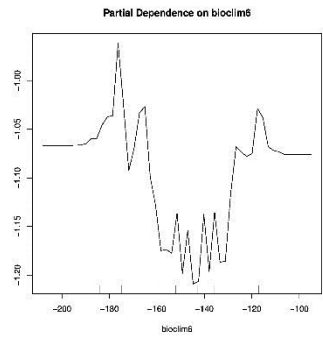
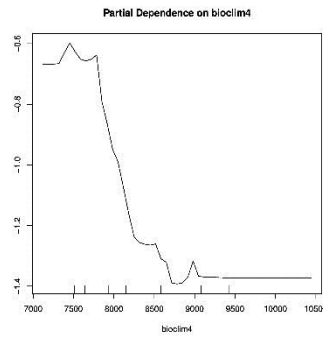
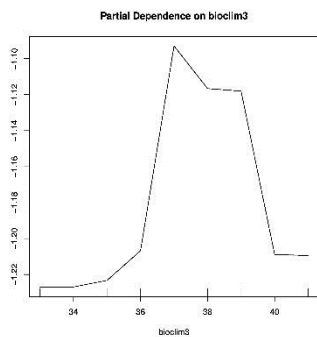
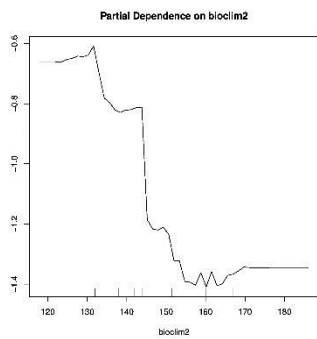
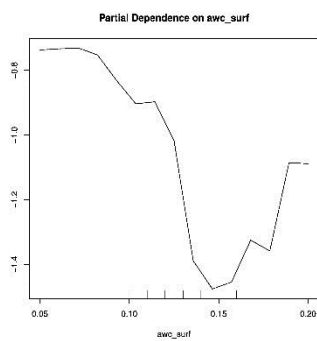
## Predictor Variable Importance:

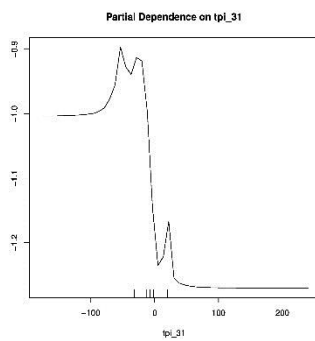
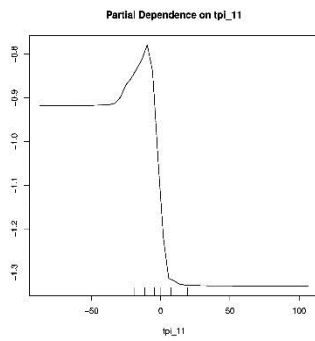
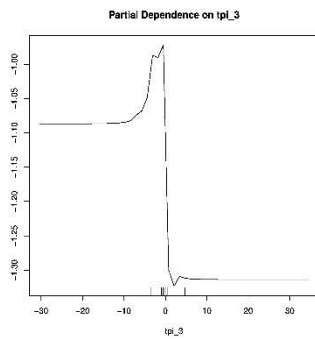
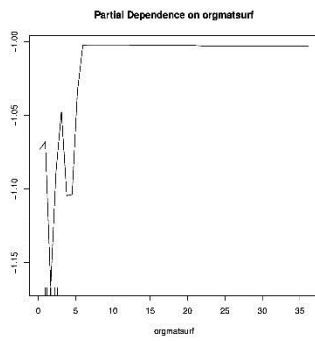
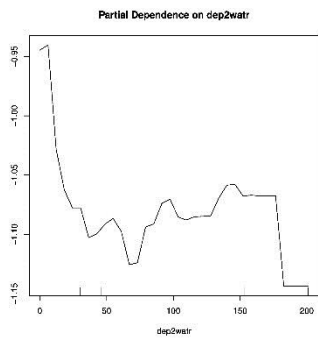
The graph below indicates the relative importance of predictors in modeling distribution for this species. “MeanDecreaseAccuracy” calculates importance by permuting (i.e., randomizing) values for the predictor and measuring the resulting decrease in model accuracy. This measure is typically a more reliable indicator of importance than “MeanDecreaseGini,” which measures improvement in a model due to splits based on the predictor. In both graphs, the further to the right the point falls on the graph, the higher the relative importance of the corresponding predictor. See Appendix 1 of this report for a detailed description of each predictor.



## Partial Plots

Partial plots show the relationship between a predictor variable and the predicted probability of occurrence, holding all other predictors at their average values. Probability values on the y-axis are unscaled; higher values on this axis indicate a higher relative probability of occurrence.

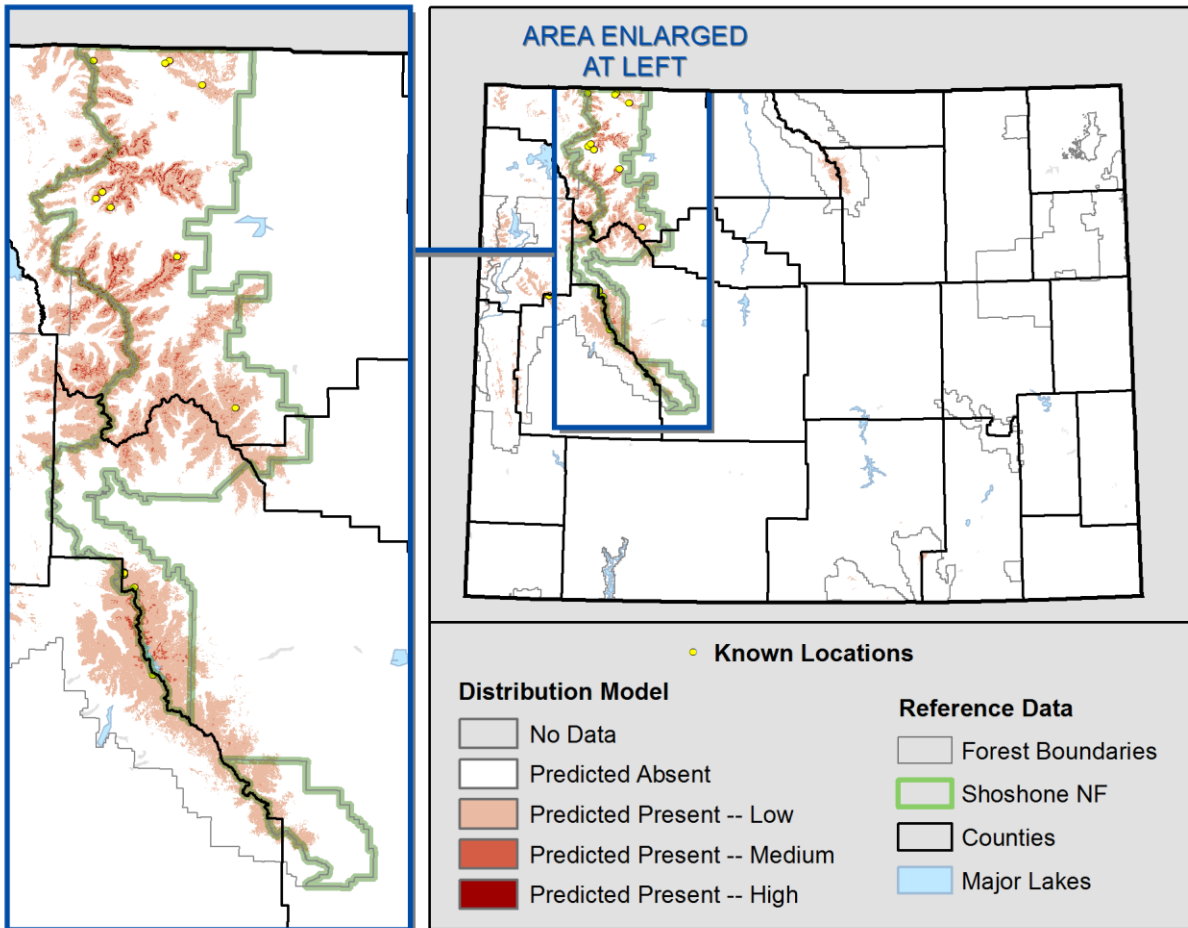






# Low fleabane (*Erigeron humilis*)

Model version: 2016-06-23



## Model Information

- Algorithm:** Random Forest
- Software:** R version 3.3.0 (2016-05-03); randomForest package v. 4.6.12
- Binary Threshold (MaxTSS):** 0.596
- Reclassification Table for Four-Category Version:**

From	To	Becomes
0	0.412	Predicted Absent (0)
0.412	0.792	Low (1)
0.792	0.904	Medium (2)
0.904	1	High (3)

## Model Details

- Number of Locations:** 13
- Out-of-Bag Error:** 13.4%
- TSS:** 64.3%
- Kappa:** 64.2%
- Sensitivity:** 73.3%
- Specificity:** 91.0%

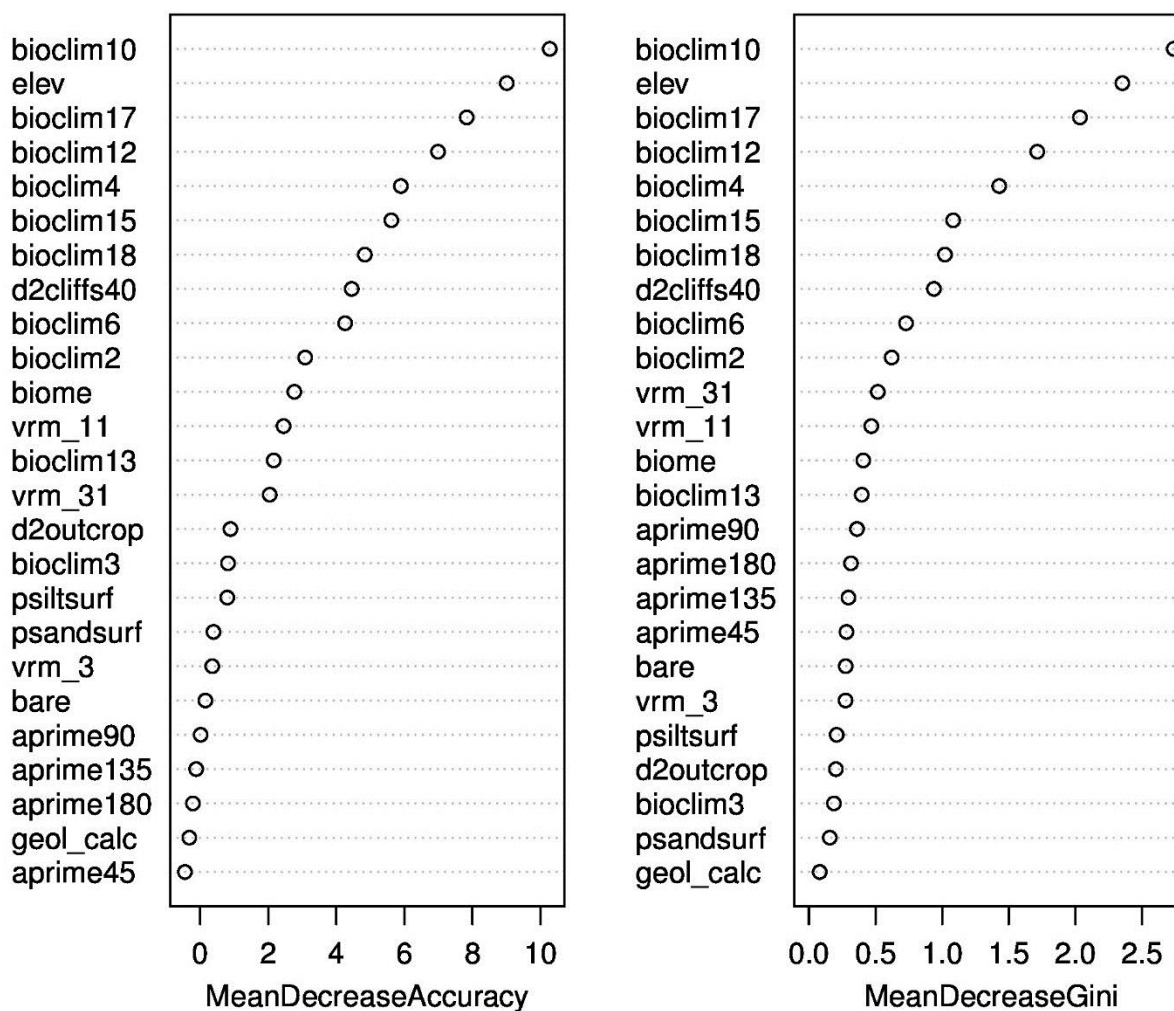
## Model Comments:

Rare alpine plant species that are restricted to moist zones are difficult to model because statewide data are coarsely mapped and categorical. A layer was developed that combines layers representing riverine and palustrine settings along a distance gradient. Moist habitats in the alpine zone can be extremely

small and patchy, complicating modeling. The hydrological complexity of the settings where it occurs and crudeness of the surrogate layer might account for the extent of high probability potential habitat.

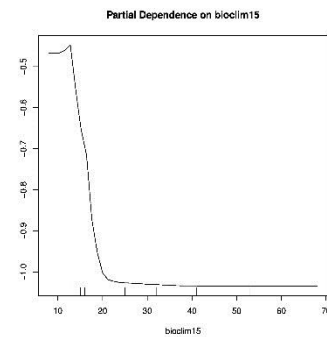
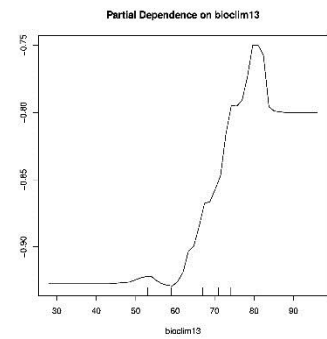
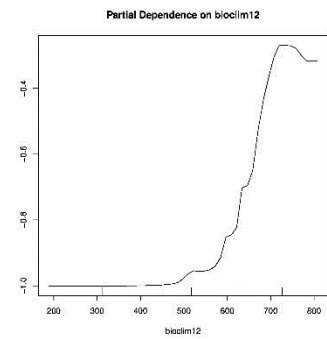
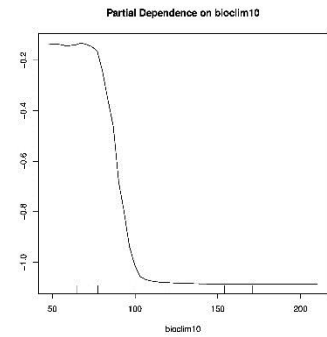
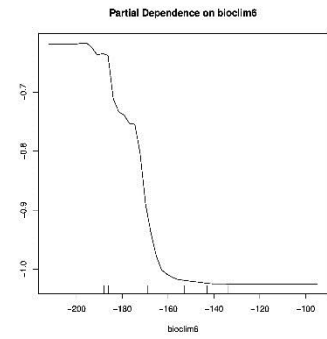
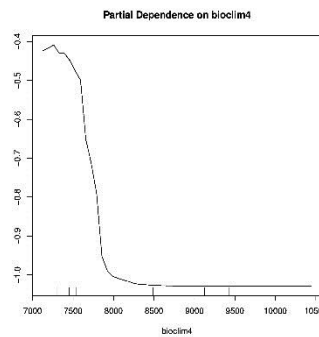
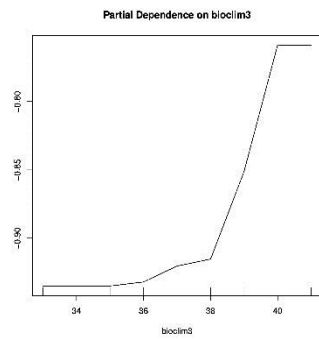
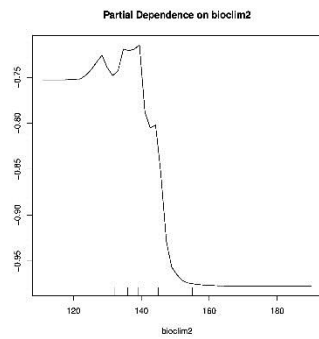
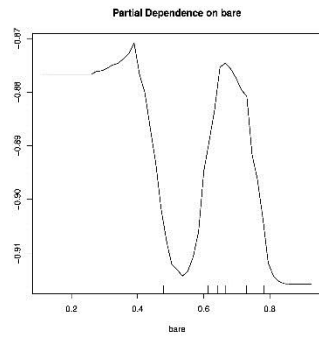
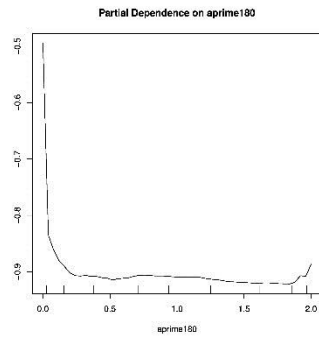
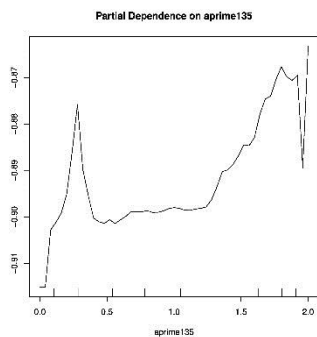
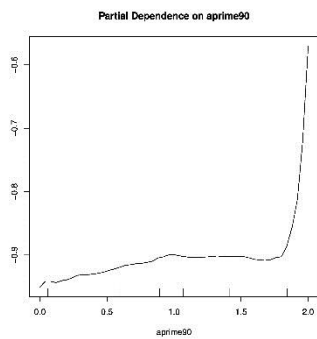
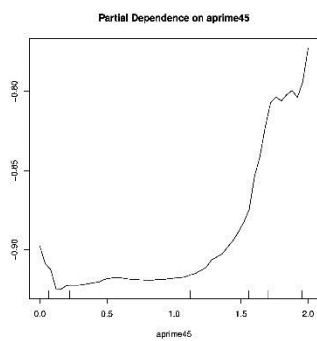
## Predictor Variable Importance:

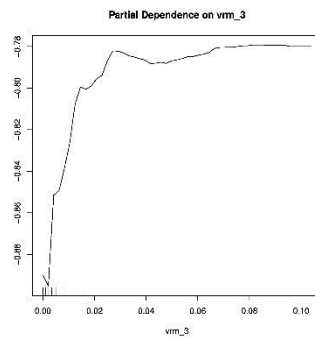
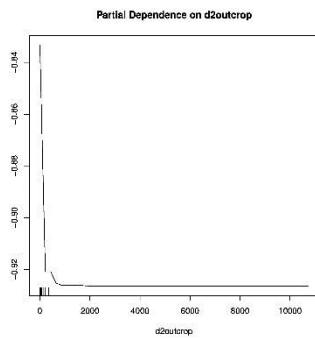
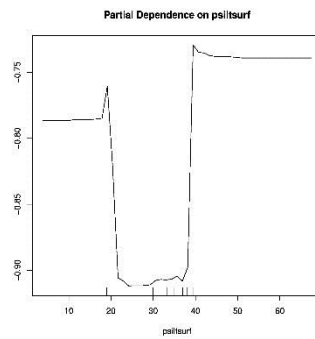
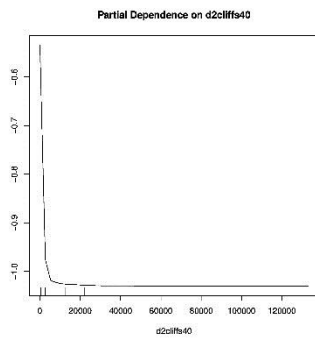
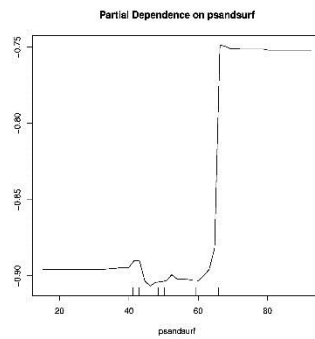
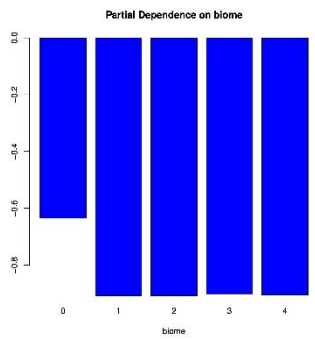
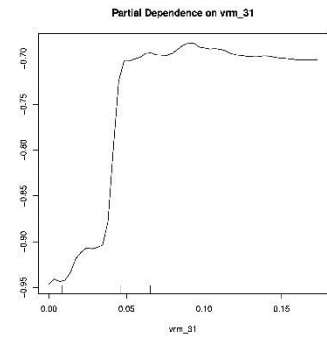
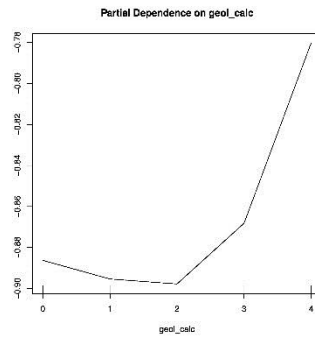
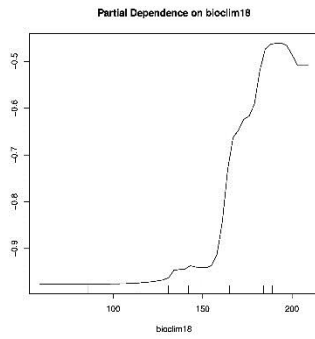
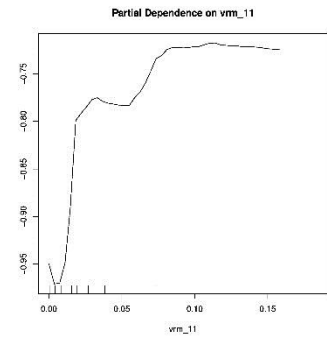
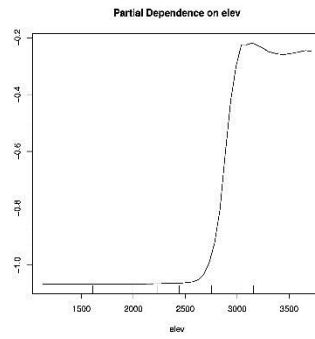
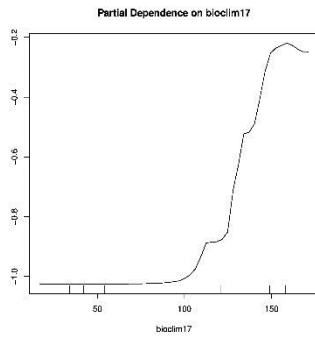
The graph below indicates the relative importance of predictors in modeling distribution for this species. “MeanDecreaseAccuracy” calculates importance by permuting (i.e., randomizing) values for the predictor and measuring the resulting decrease in model accuracy. This measure is typically a more reliable indicator of importance than “MeanDecreaseGini,” which measures improvement in a model due to splits based on the predictor. In both graphs, the further to the right the point falls on the graph, the higher the relative importance of the corresponding predictor. See Appendix 1 of this report for a detailed description of each predictor.



## Partial Plots

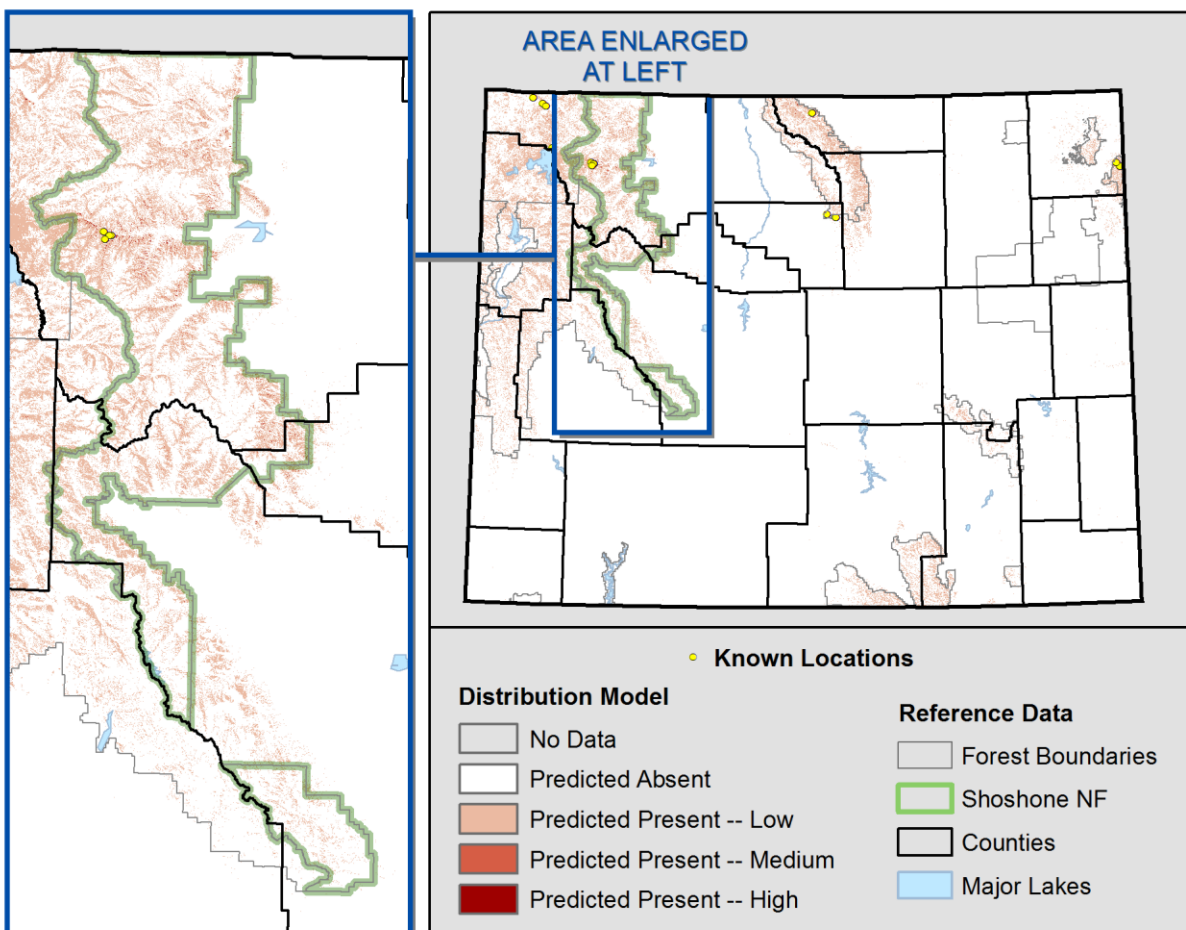
Partial plots show the relationship between a predictor variable and the predicted probability of occurrence, holding all other predictors at their average values. Probability values on the y-axis are unscaled; higher values on this axis indicate a higher relative probability of occurrence.





# Moschatel (*Adoxa moschatellina*)

Model version: 2016-12-05



## Model Information

- **Algorithm:** Random Forest
- **Software:** R version 3.3.0 (2016-05-03); randomForest package v. 4.6.12
- **Binary Threshold (MaxTSS):** 0.545
- **Reclassification Table for Four-Category Version:**

From	To	Becomes
0	0.420	Predicted Absent (0)
0.420	0.754	Low (1)
0.754	0.852	Medium (2)
0.852	1	High (3)

## Model Details

- **Number of Locations:** 13
- **Out-of-Bag Error:** 14.9%
- **TSS:** 52.5%
- **Kappa:** 57.0%
- **Sensitivity:** 58.5%
- **Specificity:** 94.0%

## Model Comments:

Rare plant species that occupy microhabitat are difficult to model. Moschatel occupies cool, sheltered often north-facing slopes. Some if not all of the settings represent cold air drainages. Dispersal vectors

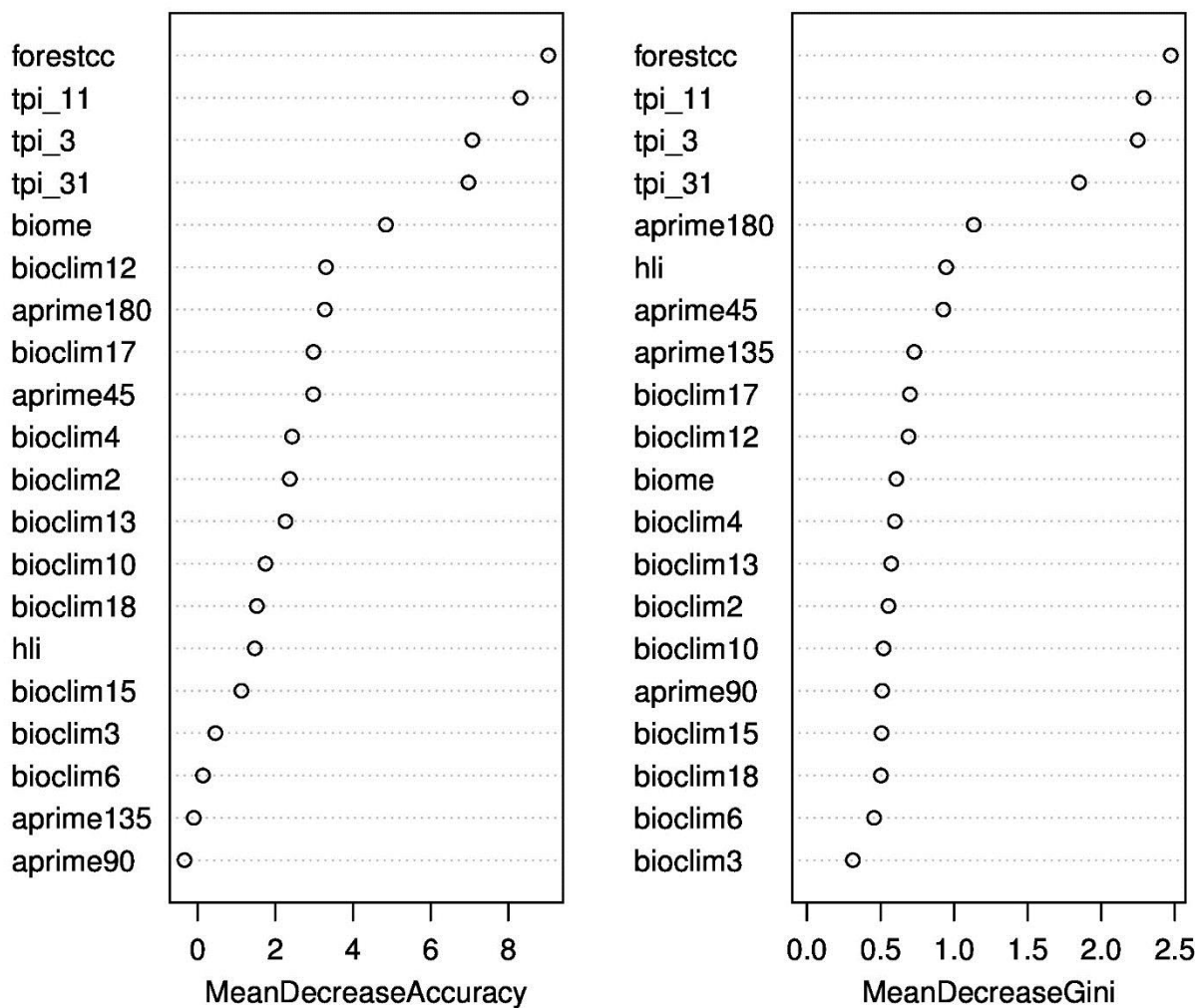
are unknown and there may be major elements of chance not reflected in model output showing it to have potential habitat in all major mountain ranges.

## Predictor Variable Importance:

The graph below indicates the relative importance of predictors in modeling distribution for this species. “MeanDecreaseAccuracy” calculates importance by permuting (i.e., randomizing) values for the predictor and measuring the resulting decrease in model accuracy. This measure is typically a more reliable indicator of importance than “MeanDecreaseGini,” which measures improvement in a model due to splits based on the predictor. In both graphs, the further to the right the point falls on the graph, the higher the relative importance of the corresponding predictor. See Appendix 1 of this report for a detailed description of each predictor.

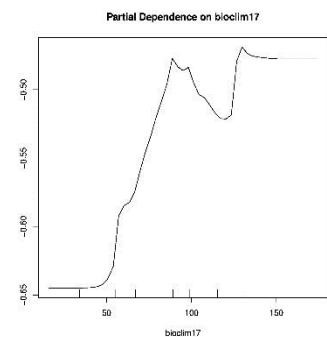
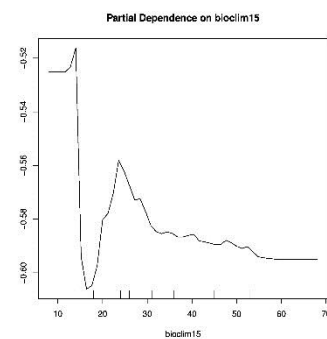
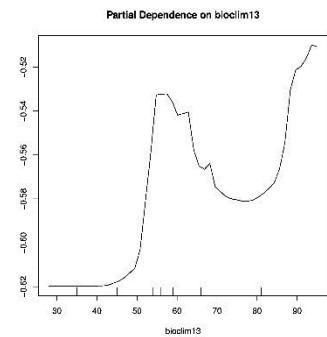
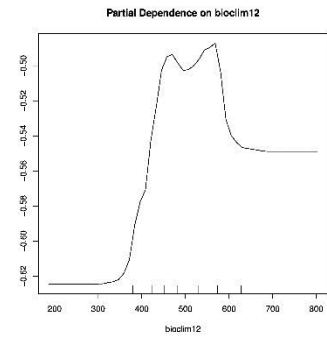
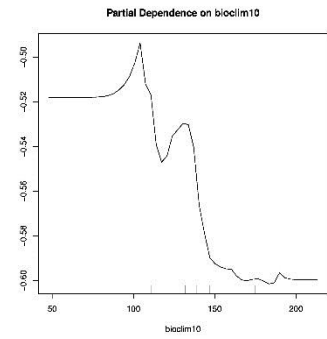
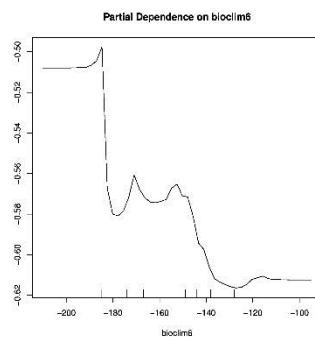
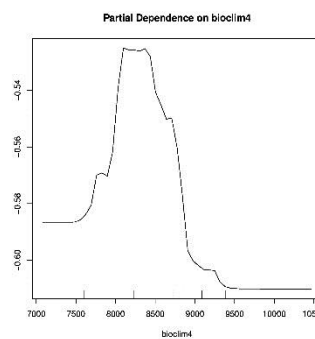
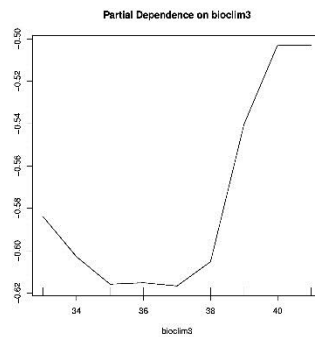
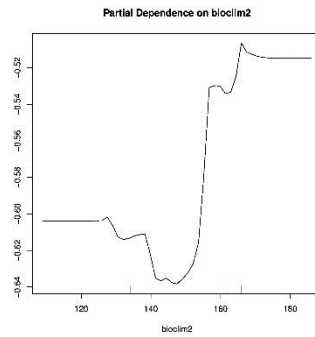
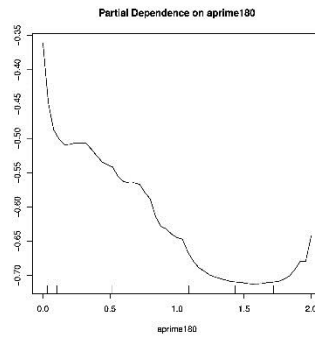
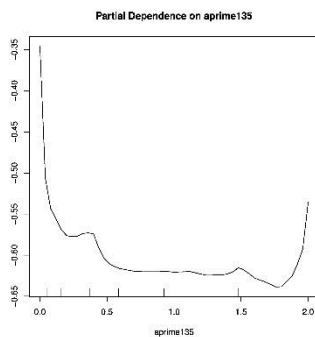
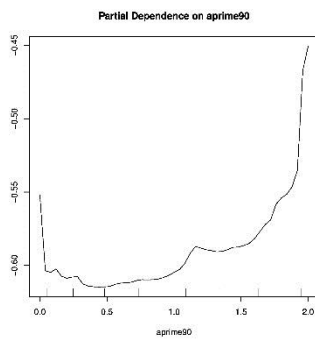
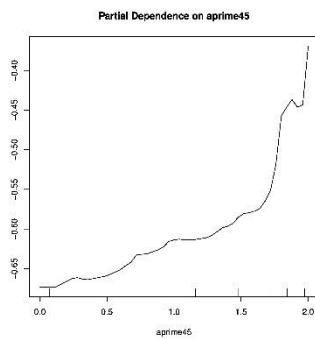
### Variable Importance for Moschatel (*Adoxa moschatellina*)

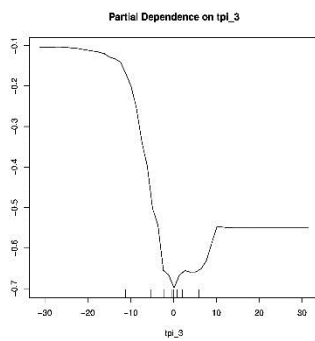
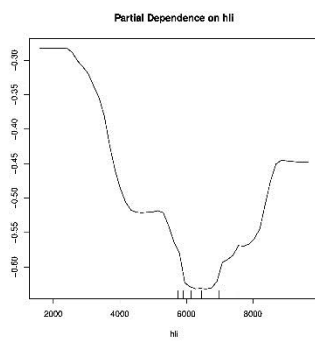
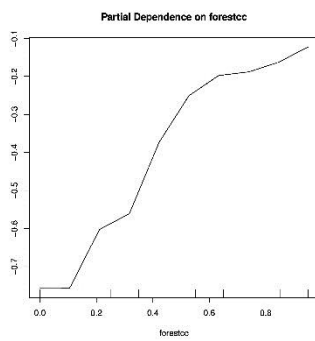
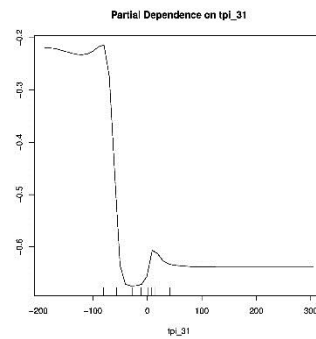
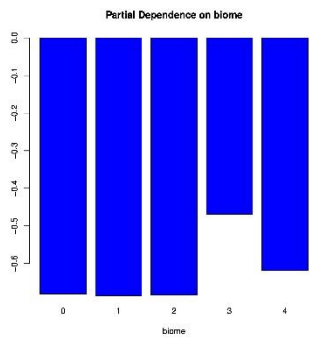
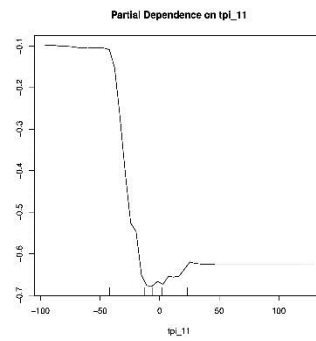
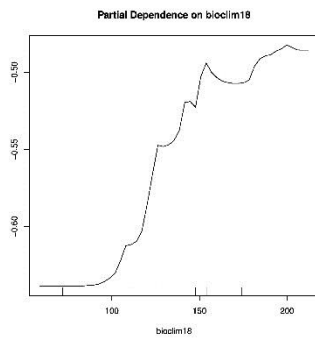
*Model: Adoxa\_moschatellina\_20161205*



## Partial Plots

Partial plots show the relationship between a predictor variable and the predicted probability of occurrence, holding all other predictors at their average values. Probability values on the y-axis are unscaled; higher values on this axis indicate a higher relative probability of occurrence.

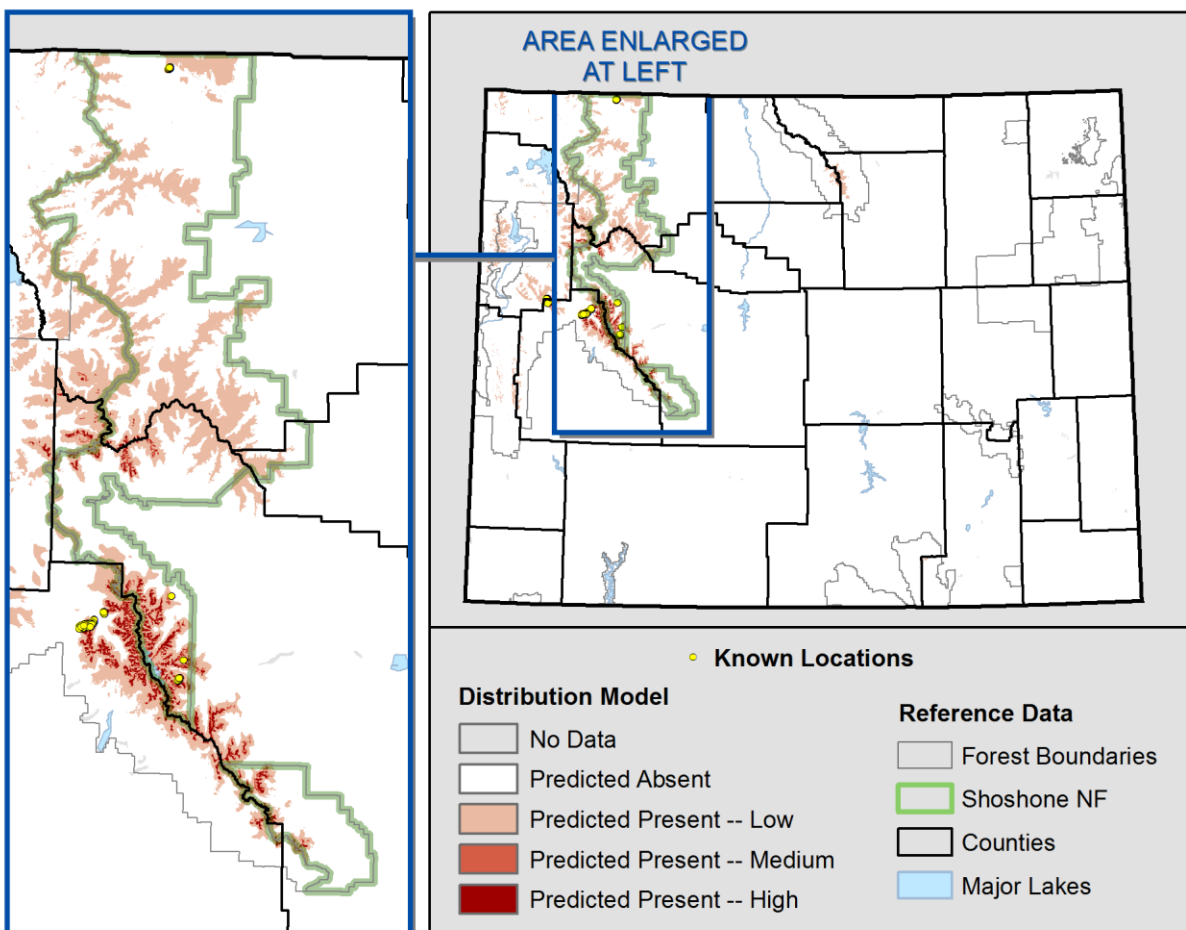






# Naked-stemmed parrya (*Parrya nudicaulis*)

Model version: 2016-06-23



## Model Information

- Algorithm:** Random Forest
- Software:** R version 3.3.0 (2016-05-03); randomForest package v. 4.6.12
- Binary Threshold (MaxTSS):** 0.472
- Reclassification Table for Four-Category Version:**

From	To	Becomes
0	0.234	Predicted Absent (0)
0.234	0.890	Low (1)
0.890	0.996	Medium (2)
0.996	1	High (3)

## Model Details

- Number of Locations:** 17
- Out-of-Bag Error:** 7.2%
- TSS:** 81.8%
- Kappa:** 81.0%
- Sensitivity:** 87.1%
- Specificity:** 94.7%

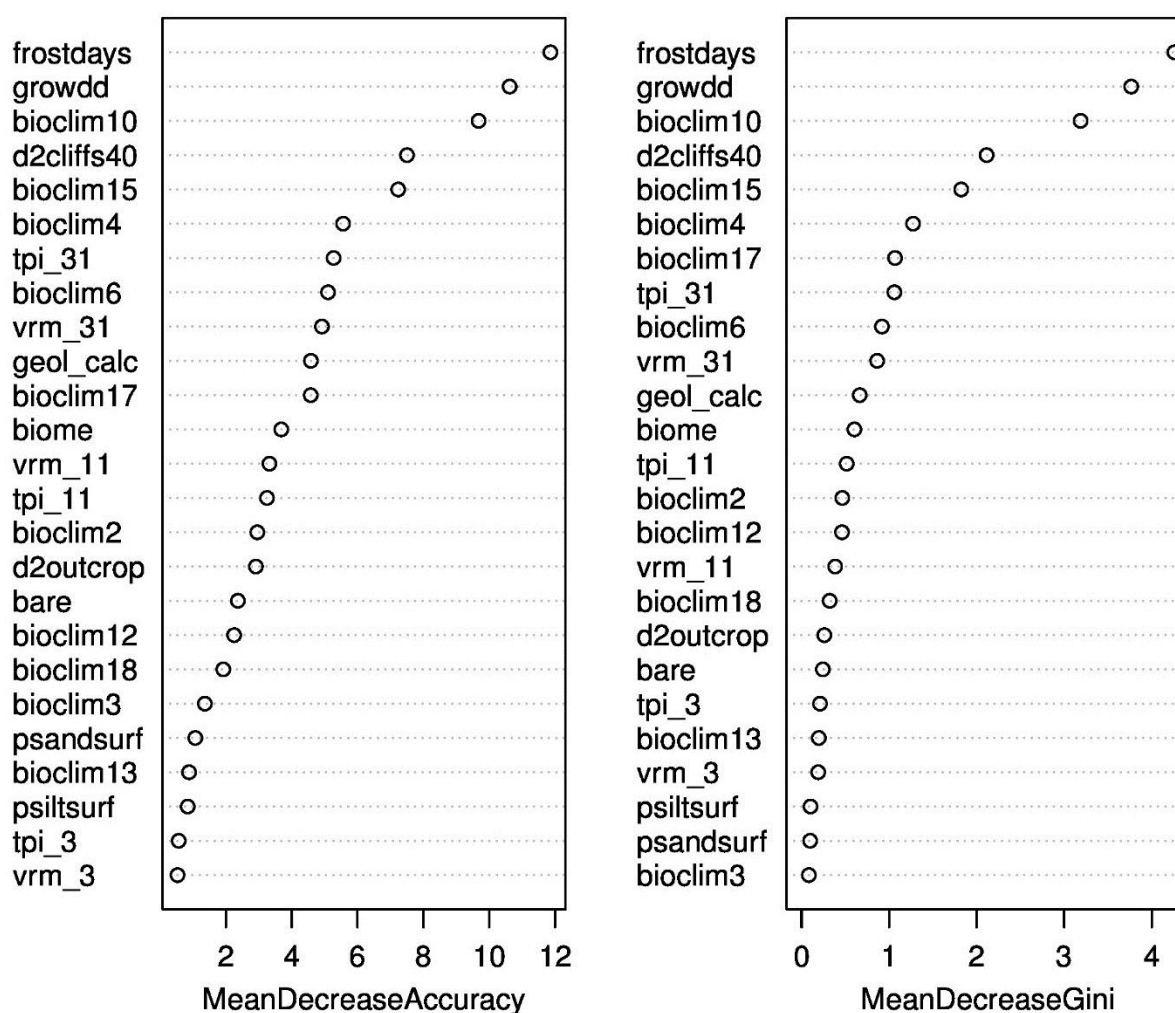
## Model Comments:

Rare alpine plant species that are restricted to certain soil conditions are difficult to model because statewide data are coarsely mapped and categorical. The statewide soils layer was parameterized to produce layers with gradients reflecting different soil properties. For species such as Naked-stemmed

parrya, which occupies a range of sedimentary substrates ranging from limestone to sandstone, no single surrogate layer will improve model performance. The geological complexity and crudeness of the surrogate layer might also account for the breadth of low probability potential habitat.

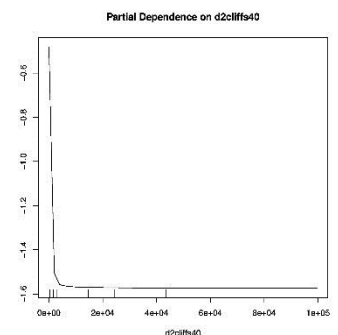
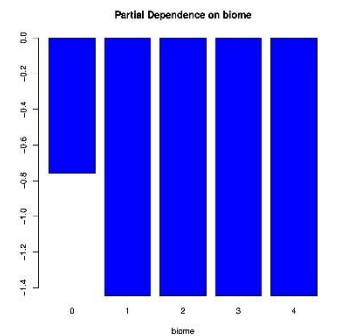
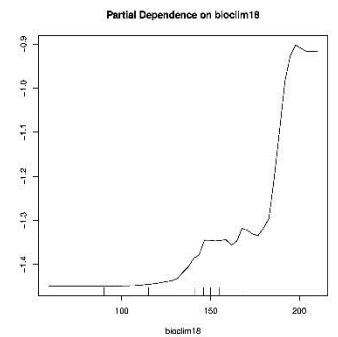
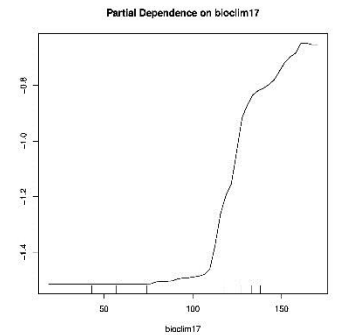
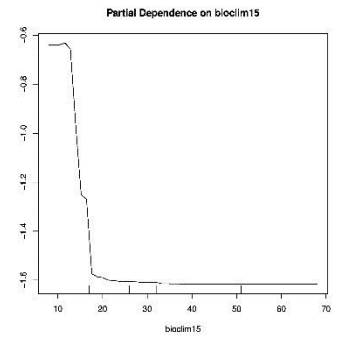
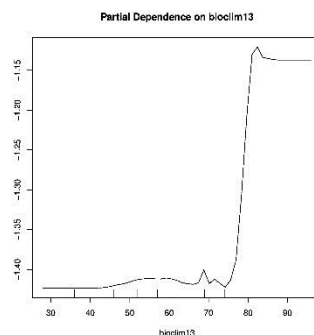
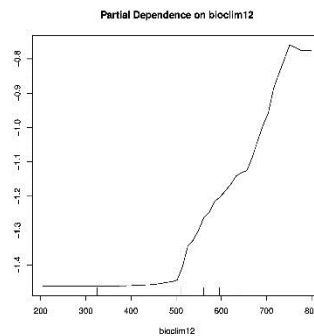
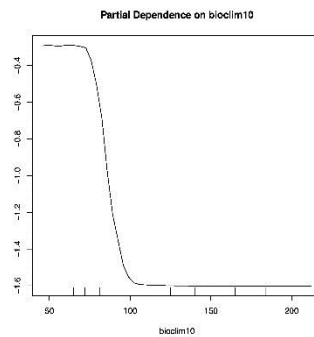
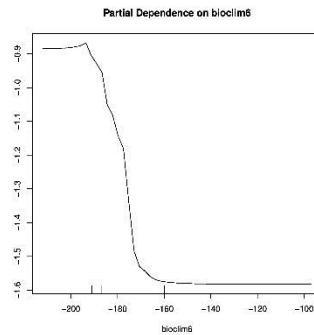
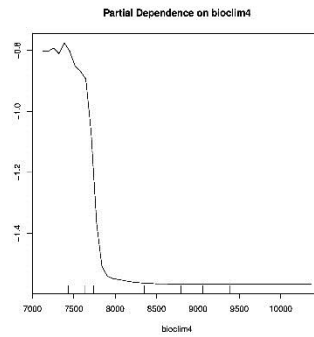
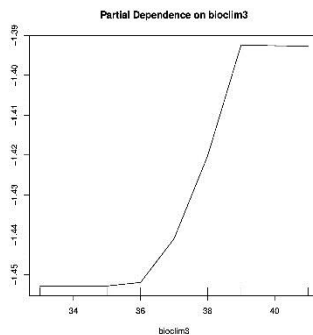
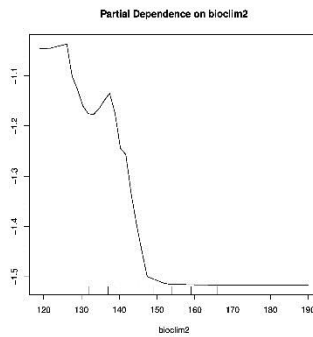
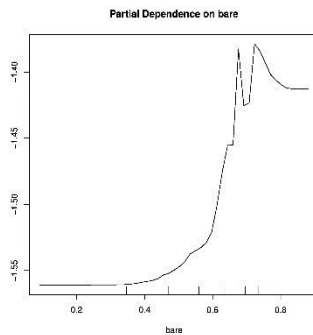
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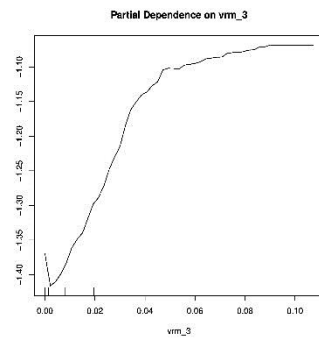
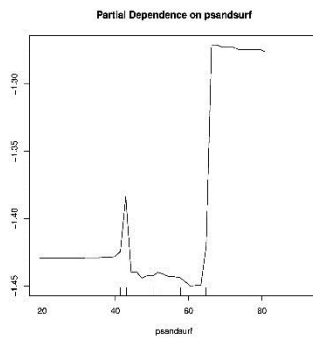
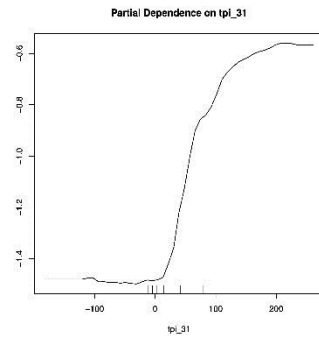
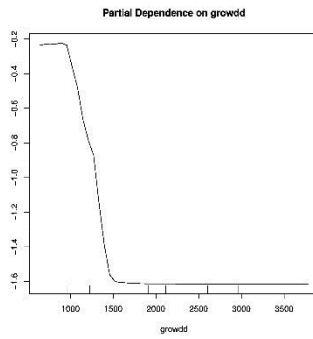
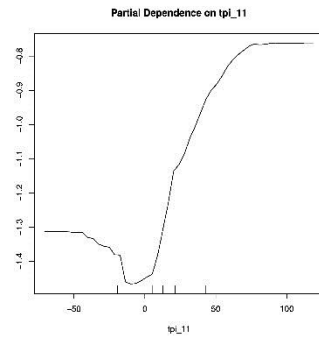
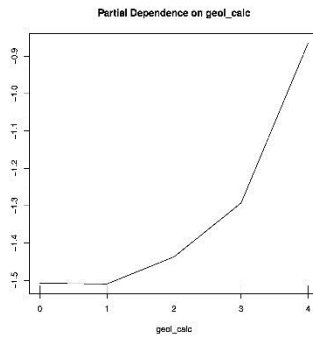
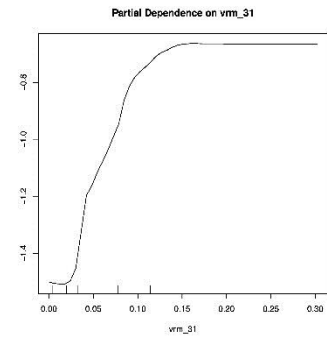
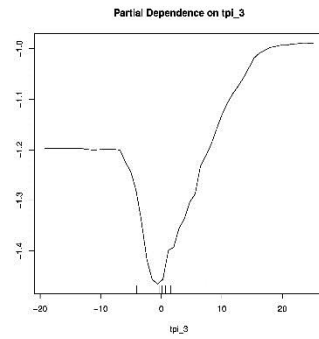
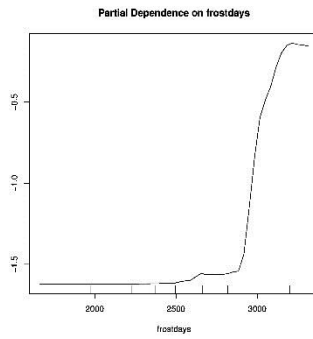
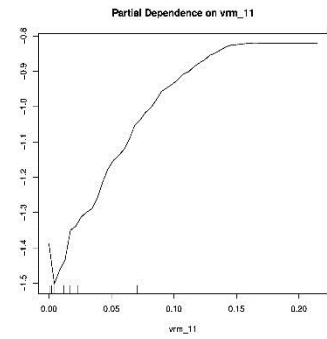
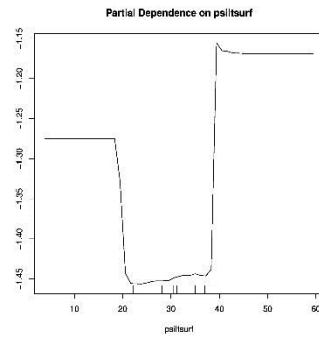
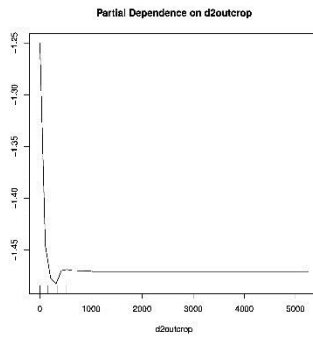
The graph below indicates the relative importance of predictors in modeling distribution for this species. “MeanDecreaseAccuracy” calculates importance by permuting (i.e., randomizing) values for the predictor and measuring the resulting decrease in model accuracy. This measure is typically a more reliable indicator of importance than “MeanDecreaseGini,” which measures improvement in a model due to splits based on the predictor. In both graphs, the further to the right the point falls on the graph, the higher the relative importance of the corresponding predictor. See Appendix 1 of this report for a detailed description of each predictor.



## Partial Plots

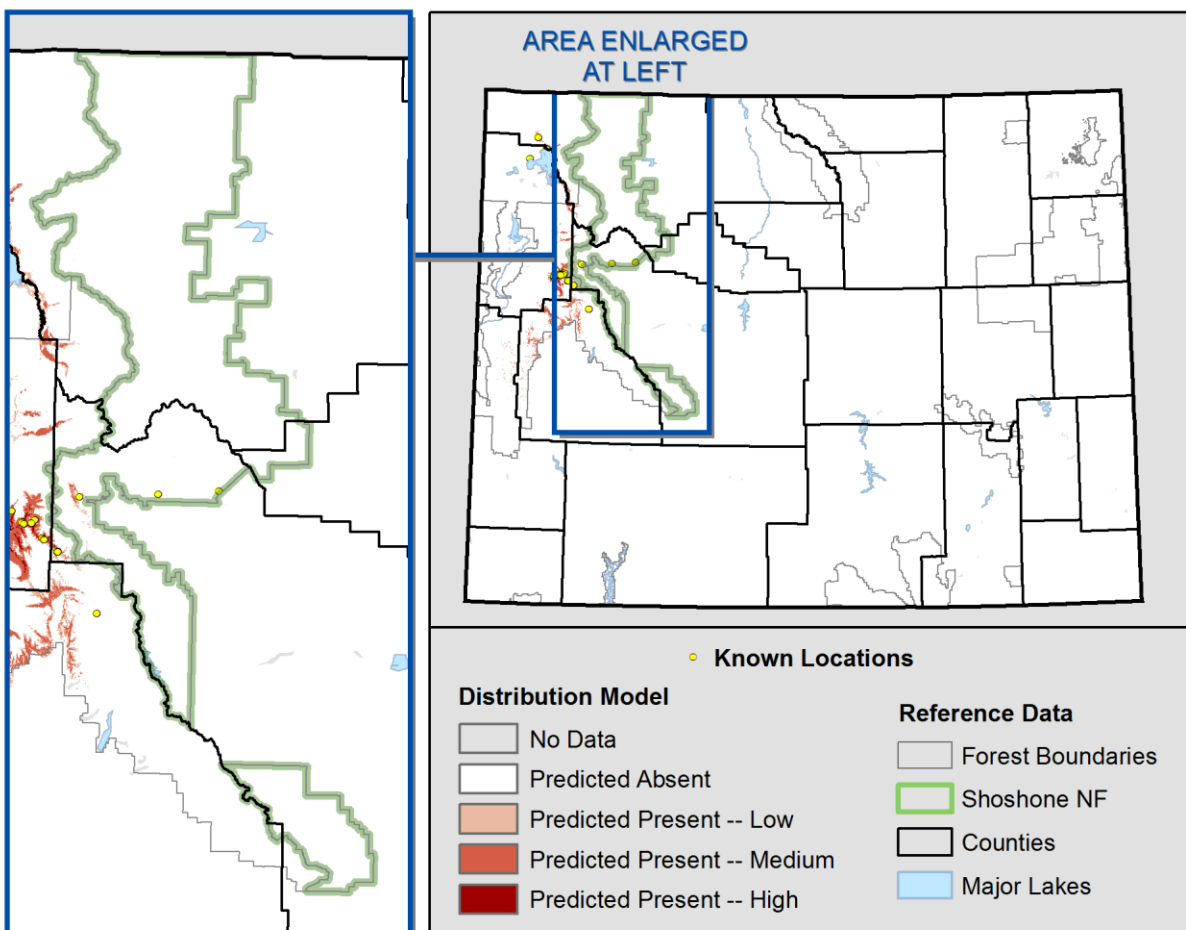
Partial plots show the relationship between a predictor variable and the predicted probability of occurrence, holding all other predictors at their average values. Probability values on the y-axis are unscaled; higher values on this axis indicate a higher relative probability of occurrence.





# Narrowleaf goldenweed (*Ericameria discoidea* var. *linearis*)

Model version: 2016-06-23



## Model Information

- Algorithm:** Random Forest
- Software:** R version 3.3.0 (2016-05-03); randomForest package v. 4.6.12
- Binary Threshold (MaxTSS):** 0.783
- Reclassification Table for Four-Category Version:**

From	To	Becomes
0	0.784	Predicted Absent (0)
0.784	0.836	Low (1)
0.836	0.994	Medium (2)
0.994	1	High (3)

## Model Details

- Number of Locations:** 19
- Out-of-Bag Error:** 6.4%
- TSS:** 79.4%
- Kappa:** 82.3%
- Sensitivity:** 81.8%
- Specificity:** 97.6%

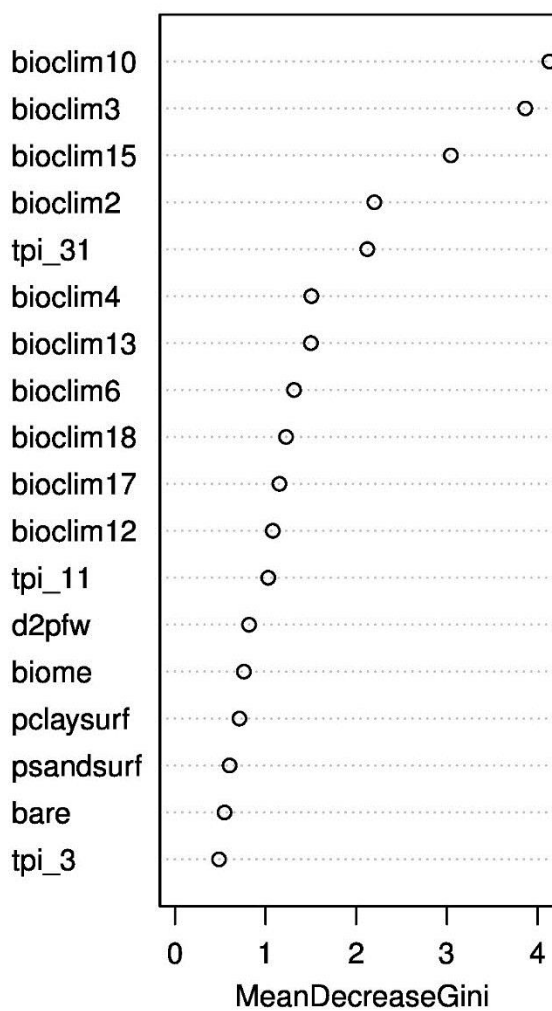
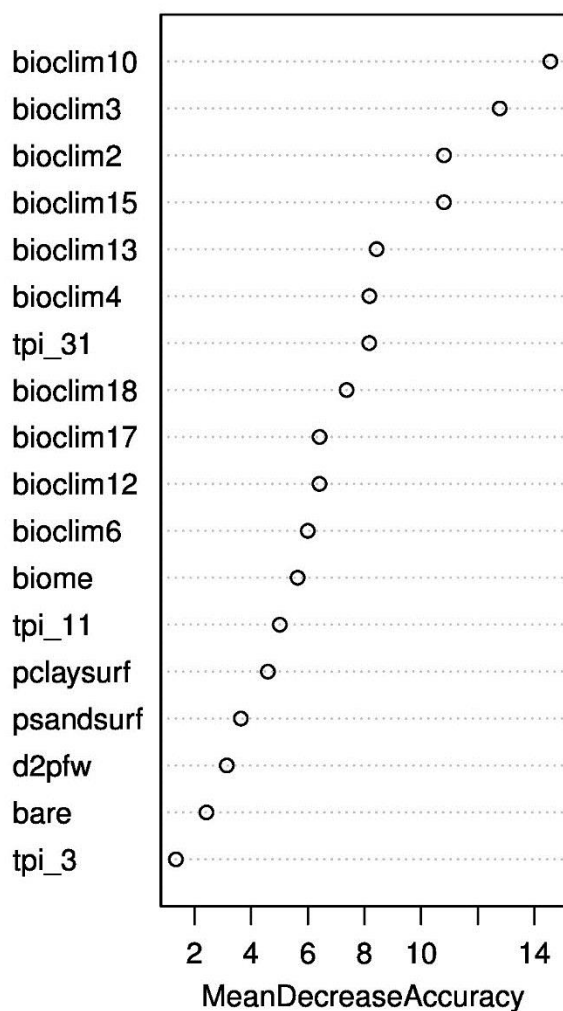
## Model Comments:

Regionally endemic plant species that are restricted to specific riparian conditions are difficult to model because statewide data are coarsely mapped and categorical. A layer was developed that combines layers representing riverine and palustrine settings along a distance gradient. Narrowleaf goldenweed

occupies cobbly stream terraces as found along major rivers, sometimes right along the rivers, and sometimes perched far above and distant from the current river course, on ancient terraces.

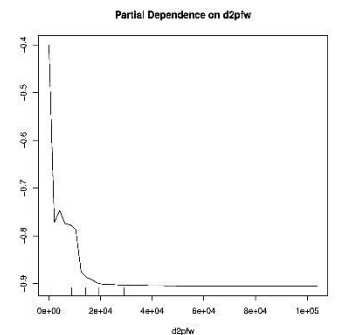
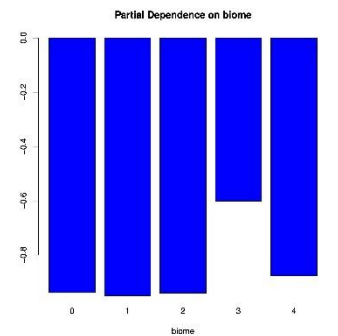
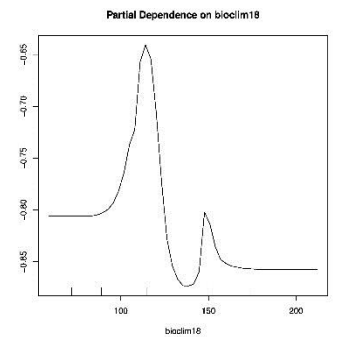
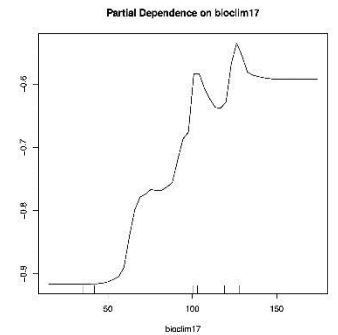
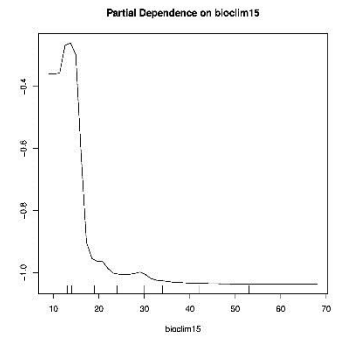
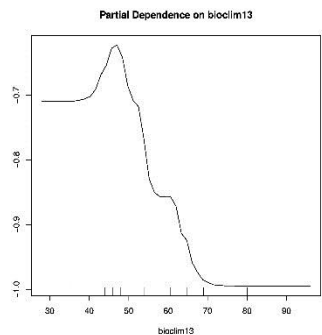
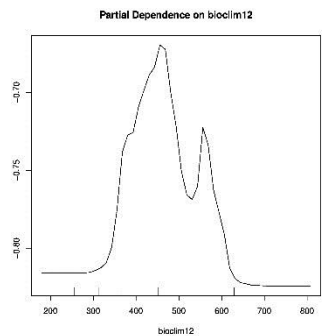
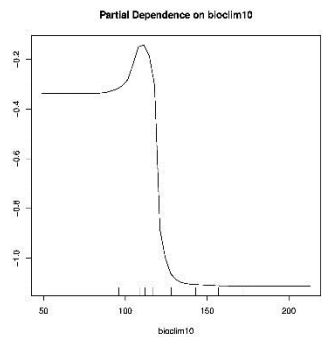
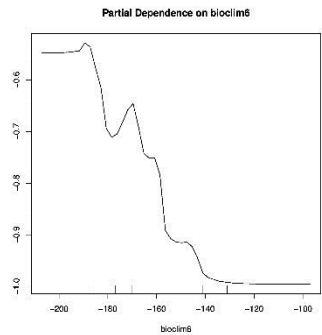
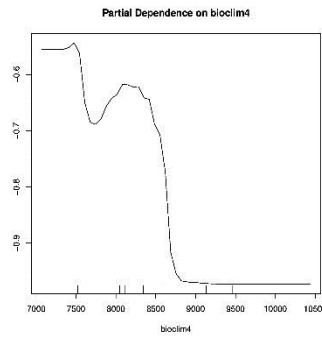
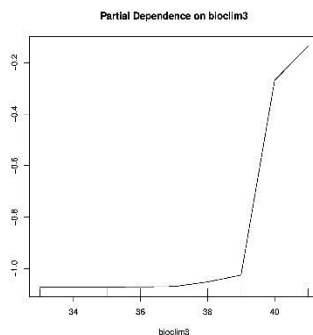
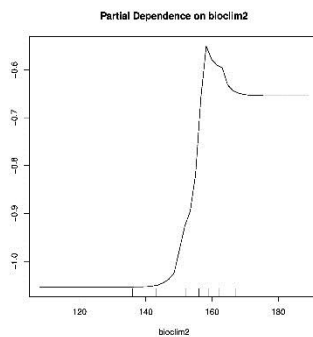
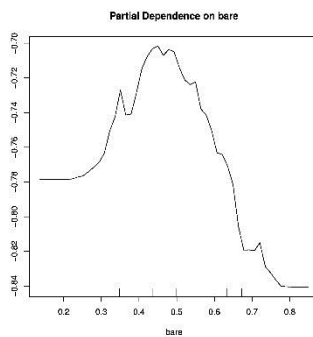
## Predictor Variable Importance:

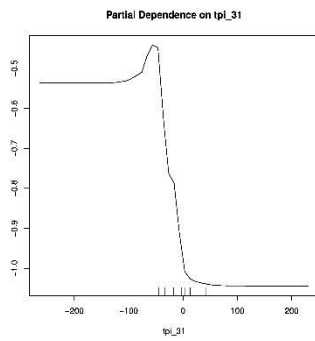
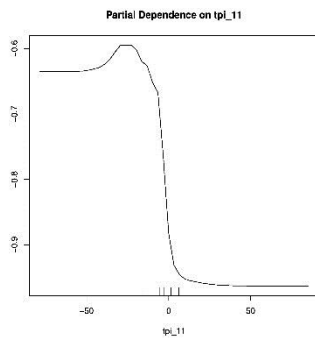
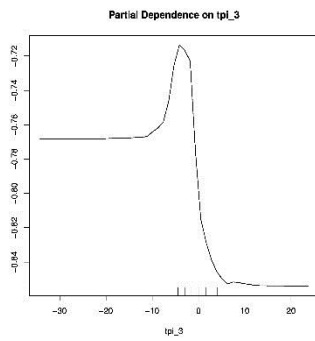
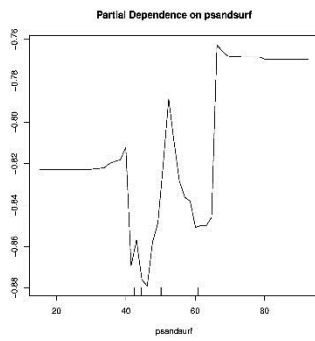
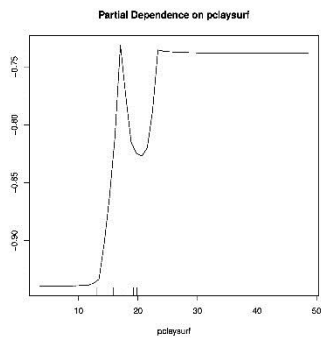
The graph below indicates the relative importance of predictors in modeling distribution for this species. “MeanDecreaseAccuracy” calculates importance by permuting (i.e., randomizing) values for the predictor and measuring the resulting decrease in model accuracy. This measure is typically a more reliable indicator of importance than “MeanDecreaseGini,” which measures improvement in a model due to splits based on the predictor. In both graphs, the further to the right the point falls on the graph, the higher the relative importance of the corresponding predictor. See Appendix 1 of this report for a detailed description of each predictor.



## Partial Plots

Partial plots show the relationship between a predictor variable and the predicted probability of occurrence, holding all other predictors at their average values. Probability values on the y-axis are unscaled; higher values on this axis indicate a higher relative probability of occurrence.

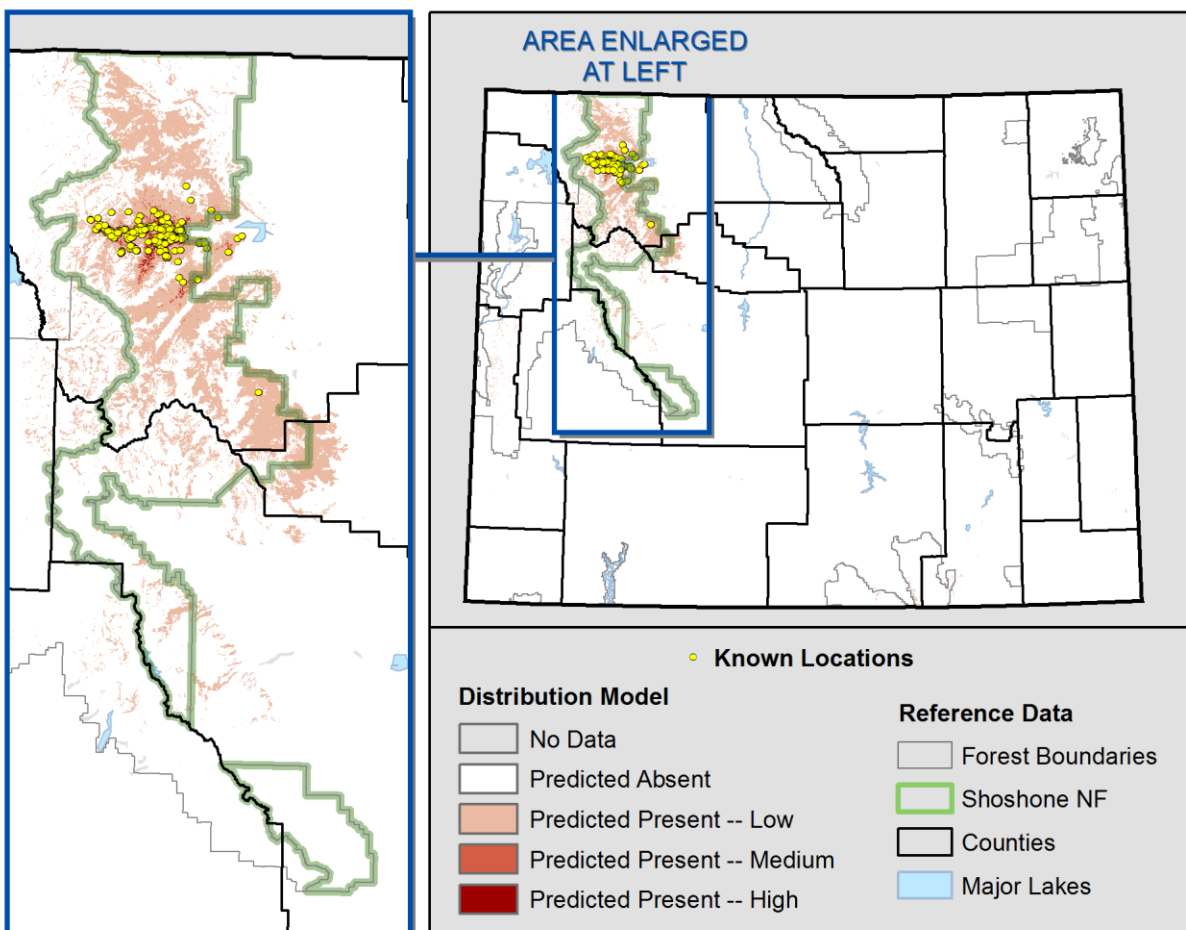






# North Fork Easter-daisy (*Townsendia condensata* var. *anomala*)

Model version: 2016-06-24



## Model Information

- **Algorithm:** Random Forest
- **Software:** R version 3.3.0 (2016-05-03); randomForest package v. 4.6.12
- **Binary Threshold (MaxTSS):** 0.608
- **Reclassification Table for Four-Category Version:**

From	To	Becomes
0	0.334	Predicted Absent (0)
0.334	0.856	Low (1)
0.856	0.972	Medium (2)
0.972	1	High (3)

## Model Details

- **Number of Locations:** 140
- **Out-of-Bag Error:** 5.1%
- **TSS:** 86.8%
- **Kappa:** 86.6%
- **Sensitivity:** 90.3%
- **Specificity:** 96.5%

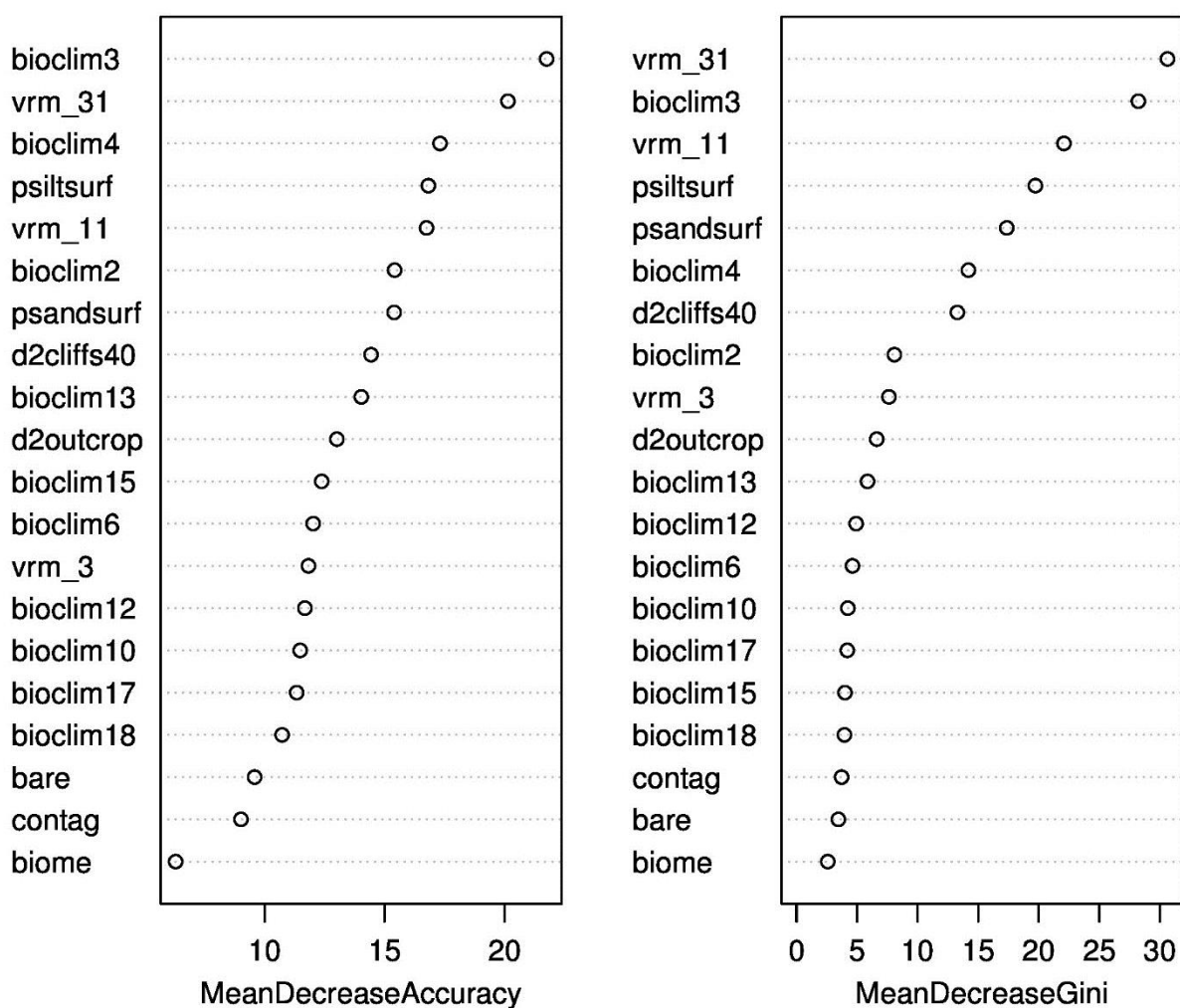
## Model Comments:

Endemic plant species that are restricted to specific soil conditions are difficult to model because statewide data are coarsely mapped and categorical. The statewide soils layer was parameterized to produce layers with gradients reflecting different soil properties. North Fork Easter-daisy is limited to

substrates derived from Absaroka volcanics, but bedrock geology was not included among environmental layers and it would eliminate most low probability potential habitat. In other words, the geological complexity of the settings where it occurs and crudeness of the surrogate layer might further contribute to overpredicting low probability potential habitat.

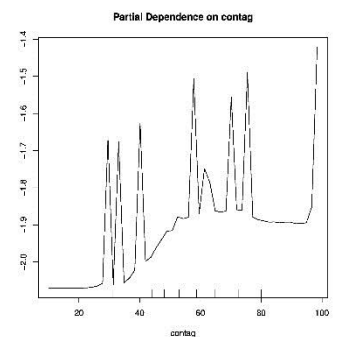
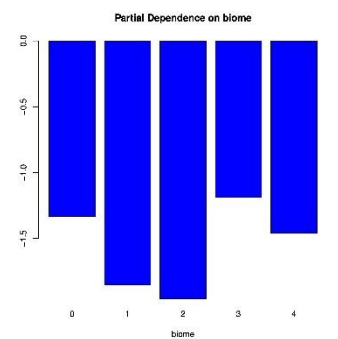
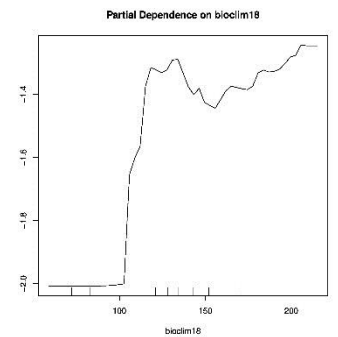
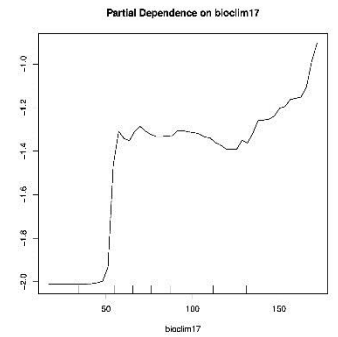
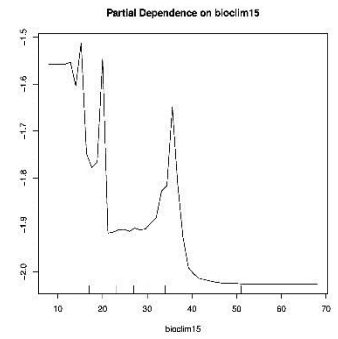
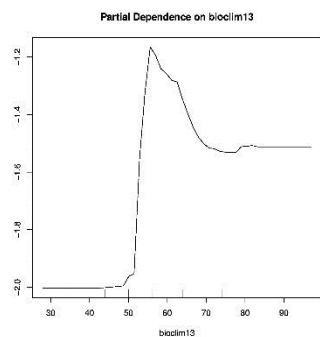
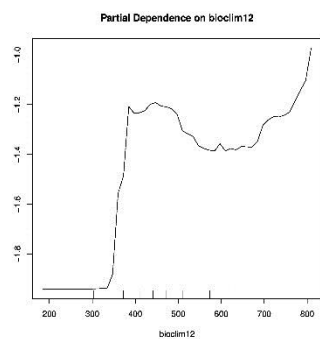
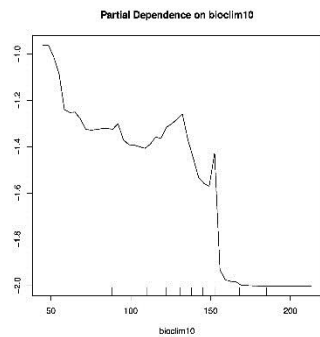
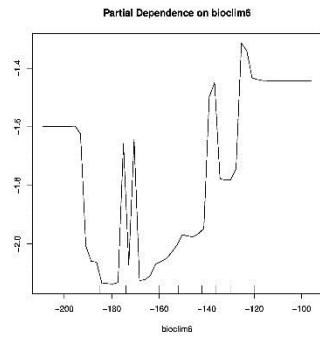
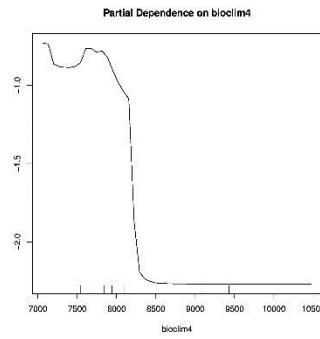
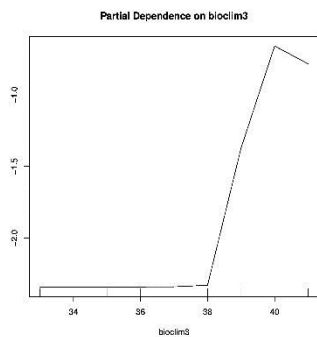
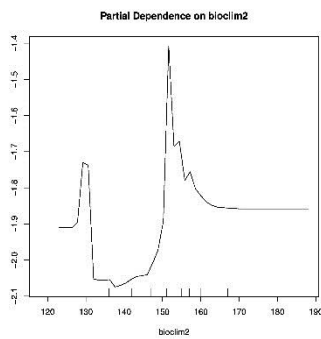
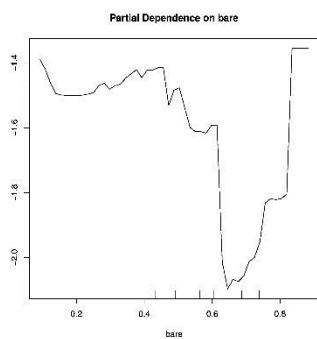
## Predictor Variable Importance:

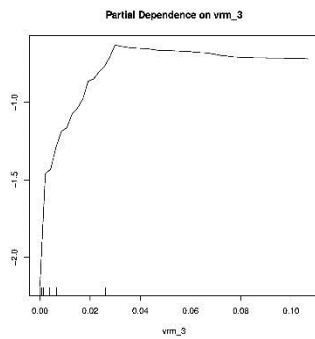
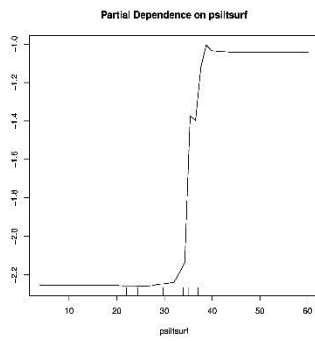
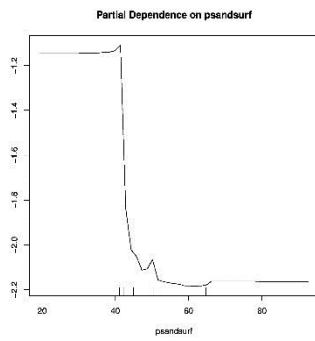
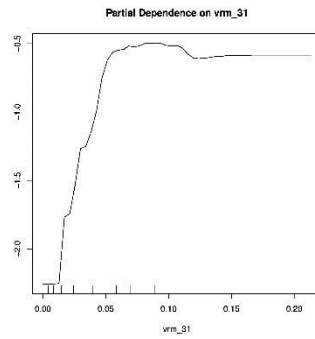
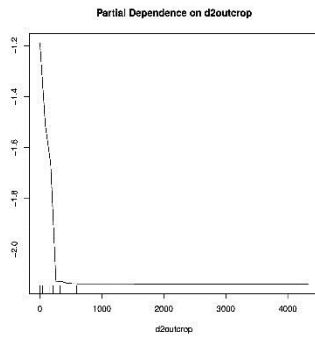
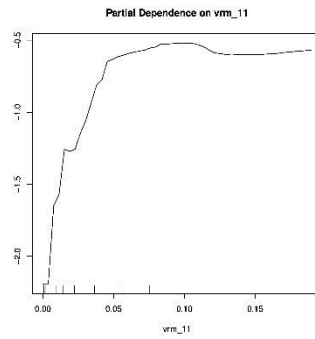
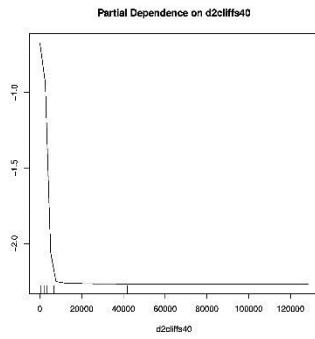
The graph below indicates the relative importance of predictors in modeling distribution for this species. “MeanDecreaseAccuracy” calculates importance by permuting (i.e., randomizing) values for the predictor and measuring the resulting decrease in model accuracy. This measure is typically a more reliable indicator of importance than “MeanDecreaseGini,” which measures improvement in a model due to splits based on the predictor. In both graphs, the further to the right the point falls on the graph, the higher the relative importance of the corresponding predictor. See Appendix 1 of this report for a detailed description of each predictor.



## Partial Plots

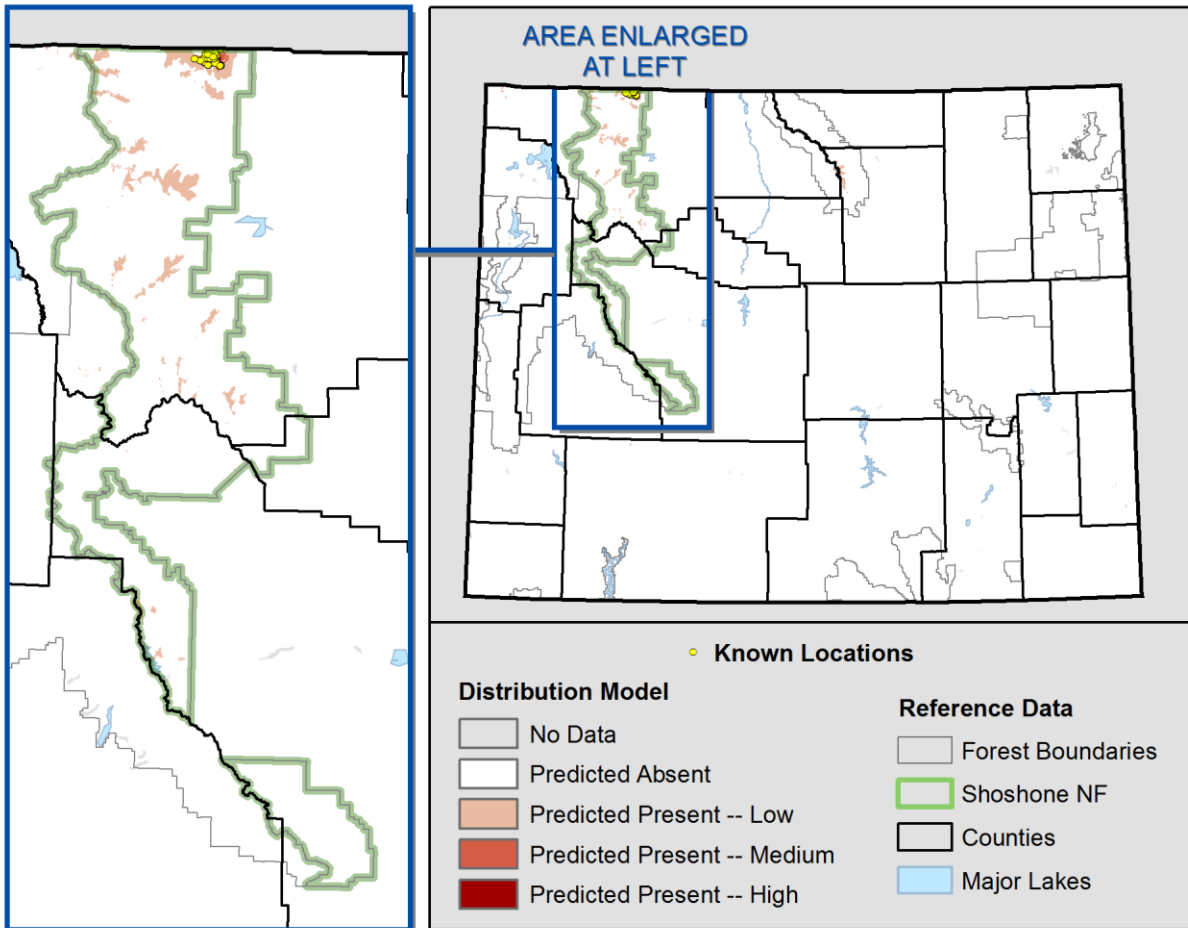
Partial plots show the relationship between a predictor variable and the predicted probability of occurrence, holding all other predictors at their average values. Probability values on the y-axis are unscaled; higher values on this axis indicate a higher relative probability of occurrence.





# Oeder's lousewort (*Pedicularis oederi*)

Model version: 2016-06-23



## Model Information

- **Algorithm:** Random Forest
- **Software:** R version 3.3.0 (2016-05-03); randomForest package v. 4.6.12
- **Binary Threshold (MaxTSS):** 0.543
- **Reclassification Table for Four-Category Version:**

From	To	Becomes
0	0.404	Predicted Absent (0)
0.404	0.986	Low (1)
0.986	1	Medium (2)
1	1	High (3)

## Model Details

- **Number of Locations:** 25
- **Out-of-Bag Error:** 2.3%
- **TSS:** 95.3%
- **Kappa:** 94.0%
- **Sensitivity:** 97.4%
- **Specificity:** 97.8%

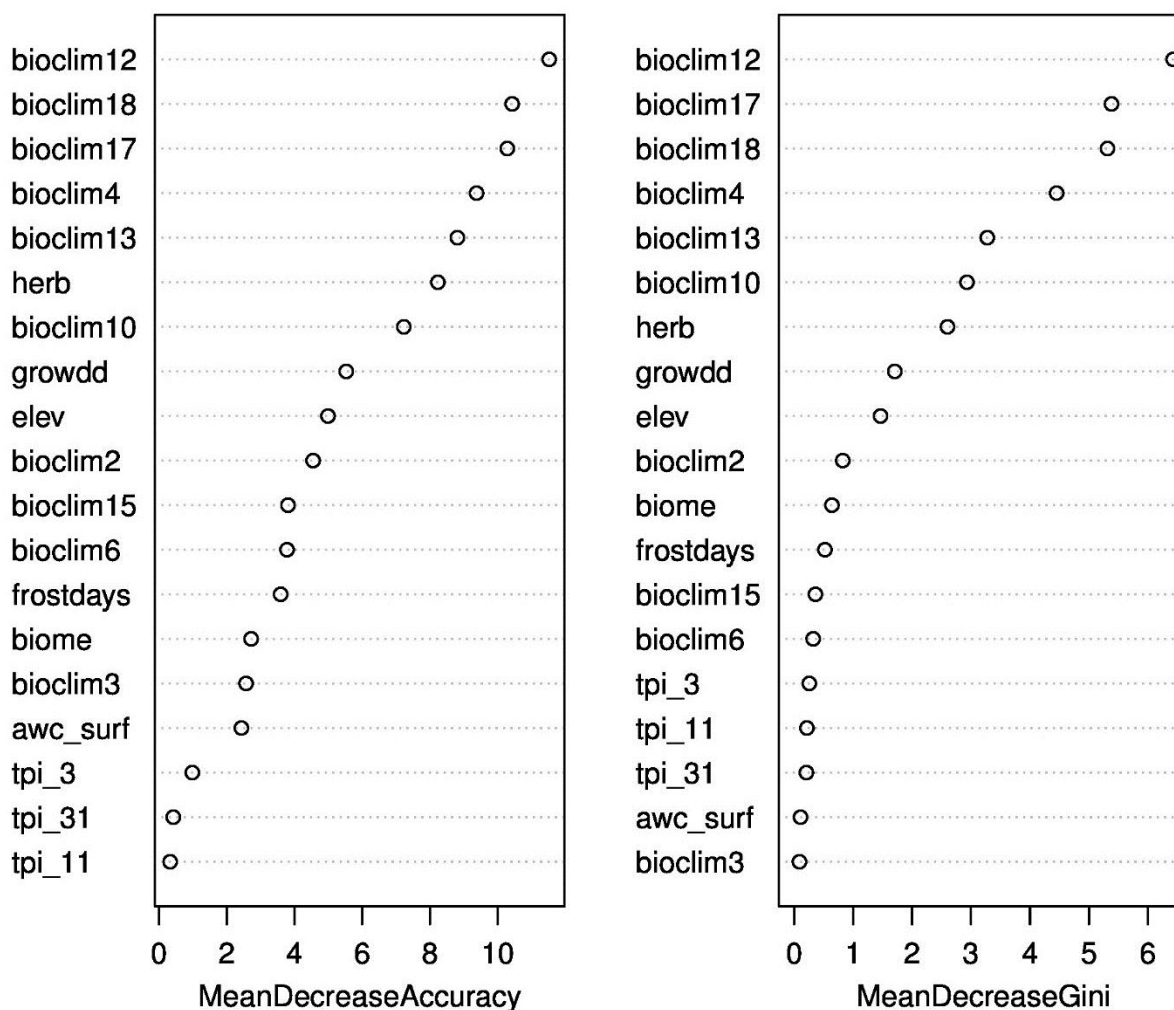
## Model Comments:

Rare alpine plant species that are restricted to specific soil conditions are difficult to model because statewide data are coarsely mapped and categorical. The statewide soils layer was parameterized to produce layers with gradients reflecting different soil properties. In addition, for calciphilic species such

as Oeder's lousewort, a surrogate layer was developed from bedrock geology layers to reflect calcium carbonate content. Its habitat may also represent a relict unglaciated alpine "island of habitat" during glacial periods, beyond the scope of modeling.

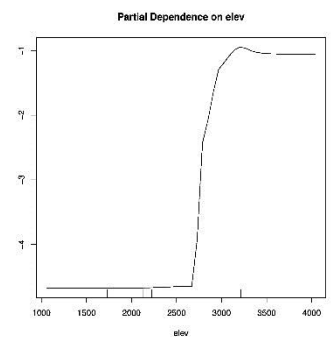
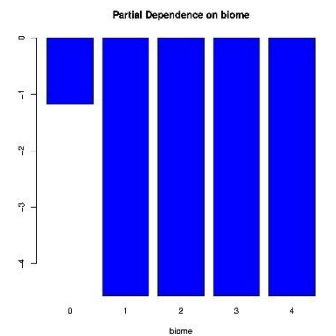
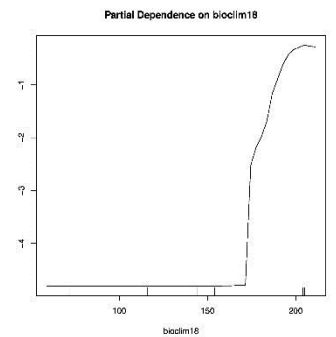
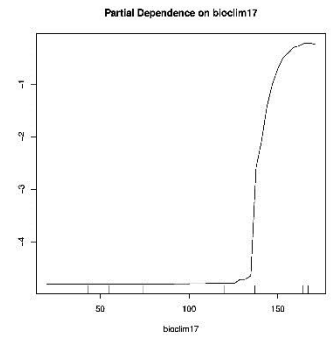
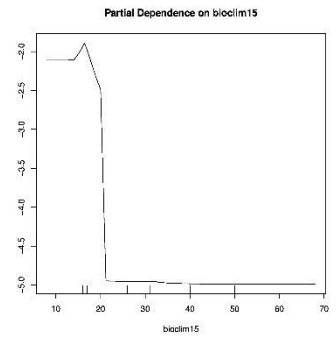
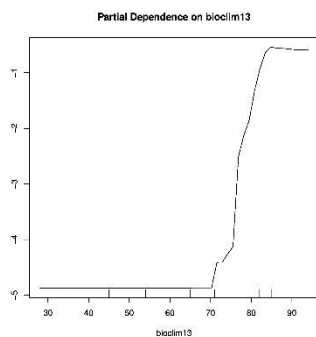
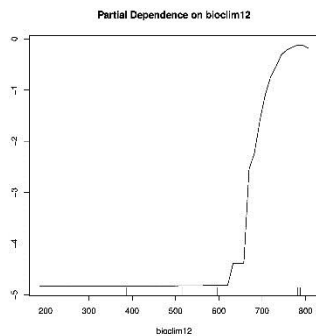
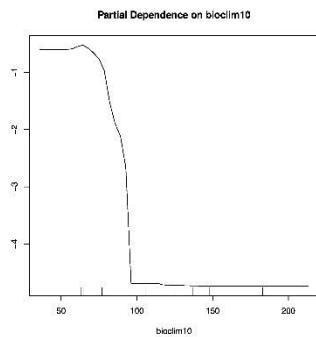
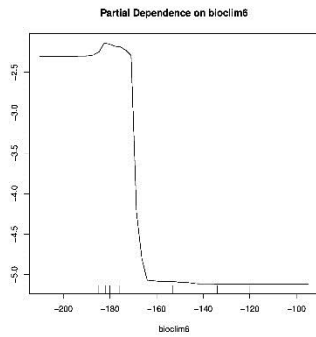
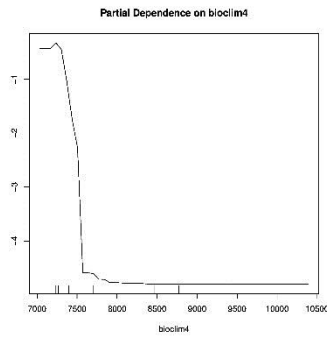
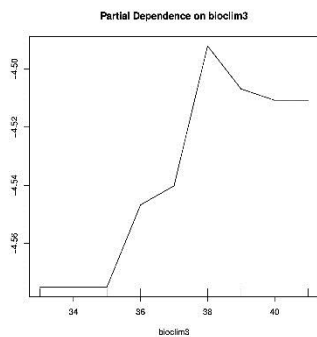
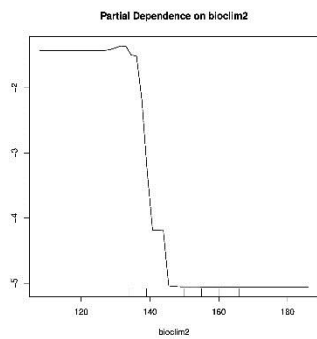
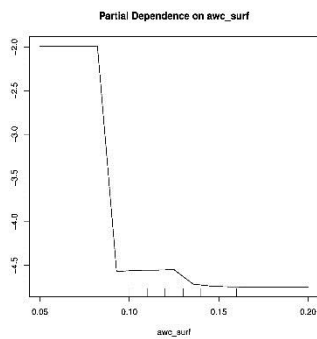
## Predictor Variable Importance:

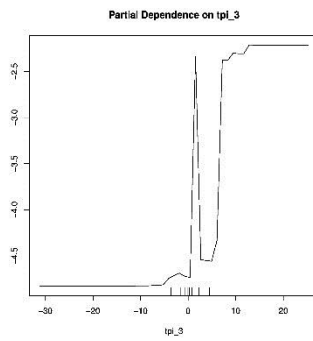
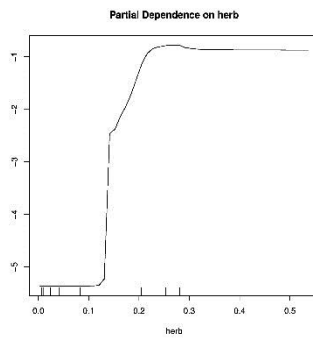
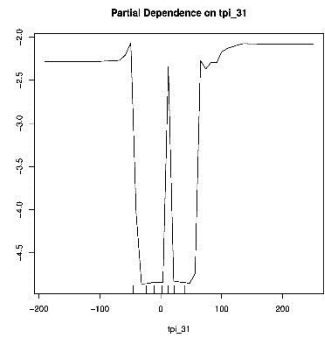
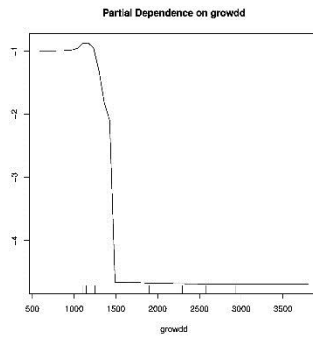
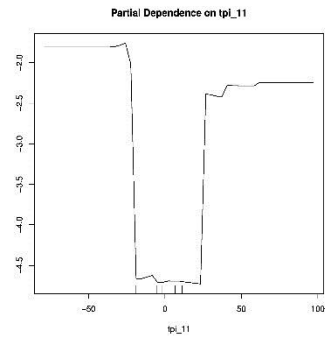
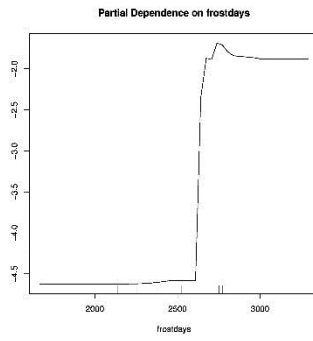
The graph below indicates the relative importance of predictors in modeling distribution for this species. "MeanDecreaseAccuracy" calculates importance by permuting (i.e., randomizing) values for the predictor and measuring the resulting decrease in model accuracy. This measure is typically a more reliable indicator of importance than "MeanDecreaseGini," which measures improvement in a model due to splits based on the predictor. In both graphs, the further to the right the point falls on the graph, the higher the relative importance of the corresponding predictor. See Appendix 1 of this report for a detailed description of each predictor.



## Partial Plots

Partial plots show the relationship between a predictor variable and the predicted probability of occurrence, holding all other predictors at their average values. Probability values on the y-axis are unscaled; higher values on this axis indicate a higher relative probability of occurrence.

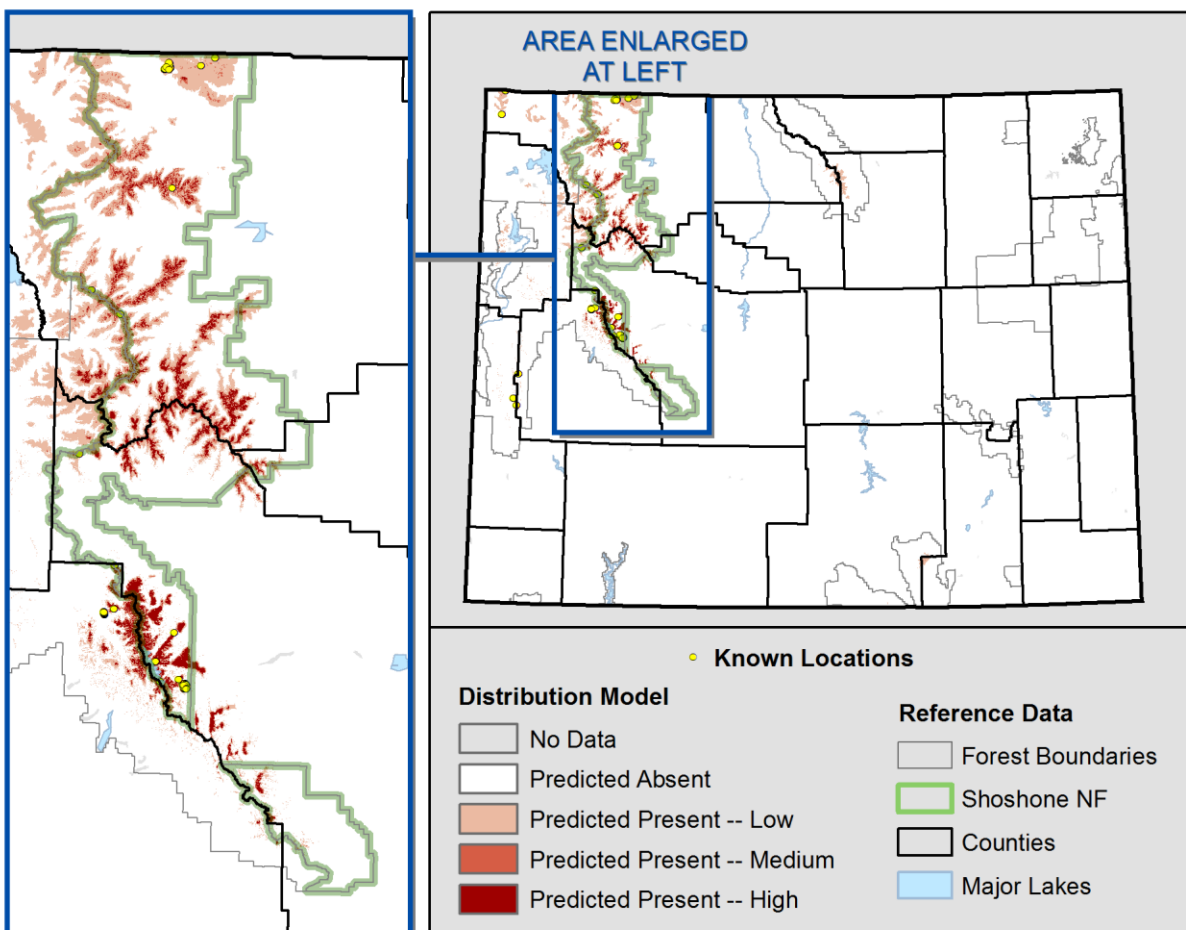






# Payson's whitlow-grass (*Draba paysonii* var. *paysonii*)

Model version: 2016-06-22



## Model Information

- Algorithm:** Random Forest
- Software:** R version 3.3.0 (2016-05-03); randomForest package v. 4.6.12
- Binary Threshold (MaxTSS):** 0.520
- Reclassification Table for Four-Category Version:**

From	To	Becomes
0	0.510	Predicted Absent (0)
0.510	0.818	Low (1)
0.818	0.938	Medium (2)
0.938	1	High (3)

## Model Details

- Number of Locations:** 24
- Out-of-Bag Error:** 10.8%
- TSS:** 73.3%
- Kappa:** 71.8%
- Sensitivity:** 81.5%
- Specificity:** 91.8%

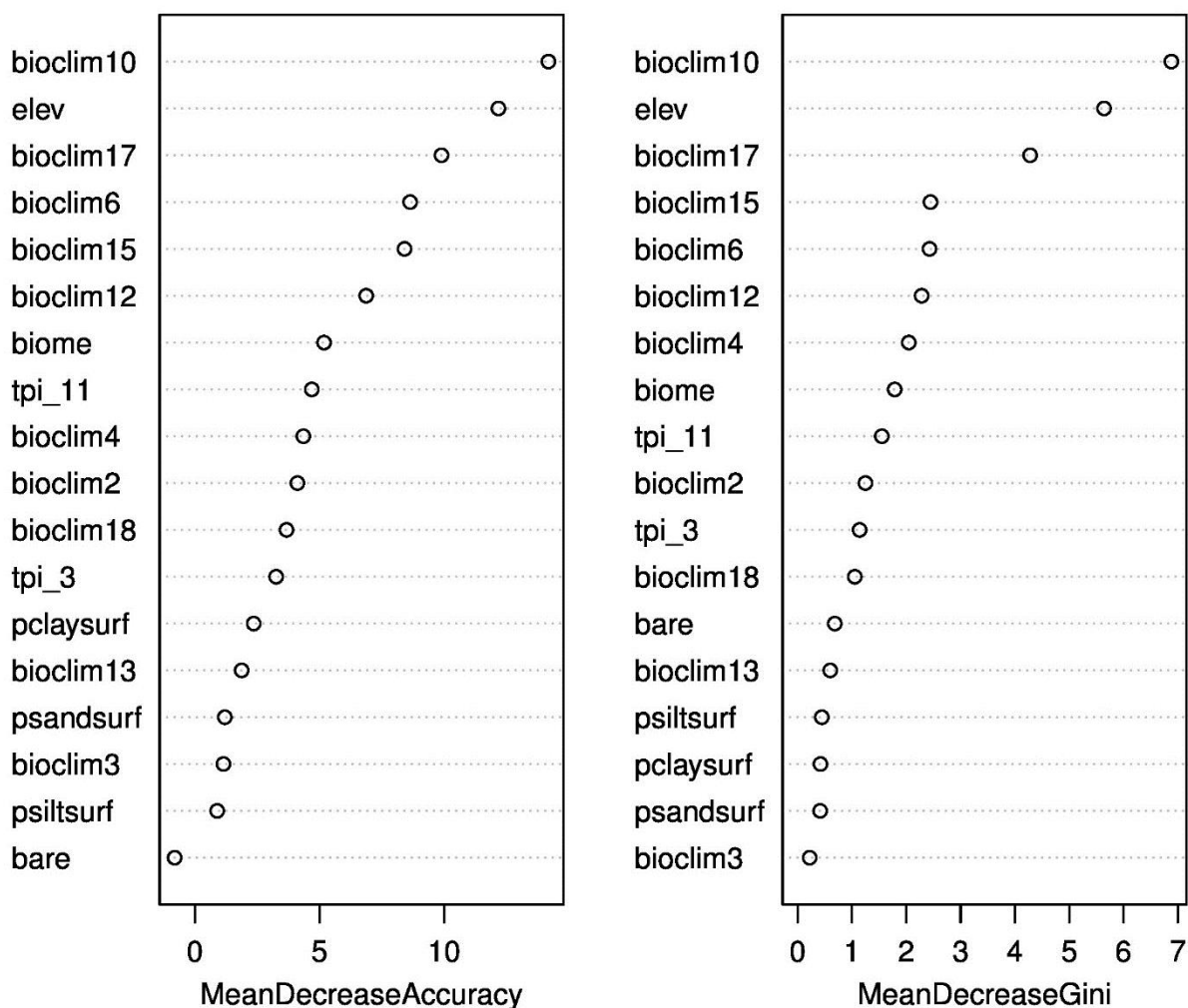
## Model Comments:

Rare alpine plant species that are restricted to certain soil conditions are difficult to model because statewide data are coarsely mapped and categorical. The statewide soils layer was parameterized to produce layers with gradients reflecting different soil properties. For species such as Payson's whitlow-

grass that occupy more than one substrate (mainly limestone but also volcanics), no single surrogate layer will improve model performance. The geological complexity of the settings where it occurs and crudeness of the surrogate layer might account for the extent of high probability potential habitat.

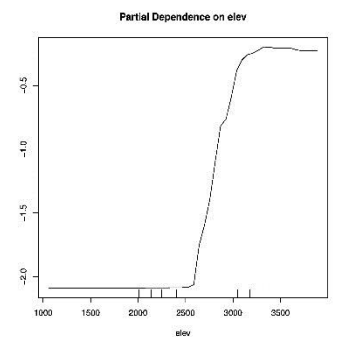
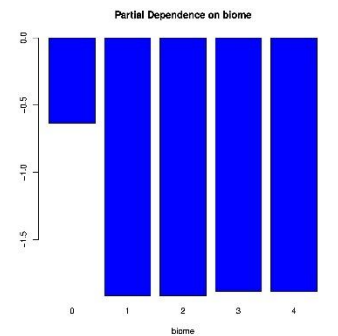
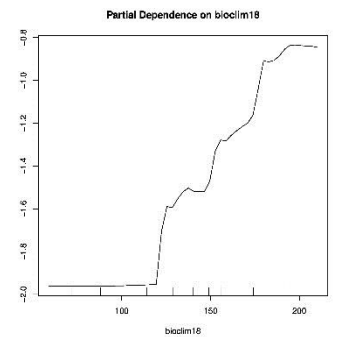
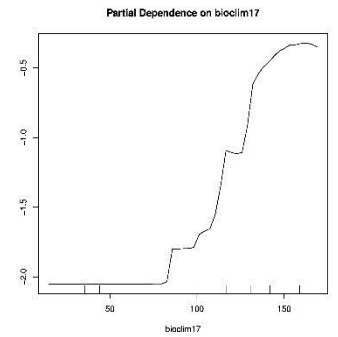
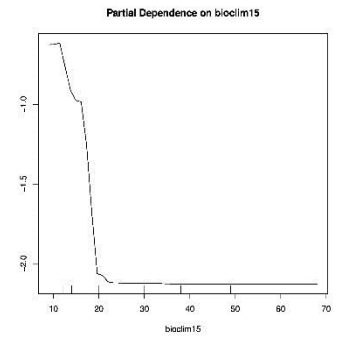
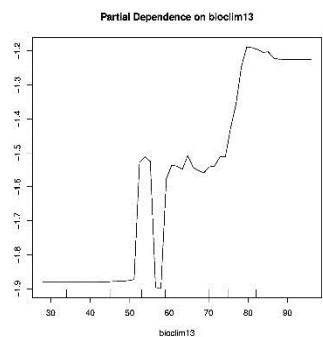
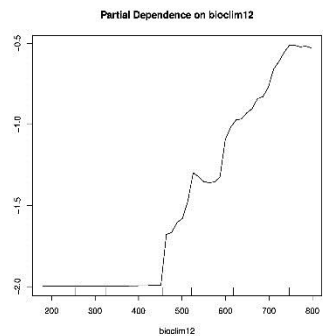
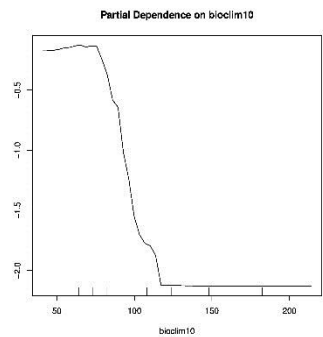
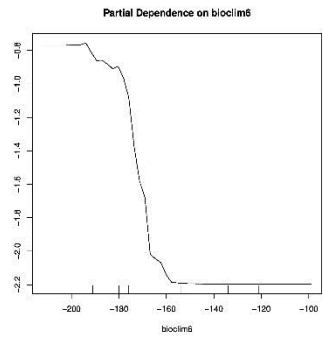
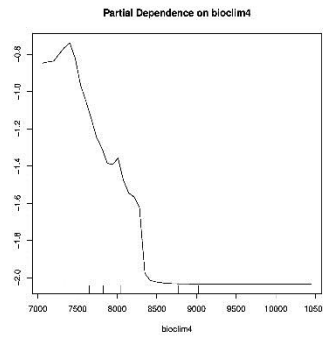
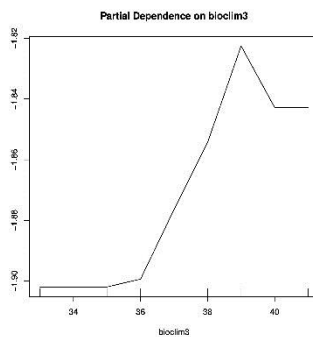
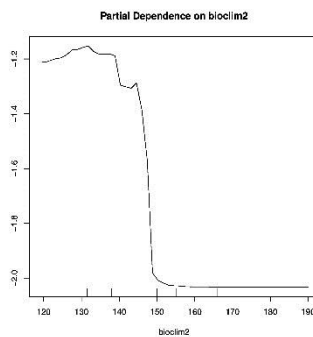
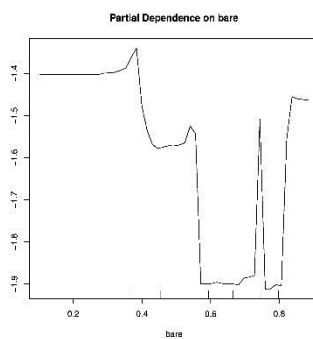
### Predictor Variable Importance:

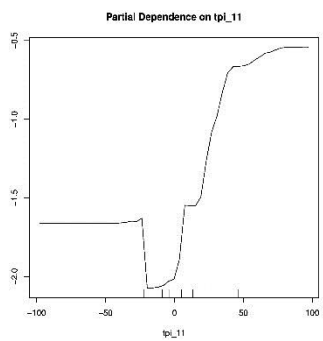
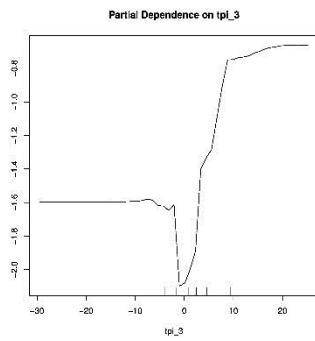
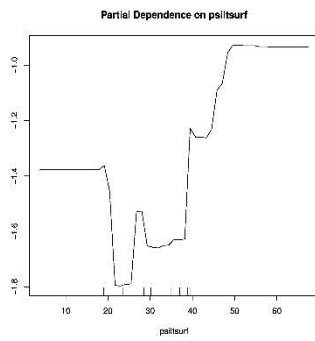
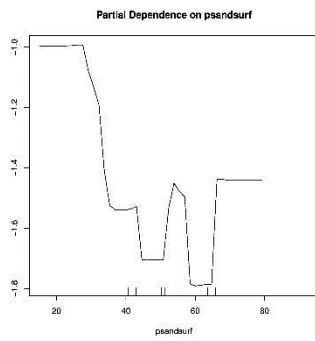
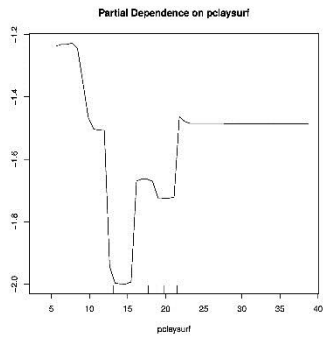
The graph below indicates the relative importance of predictors in modeling distribution for this species. “MeanDecreaseAccuracy” calculates importance by permuting (i.e., randomizing) values for the predictor and measuring the resulting decrease in model accuracy. This measure is typically a more reliable indicator of importance than “MeanDecreaseGini,” which measures improvement in a model due to splits based on the predictor. In both graphs, the further to the right the point falls on the graph, the higher the relative importance of the corresponding predictor. See Appendix 1 of this report for a detailed description of each predictor.



## Partial Plots

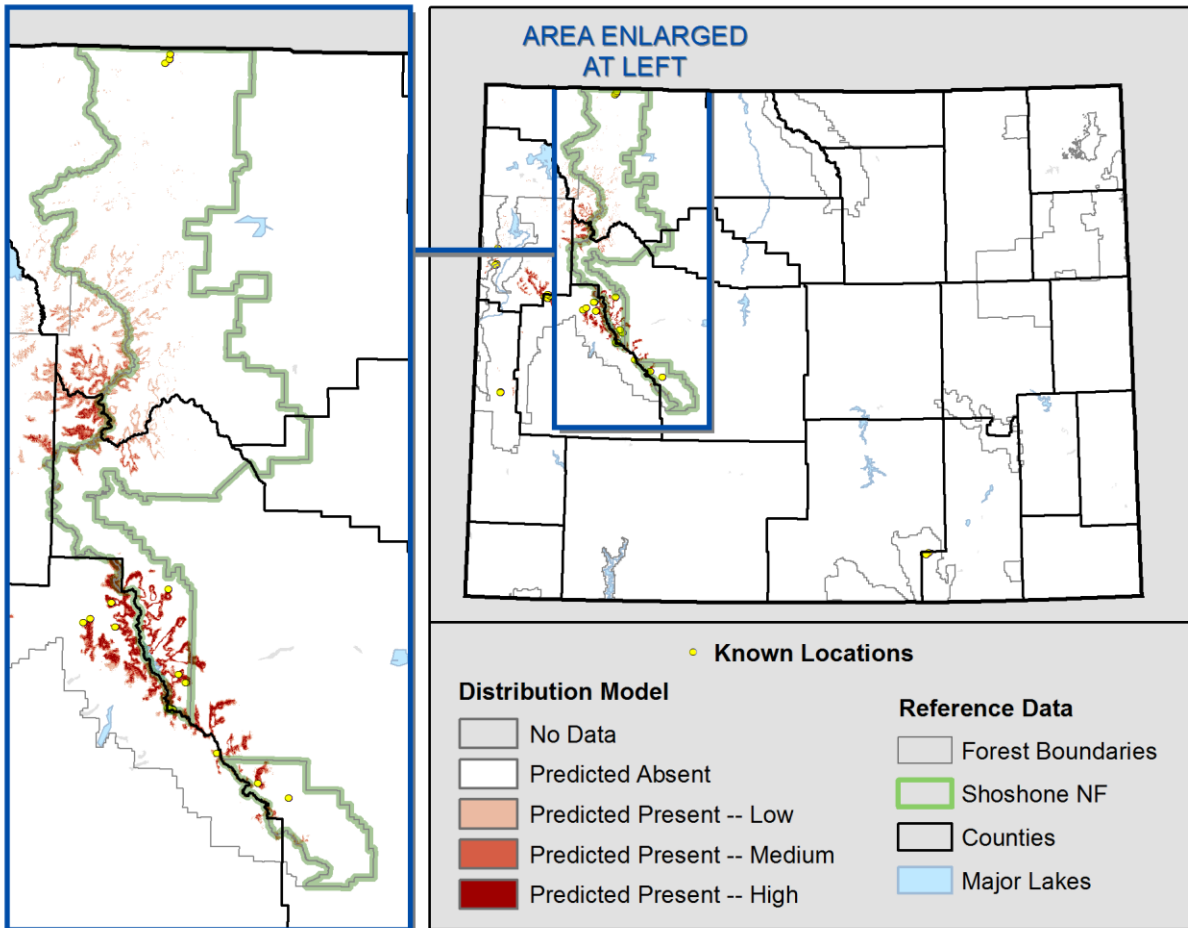
Partial plots show the relationship between a predictor variable and the predicted probability of occurrence, holding all other predictors at their average values. Probability values on the y-axis are unscaled; higher values on this axis indicate a higher relative probability of occurrence.





# Rockcress whitlow-grass (*Draba globosa*)

Model version: 2016-06-22



## Model Information

- Algorithm:** Random Forest
- Software:** R version 3.3.0 (2016-05-03); randomForest package v. 4.6.12
- Binary Threshold (MaxTSS):** 0.732
- Reclassification Table for Four-Category Version:**

From	To	Becomes
0	0.728	Predicted Absent (0)
0.728	0.830	Low (1)
0.830	0.950	Medium (2)
0.950	1	High (3)

## Model Details

- Number of Locations:** 28
- Out-of-Bag Error:** 9.6%
- TSS:** 77.4%
- Kappa:** 75.2%
- Sensitivity:** 85.2%
- Specificity:** 92.1%

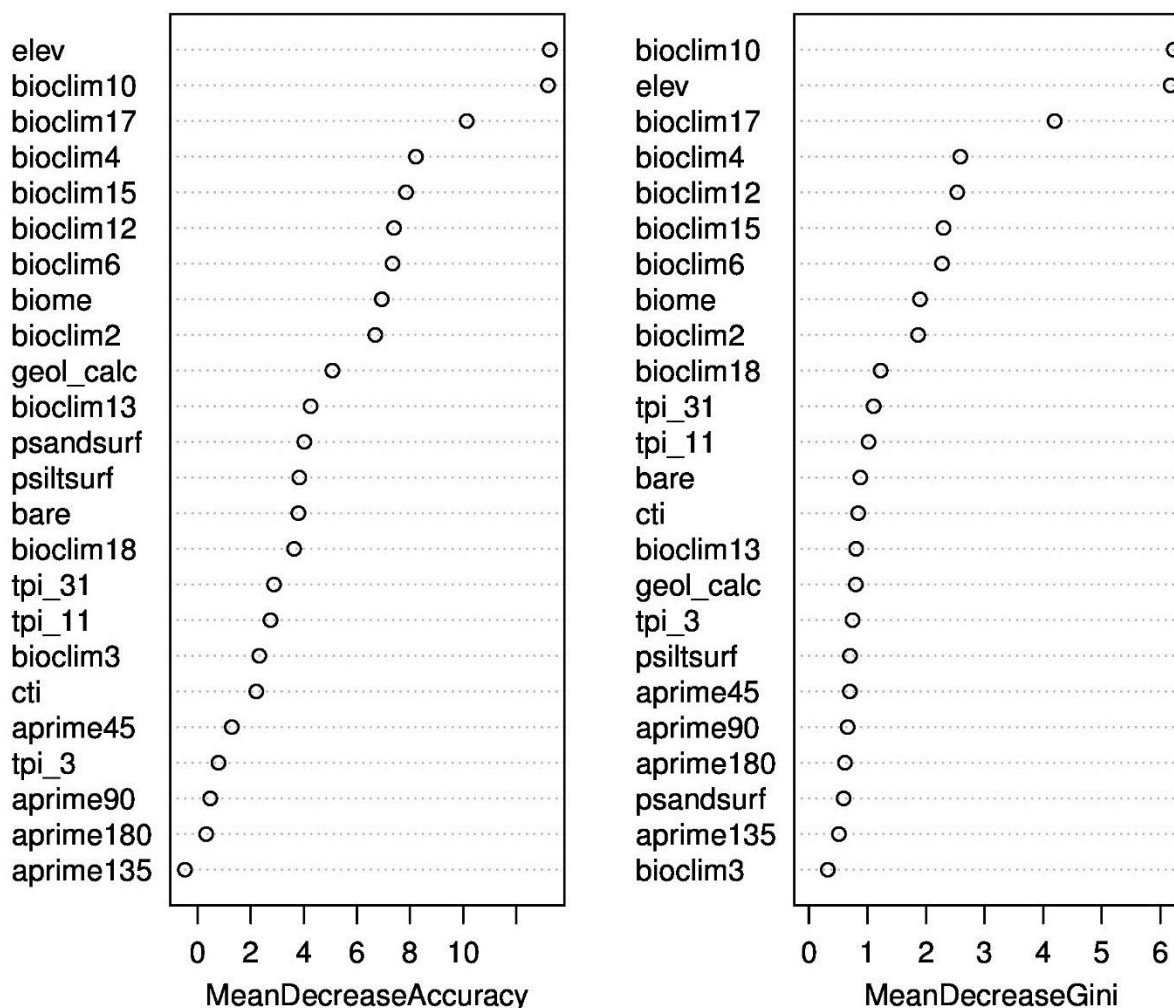
## Model Comments:

Regionally endemic plant species that are restricted to specific soil conditions are difficult to model because statewide data are coarsely mapped and categorical. The statewide soils layer was parameterized to produce layers with gradients reflecting different soil properties. In addition, for

calciphilic species such as Rockcress whitlow-grass, a surrogate layer was developed from bedrock geology layers to reflect calcium carbonate content.

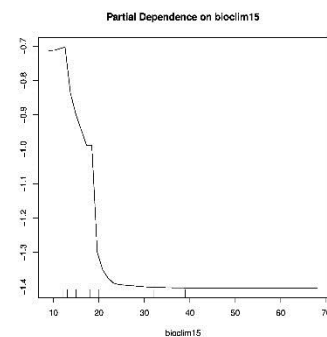
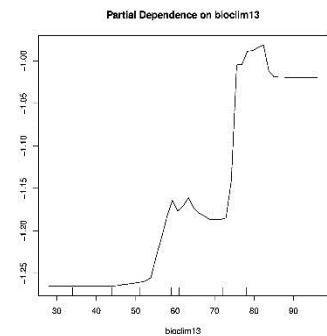
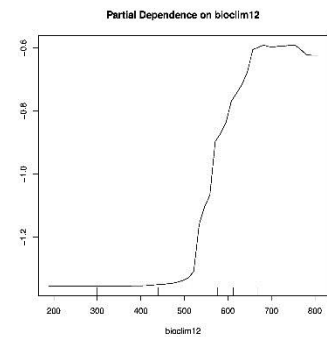
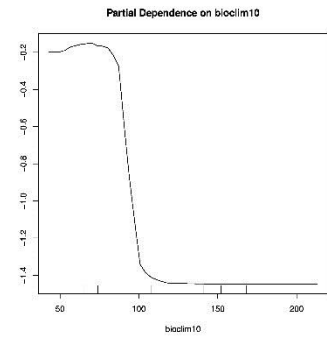
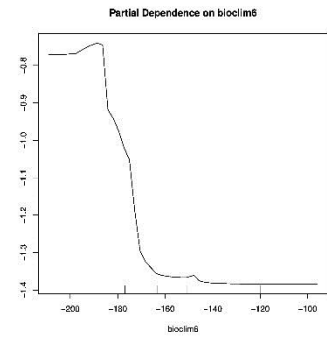
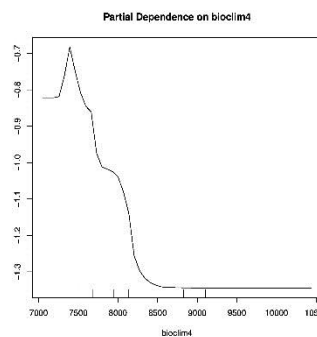
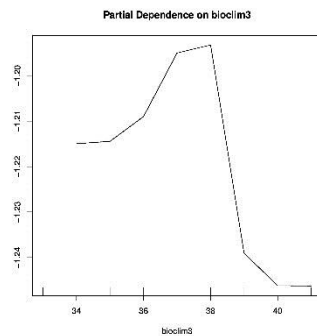
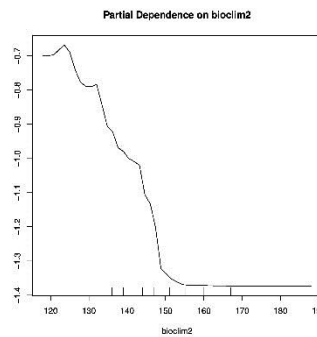
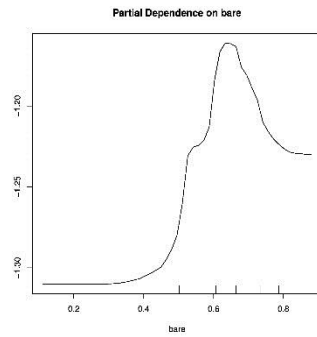
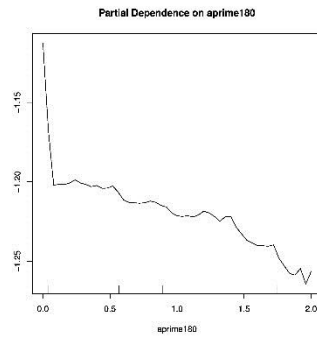
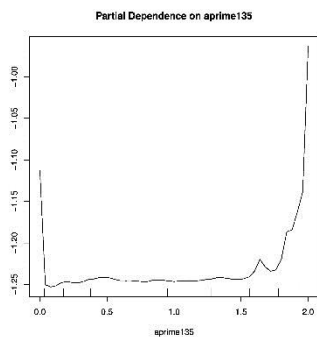
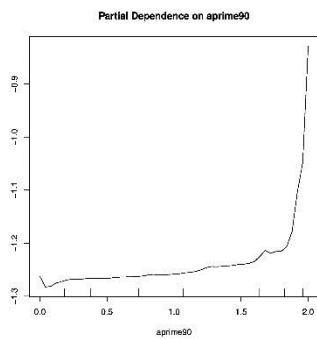
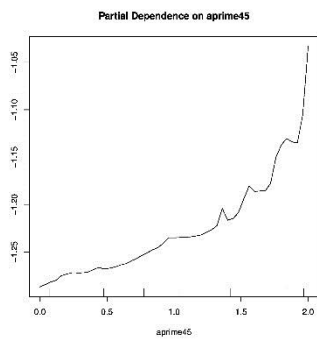
## Predictor Variable Importance:

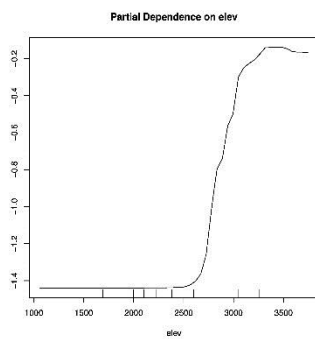
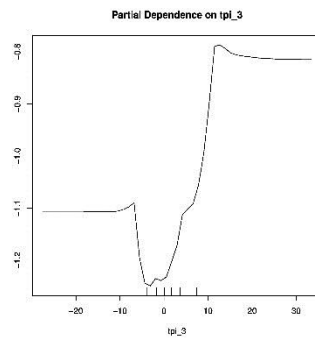
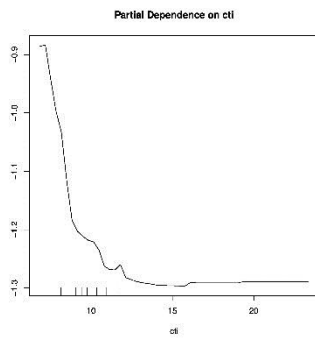
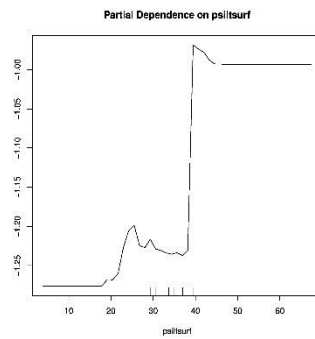
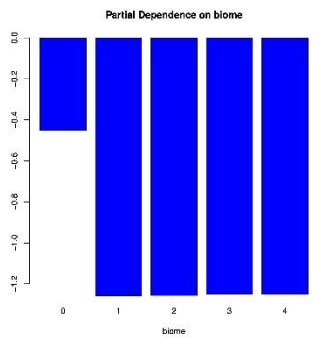
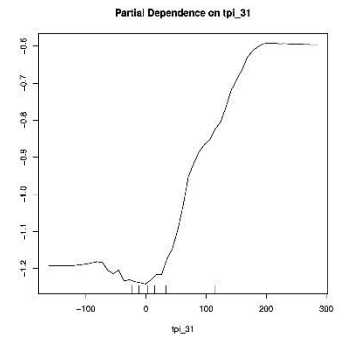
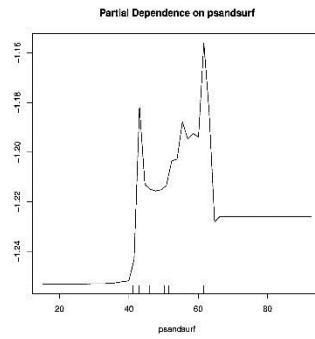
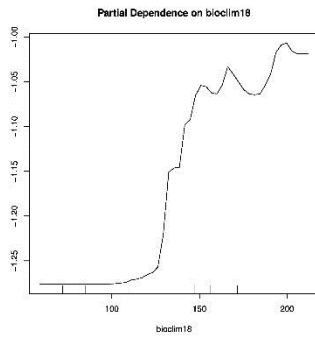
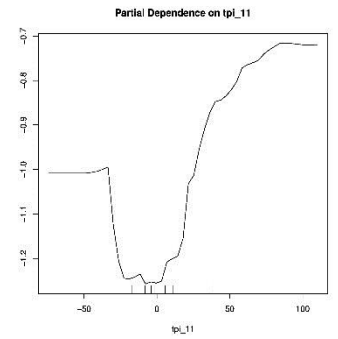
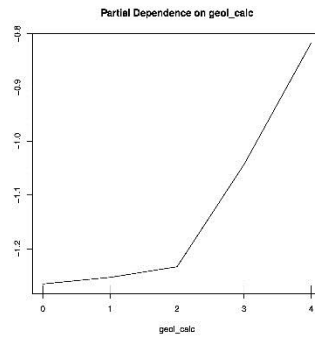
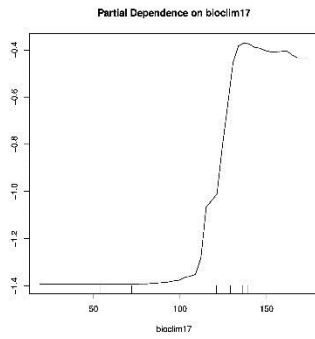
The graph below indicates the relative importance of predictors in modeling distribution for this species. “MeanDecreaseAccuracy” calculates importance by permuting (i.e., randomizing) values for the predictor and measuring the resulting decrease in model accuracy. This measure is typically a more reliable indicator of importance than “MeanDecreaseGini,” which measures improvement in a model due to splits based on the predictor. In both graphs, the further to the right the point falls on the graph, the higher the relative importance of the corresponding predictor. See Appendix 1 of this report for a detailed description of each predictor.



## Partial Plots

Partial plots show the relationship between a predictor variable and the predicted probability of occurrence, holding all other predictors at their average values. Probability values on the y-axis are unscaled; higher values on this axis indicate a higher relative probability of occurrence.

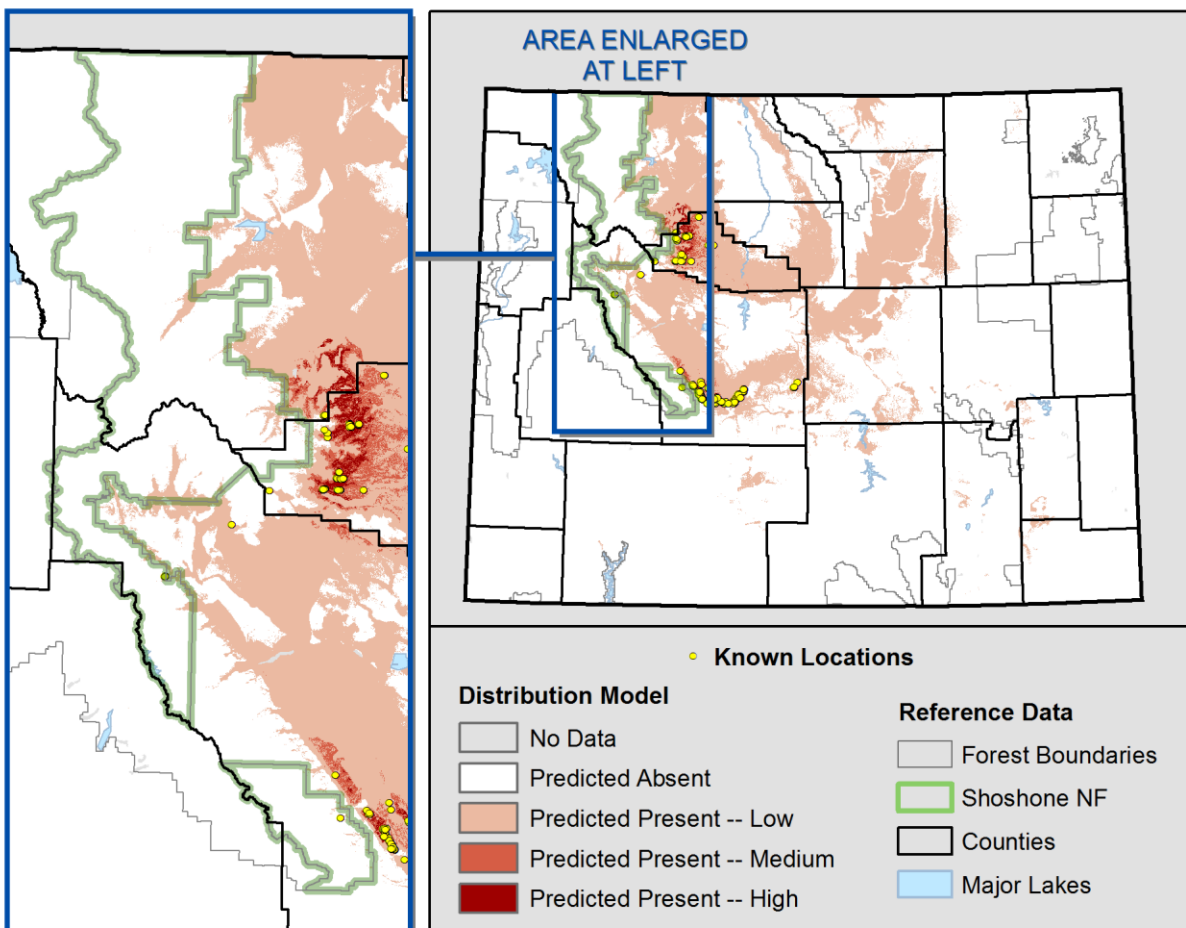






# Rocky Mountain twinpod (*Physaria saximontana* var. *saximontana*)

Model version: 2016-06-24



## Model Information

- Algorithm:** Random Forest
- Software:** R version 3.3.0 (2016-05-03); randomForest package v. 4.6.12
- Binary Threshold (MaxTSS):** 0.397
- Reclassification Table for Four-Category Version:**

From	To	Becomes
0	0.270	Predicted Absent (0)
0.270	0.888	Low (1)
0.888	0.984	Medium (2)
0.984	1	High (3)

## Model Details

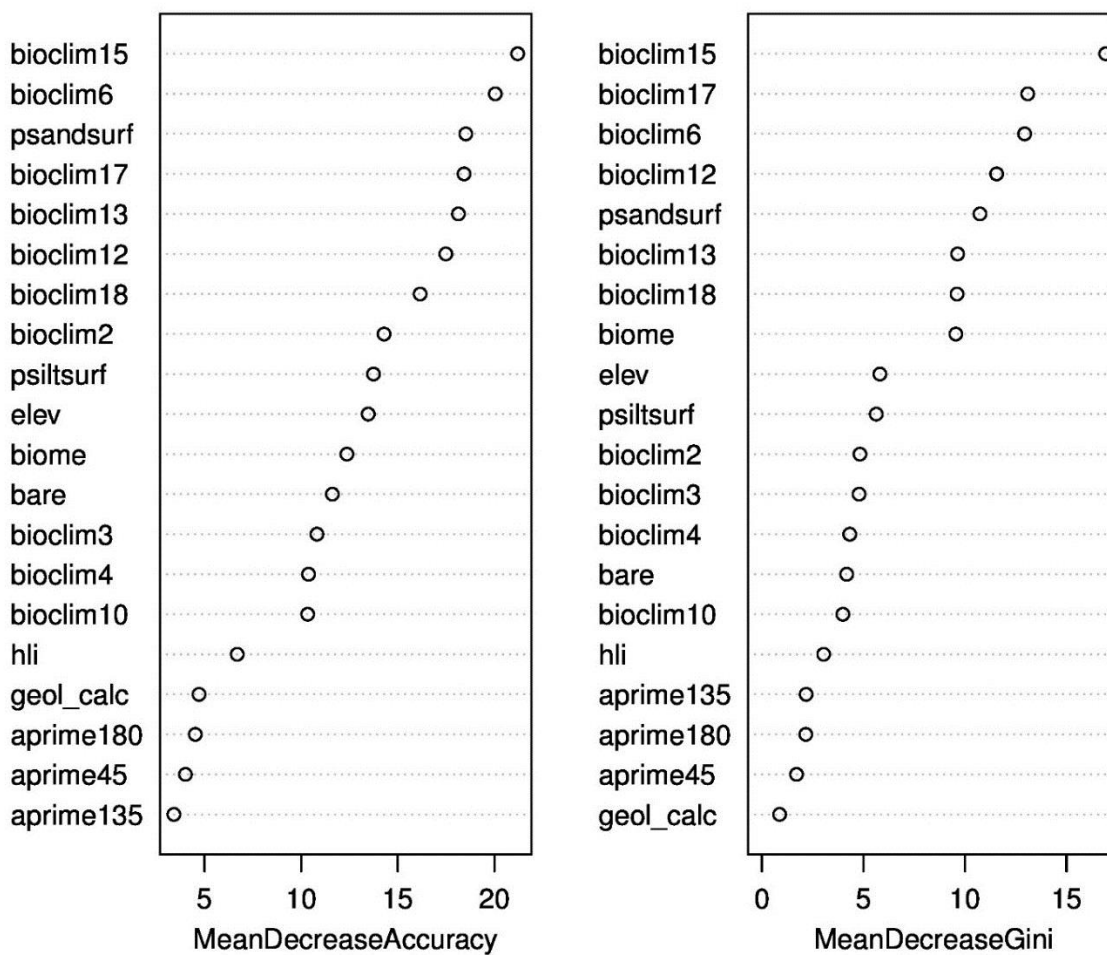
- Number of Locations:** 92
- Out-of-Bag Error:** 4.2%
- TSS:** 88.5%
- Kappa:** 88.9%
- Sensitivity:** 91.1%
- Specificity:** 97.4%

## Model Comments:

Endemic plant species that are restricted to specific soil conditions are difficult to model because statewide data are coarsely mapped and categorical. The statewide soils layer was parameterized to produce layers with gradients reflecting different soil properties. As such, large areas are shown as low probability potential habitat, and a number of presence points from occupied habitat are mapped as unsuitable. The geological complexity and crudeness of the surrogate layer might account for the breadth of low probability potential habitat.

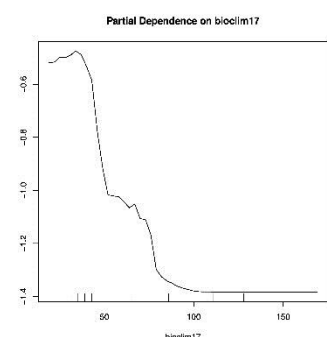
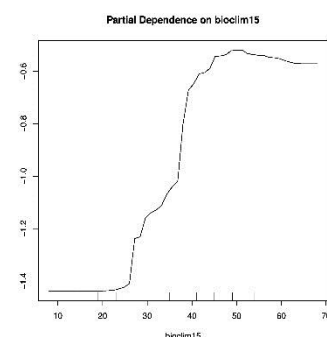
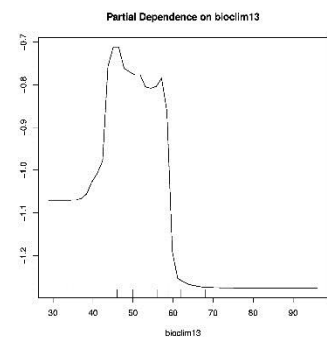
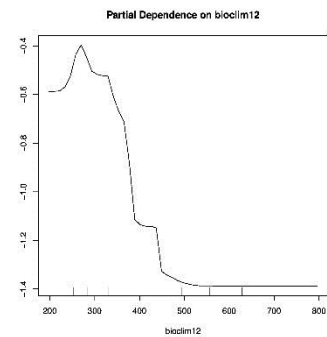
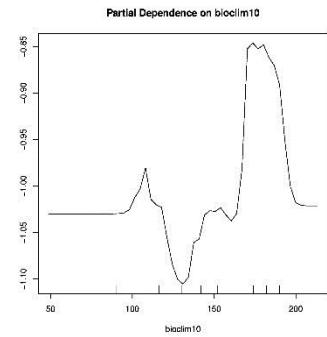
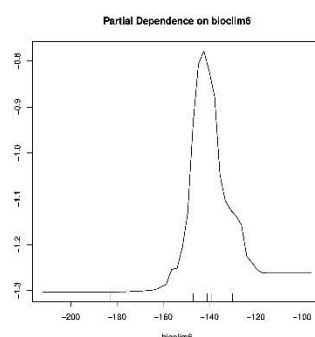
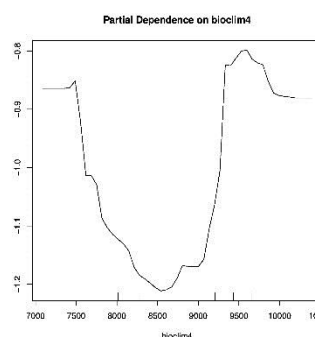
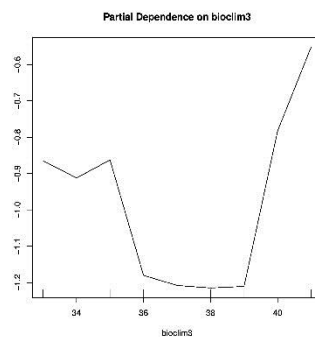
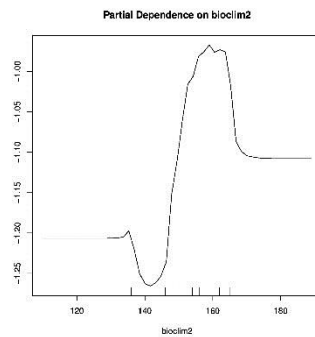
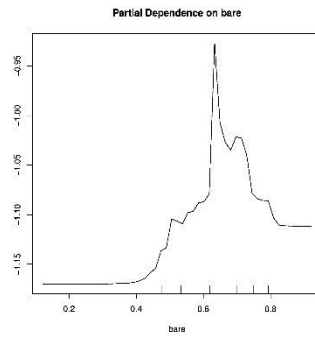
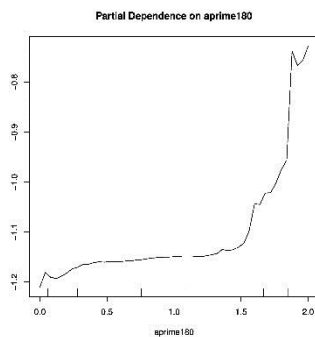
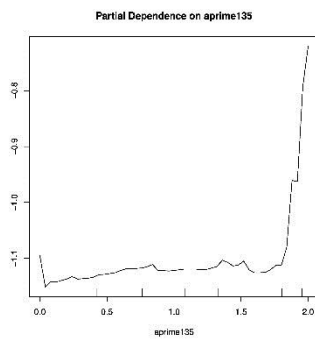
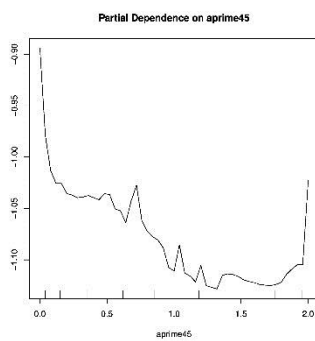
## Predictor Variable Importance:

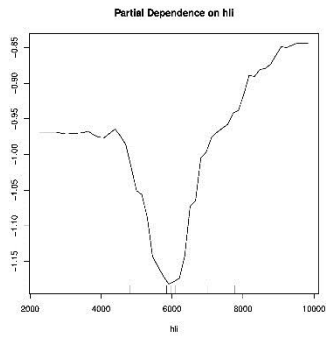
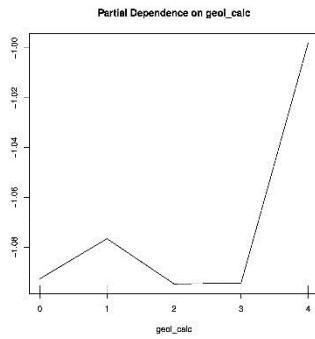
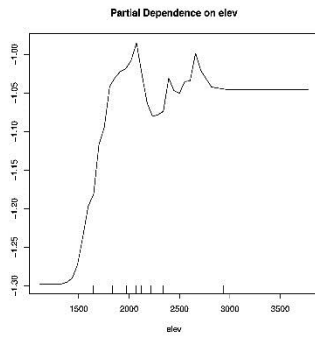
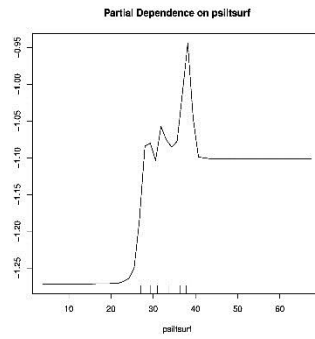
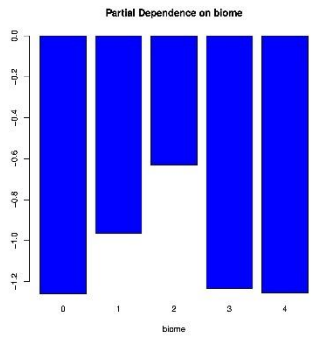
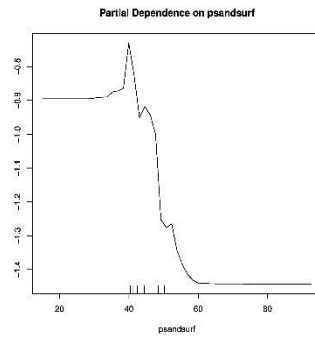
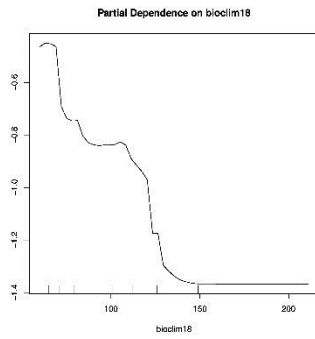
The graph below indicates the relative importance of predictors in modeling distribution for this species. “MeanDecreaseAccuracy” calculates importance by permuting (i.e., randomizing) values for the predictor and measuring the resulting decrease in model accuracy. This measure is typically a more reliable indicator of importance than “MeanDecreaseGini,” which measures improvement in a model due to splits based on the predictor. In both graphs, the further to the right the point falls on the graph, the higher the relative importance of the corresponding predictor. See Appendix 1 of this report for a detailed description of each predictor.



## Partial Plots

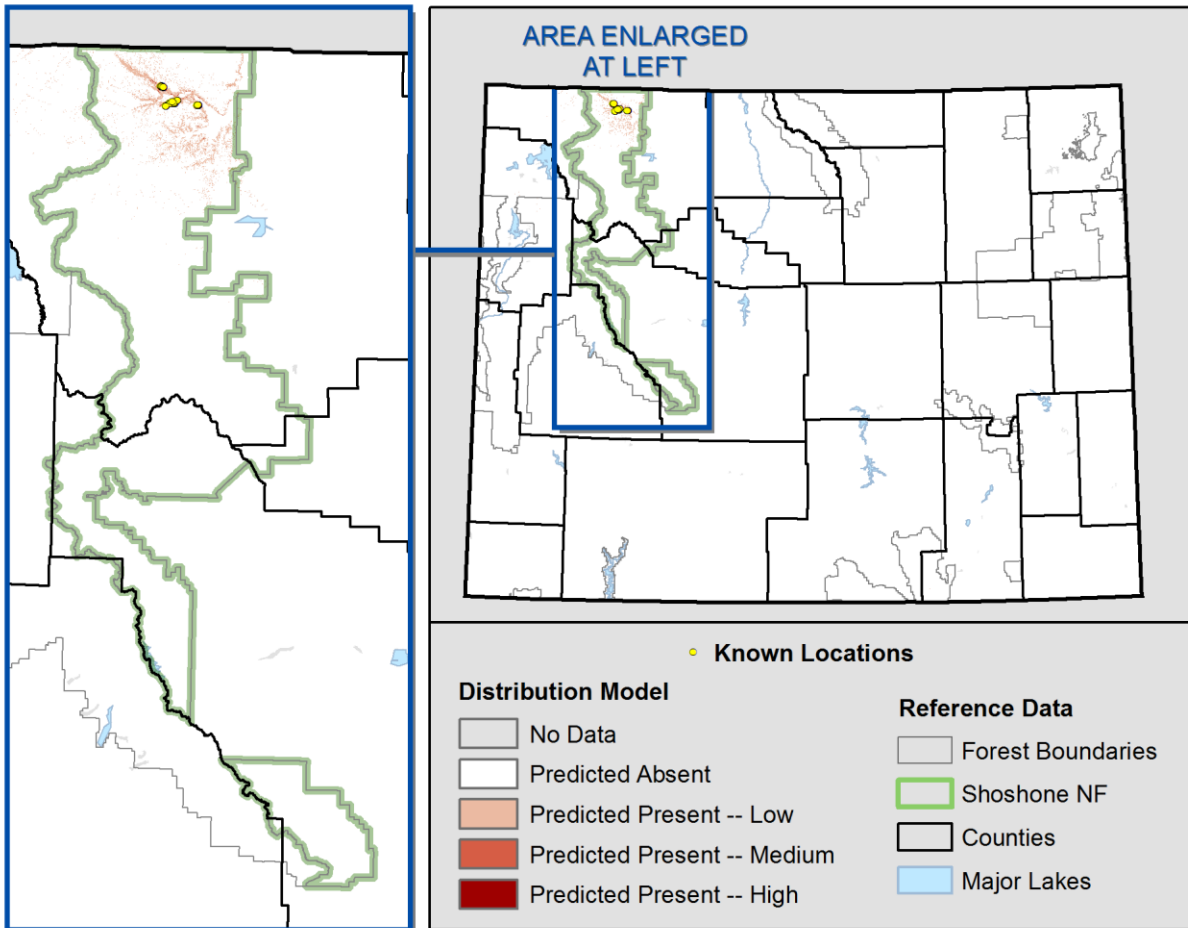
Partial plots show the relationship between a predictor variable and the predicted probability of occurrence, holding all other predictors at their average values. Probability values on the y-axis are unscaled; higher values on this axis indicate a higher relative probability of occurrence.





# Roundleaf orchid (*Amerorchis rotundifolia*)

Model version: 2016-06-22



## Model Information

- Algorithm:** Random Forest
- Software:** R version 3.3.0 (2016-05-03); randomForest package v. 4.6.12
- Binary Threshold (MaxTSS):** 0.561
- Reclassification Table for Four-Category Version:**

From	To	Becomes
0	0.508	Predicted Absent (0)
0.508	0.828	Low (1)
0.828	0.900	Medium (2)
0.900	1	High (3)

## Model Details

- Number of Locations:** 10
- Out-of-Bag Error:** 2.7%
- TSS:** 93.9%
- Kappa:** 92.9%
- Sensitivity:** 96.3%
- Specificity:** 97.6%

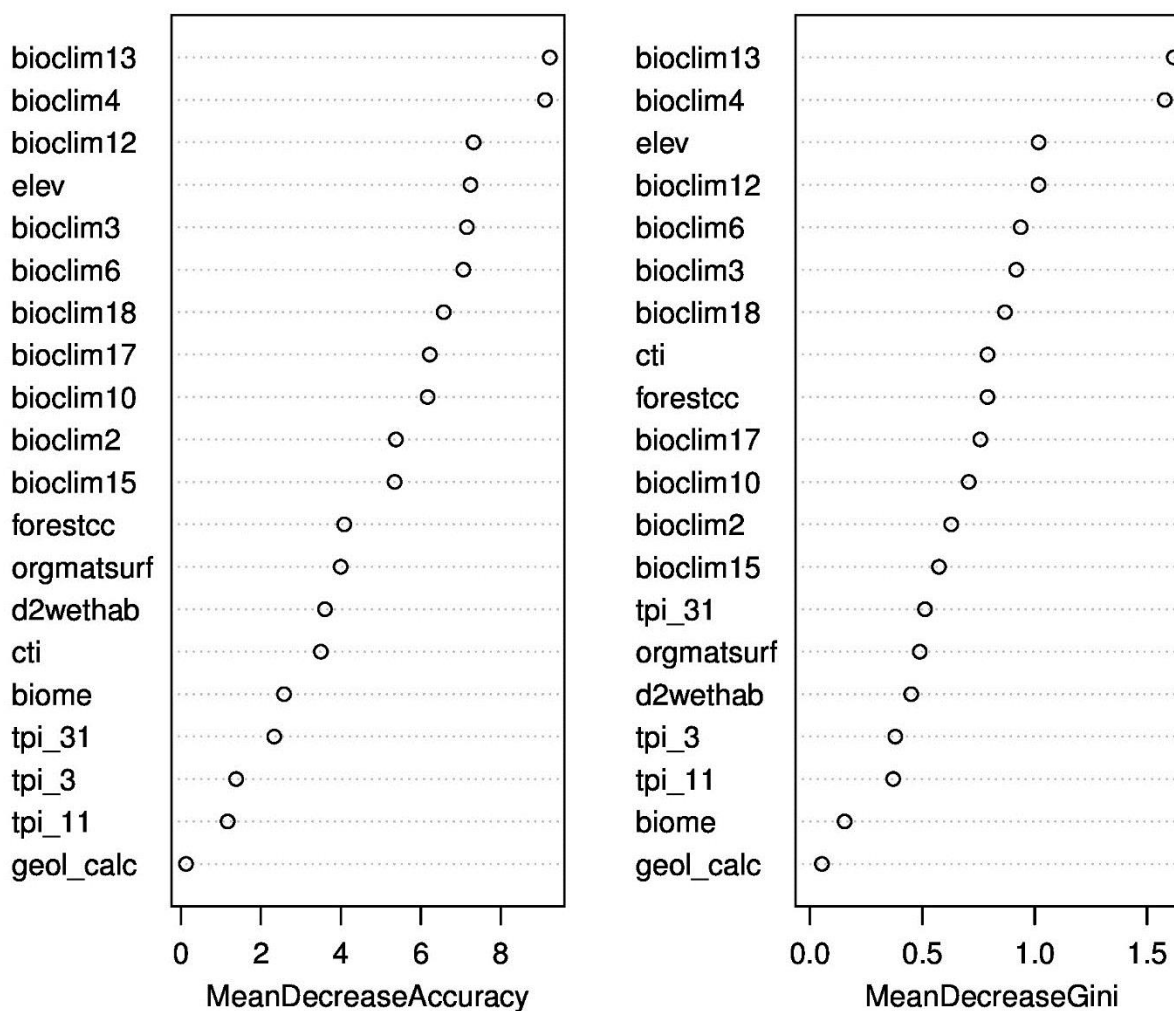
## Model Comments:

Rare wetland plant species that occupy microhabitat are difficult to model. A layer was developed that combines layers representing riverine and palustrine settings along a distance gradient. But Roundleaf orchid habitat is doubly difficult to model because it represents transition habitat in between wetlands

and uplands, and the wetlands are relict habitat (organic soil accumulation) that are vestiges of the geological past, beyond the scope of modeling. Thus the model output shows continuous potential habitat along the Clarks Fork of the Yellowstone and widespread potential habitat above the Sunlight Basin.

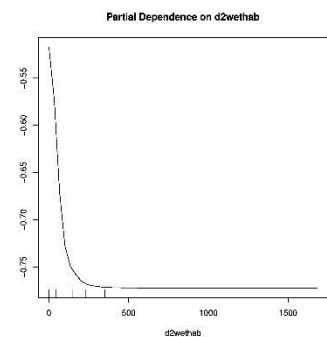
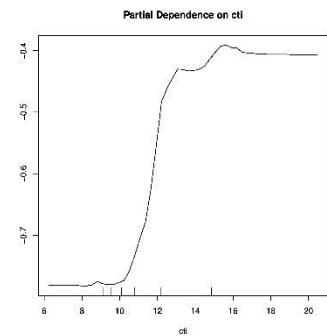
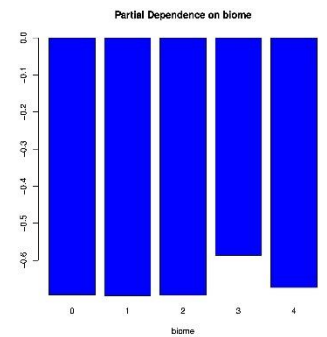
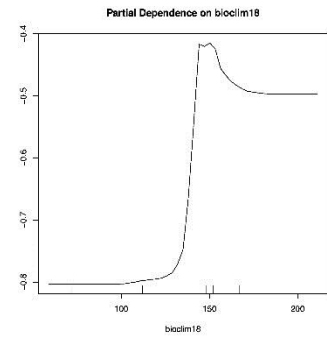
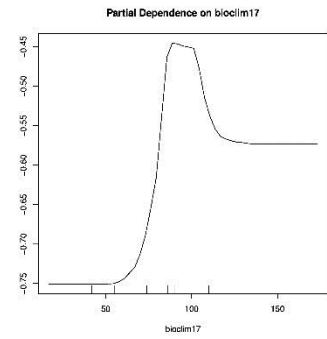
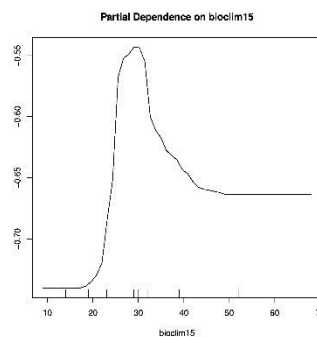
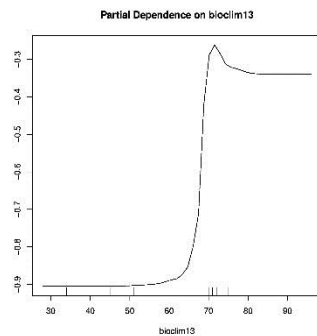
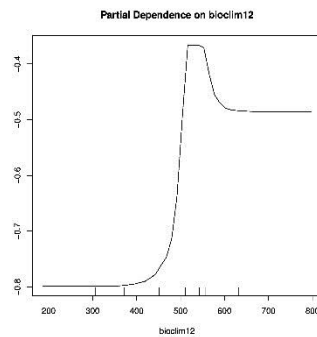
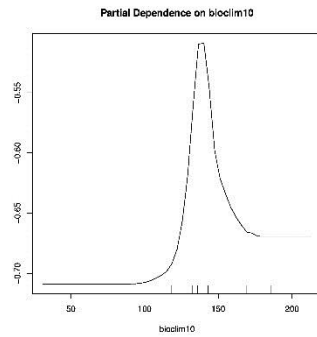
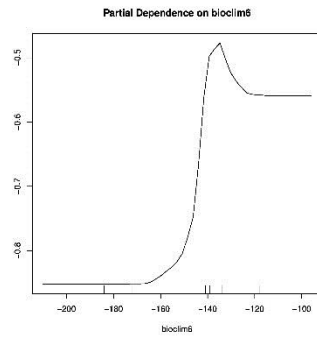
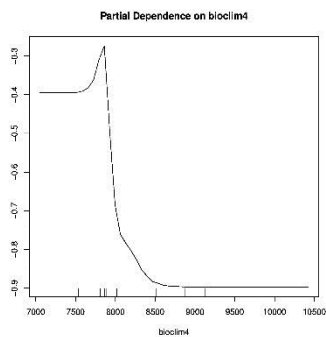
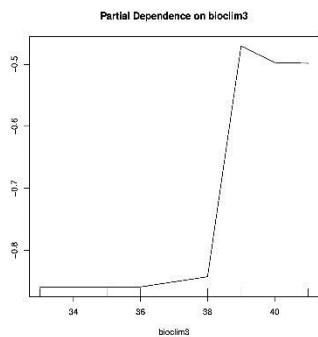
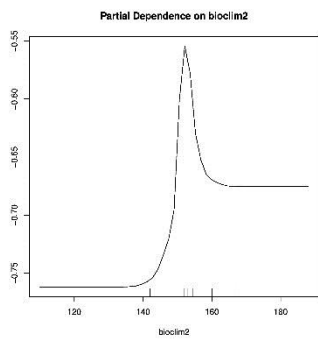
## Predictor Variable Importance:

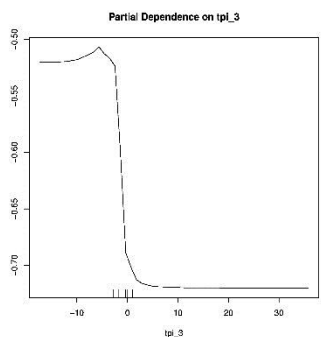
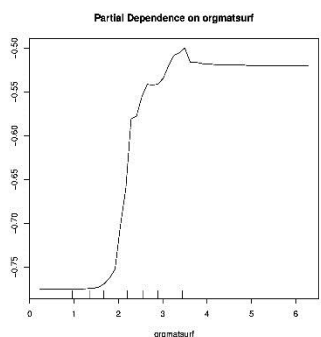
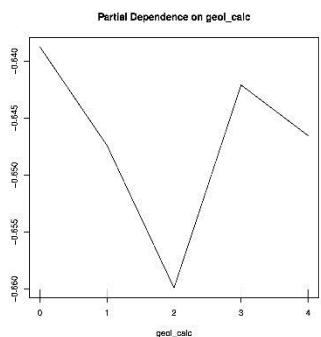
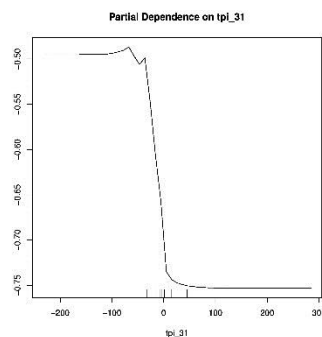
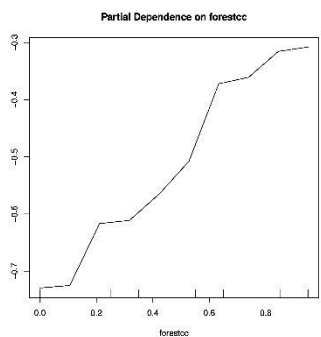
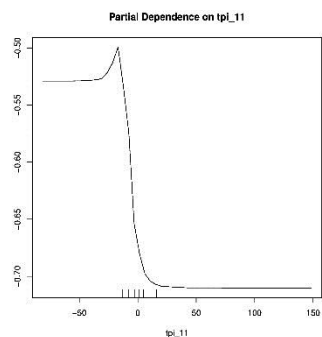
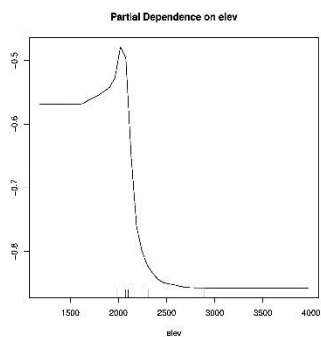
The graph below indicates the relative importance of predictors in modeling distribution for this species. “MeanDecreaseAccuracy” calculates importance by permuting (i.e., randomizing) values for the predictor and measuring the resulting decrease in model accuracy. This measure is typically a more reliable indicator of importance than “MeanDecreaseGini,” which measures improvement in a model due to splits based on the predictor. In both graphs, the further to the right the point falls on the graph, the higher the relative importance of the corresponding predictor. See Appendix 1 of this report for a detailed description of each predictor.



## Partial Plots

Partial plots show the relationship between a predictor variable and the predicted probability of occurrence, holding all other predictors at their average values. Probability values on the y-axis are unscaled; higher values on this axis indicate a higher relative probability of occurrence.

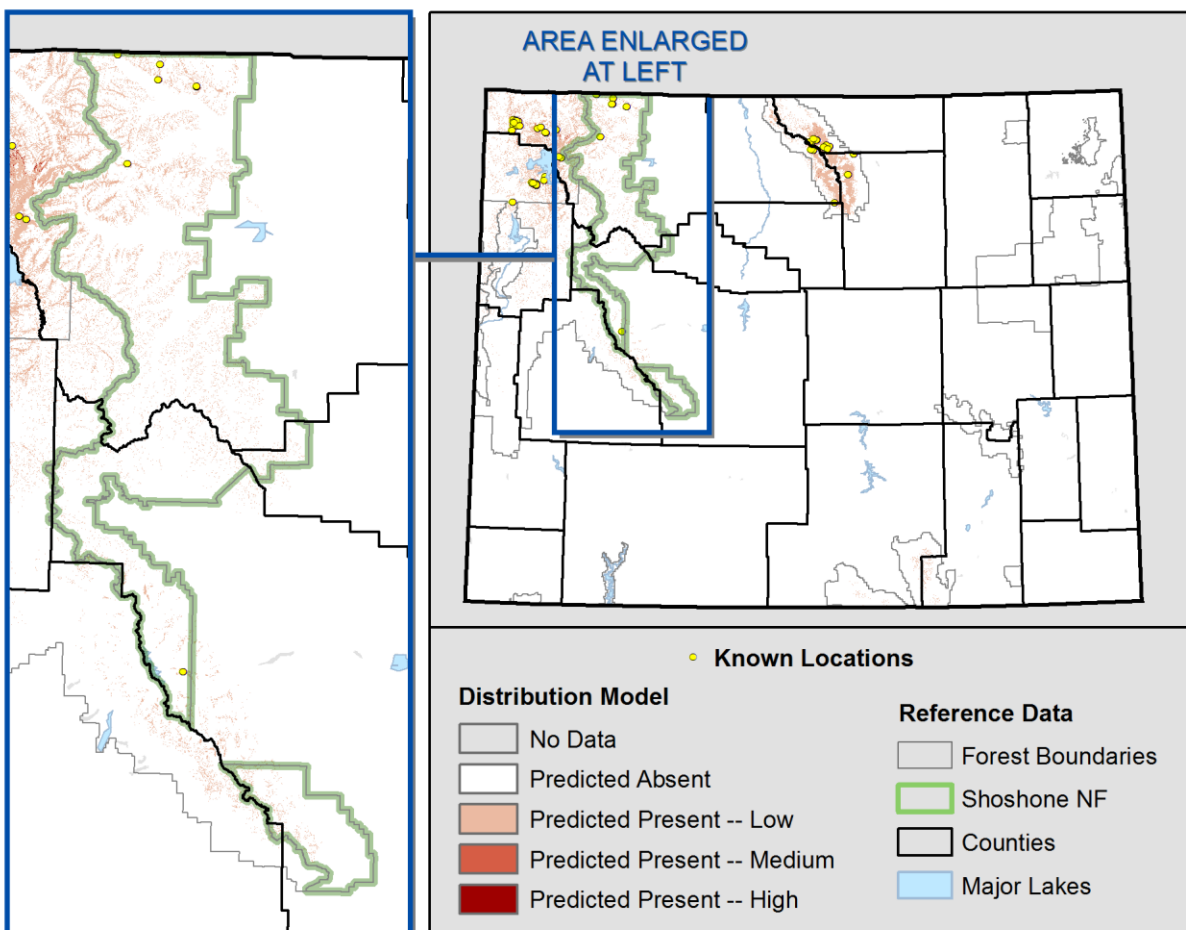






# Russet cottongrass (*Eriophorum chamissonis*)

Model version: 2016-06-23



## Model Information

- Algorithm:** Random Forest
- Software:** R version 3.3.0 (2016-05-03); randomForest package v. 4.6.12
- Binary Threshold (MaxTSS):** 0.638
- Reclassification Table for Four-Category Version:**

From	To	Becomes
0	0.396	Predicted Absent (0)
0.396	0.868	Low (1)
0.868	0.972	Medium (2)
0.972	1	High (3)

## Model Details

- Number of Locations:** 72
- Out-of-Bag Error:** 6.8%
- TSS:** 80.6%
- Kappa:** 81.7%
- Sensitivity:** 84.4%
- Specificity:** 96.2%

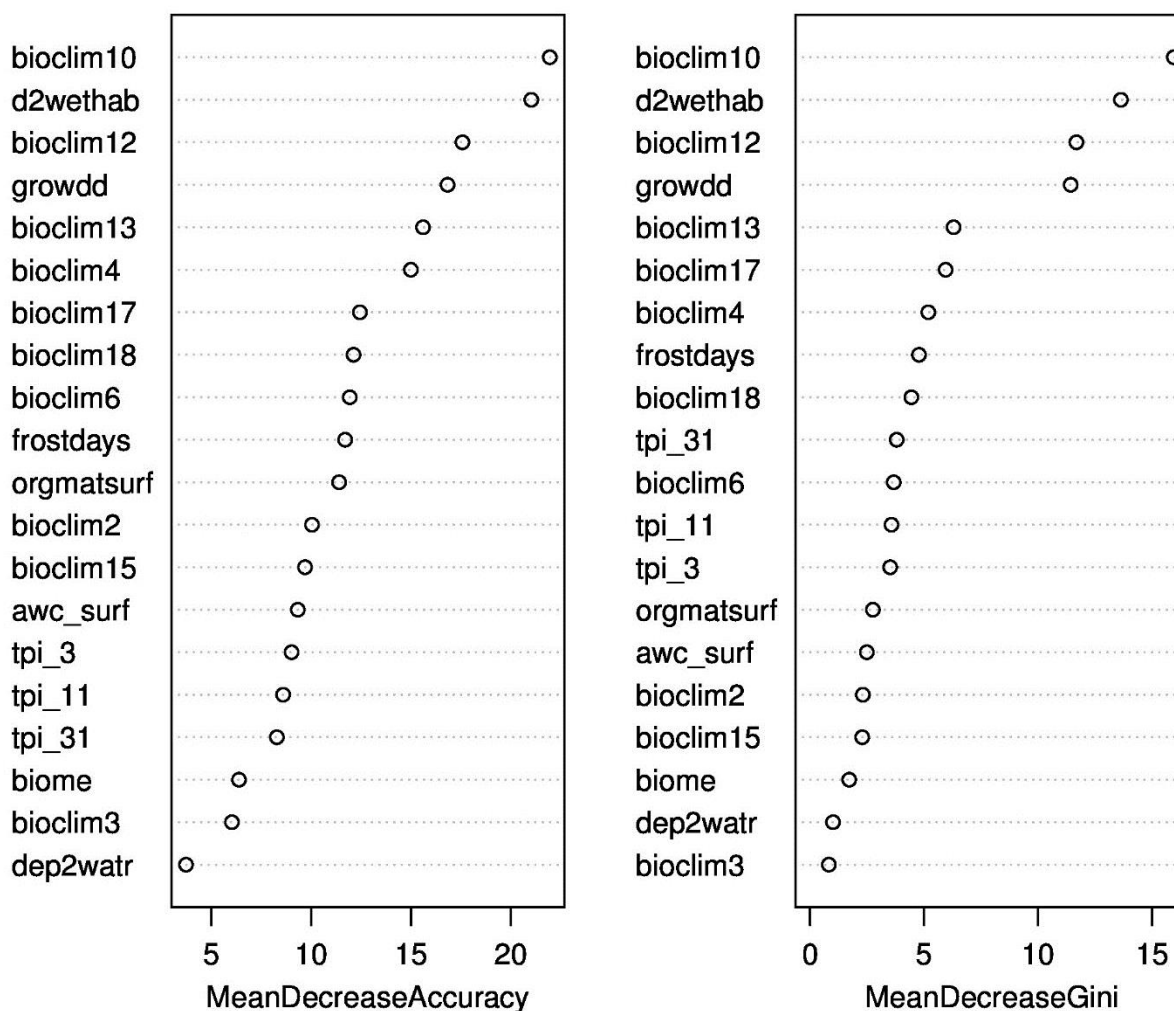
## Model Comments:

Rare wetland plant species that occupy microhabitat are difficult to model. A layer was developed that combines layers representing riverine and palustrine settings along a distance gradient. Russet cottongrass also occupies relict habitat (organic soil accumulation) that is vestige of the geological past,

beyond the scope of modeling. The output shows SNF potential habitat as low probability locations in a highly pixelated pattern.

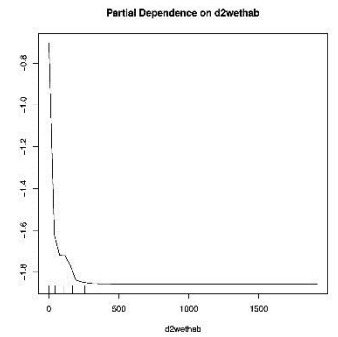
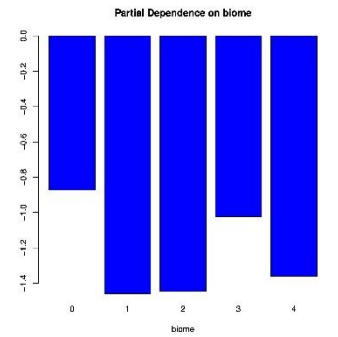
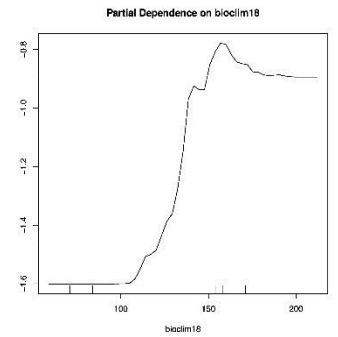
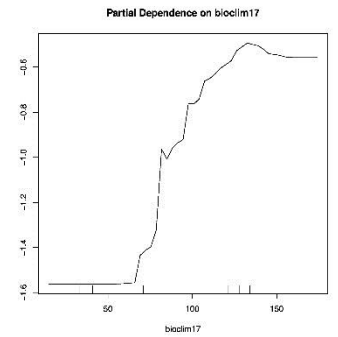
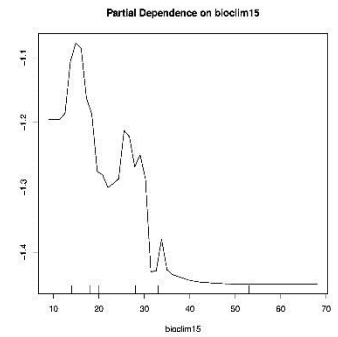
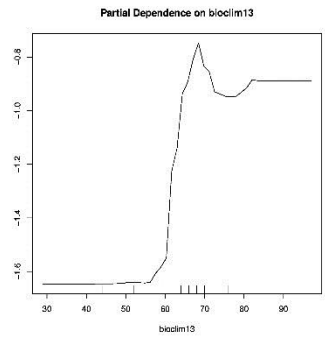
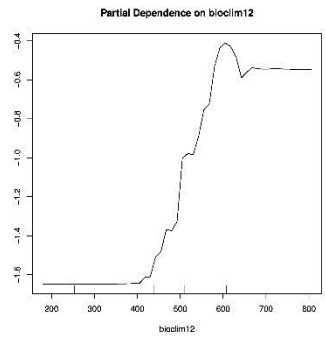
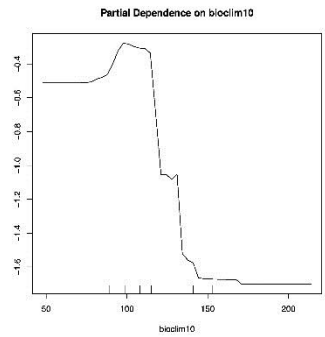
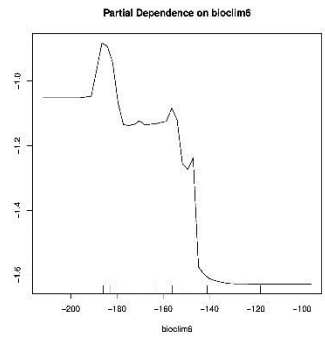
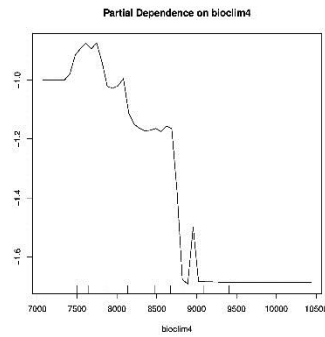
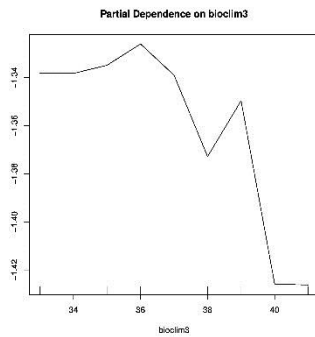
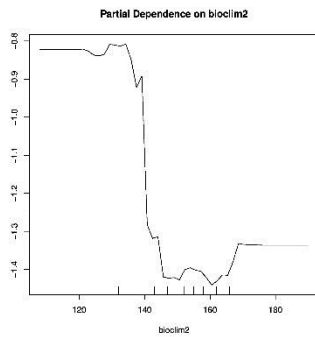
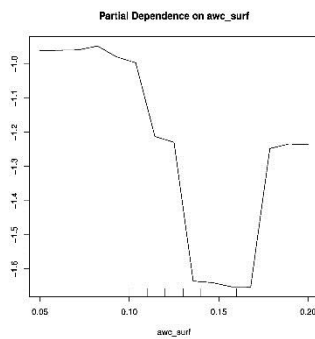
## Predictor Variable Importance:

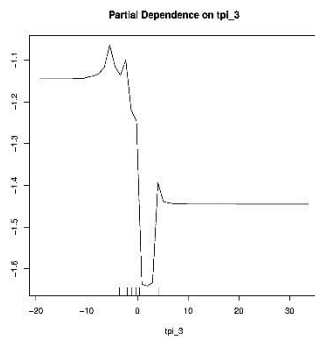
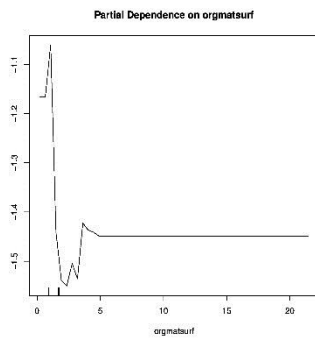
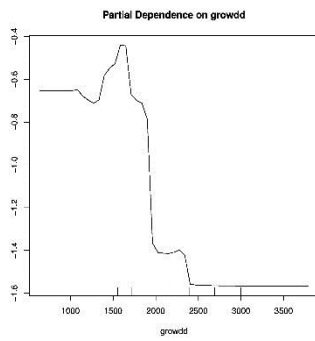
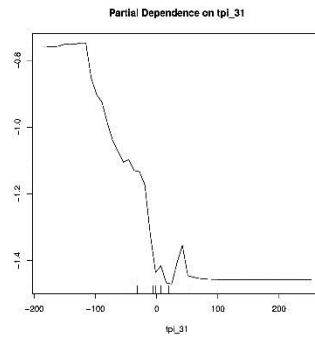
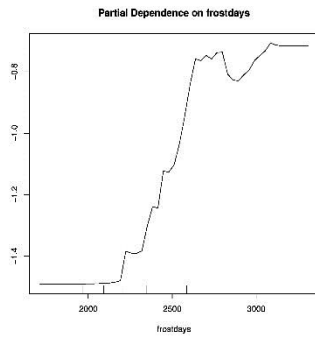
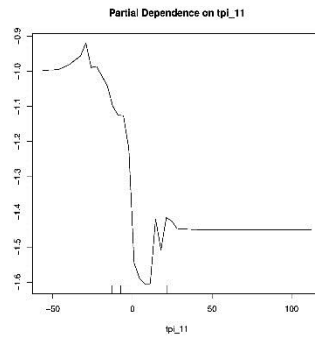
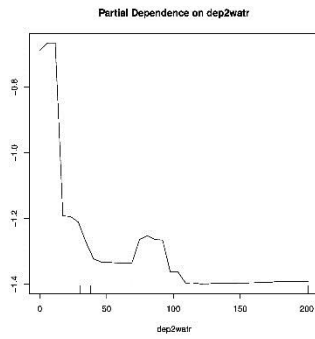
The graph below indicates the relative importance of predictors in modeling distribution for this species. “MeanDecreaseAccuracy” calculates importance by permuting (i.e., randomizing) values for the predictor and measuring the resulting decrease in model accuracy. This measure is typically a more reliable indicator of importance than “MeanDecreaseGini,” which measures improvement in a model due to splits based on the predictor. In both graphs, the further to the right the point falls on the graph, the higher the relative importance of the corresponding predictor. See Appendix 1 of this report for a detailed description of each predictor.



## Partial Plots

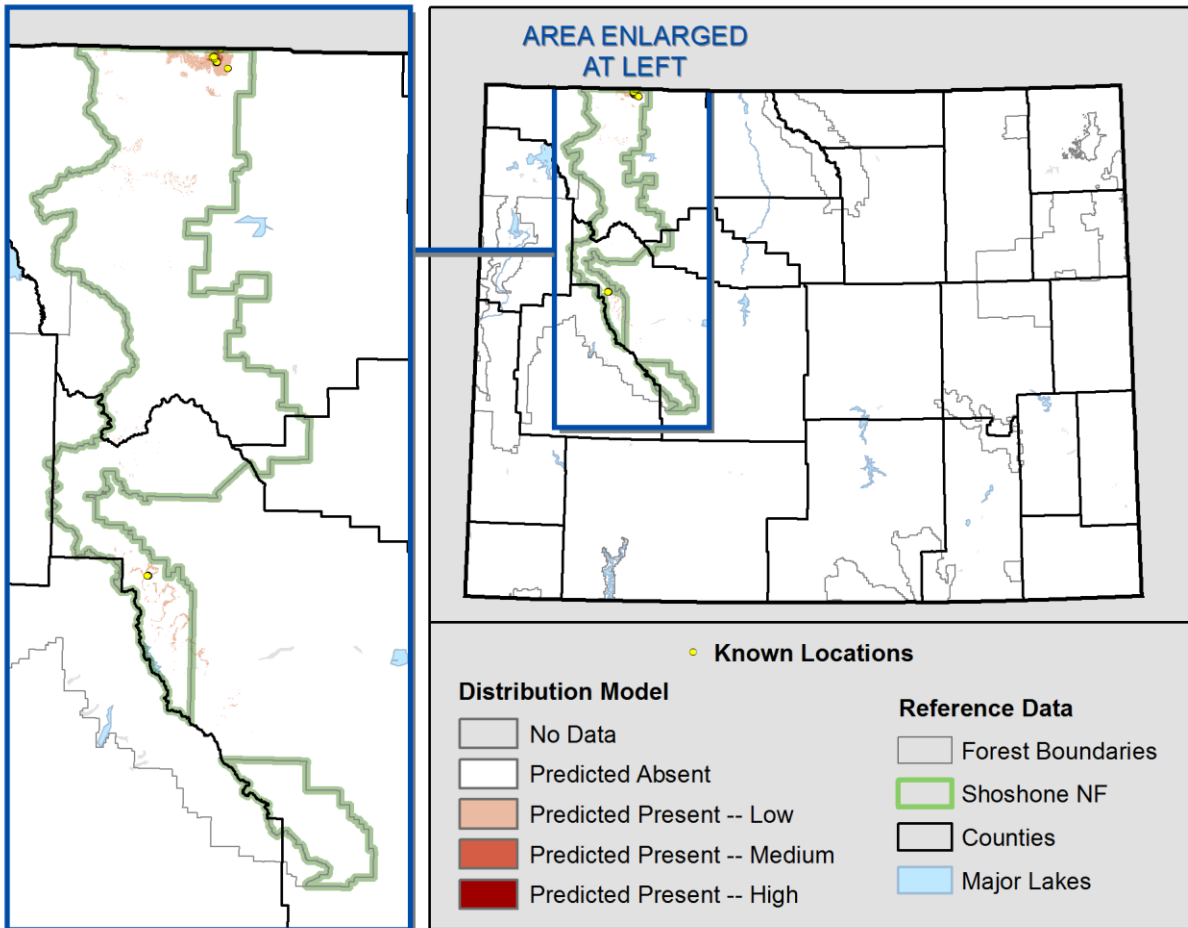
Partial plots show the relationship between a predictor variable and the predicted probability of occurrence, holding all other predictors at their average values. Probability values on the y-axis are unscaled; higher values on this axis indicate a higher relative probability of occurrence.





# Sheathed cottongrass (*Eriophorum callitrix*)

Model version: 2016-06-23



## Model Information

- Algorithm:** Random Forest
- Software:** R version 3.3.0 (2016-05-03); randomForest package v. 4.6.12
- Binary Threshold (MaxTSS):** 0.813
- Reclassification Table for Four-Category Version:**

From	To	Becomes
0	0.816	Predicted Absent (0)
0.816	0.968	Low (1)
0.968	0.994	Medium (2)
0.994	1	High (3)

## Model Details

- Number of Locations:** 14
- Out-of-Bag Error:** 4.8%
- TSS:** 91.7%
- Kappa:** 87.7%
- Sensitivity:** 97.2%
- Specificity:** 94.5%

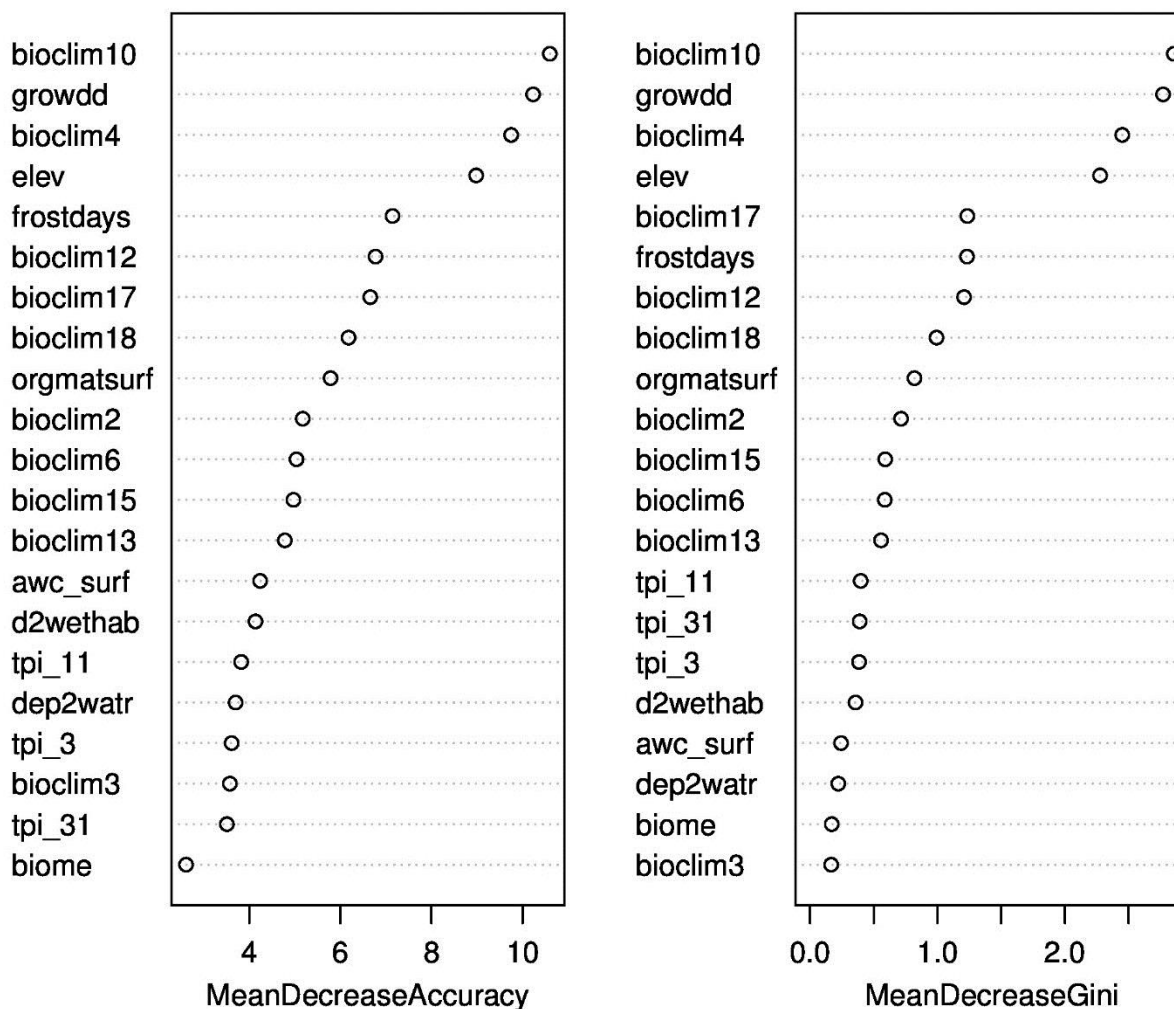
## Model Comments:

Rare alpine wetland plant species that occupy microhabitat are difficult to model. A layer was developed that combines layers representing riverine and palustrine settings along a distance gradient. Sheathed

cottongrass also occupies relict habitat (organic soil accumulation) that is vestige of the geological past, beyond the scope of modeling.

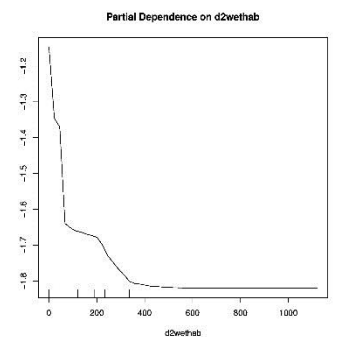
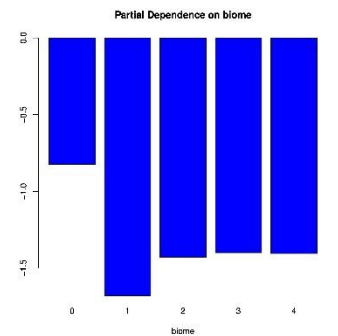
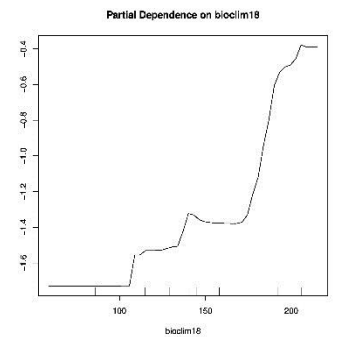
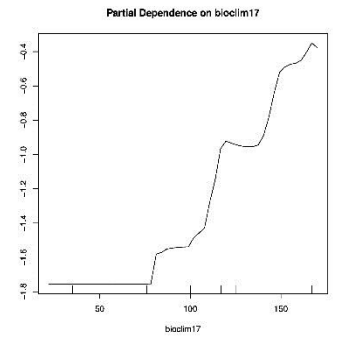
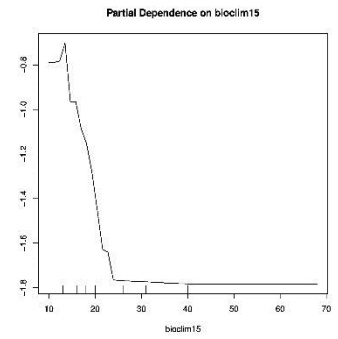
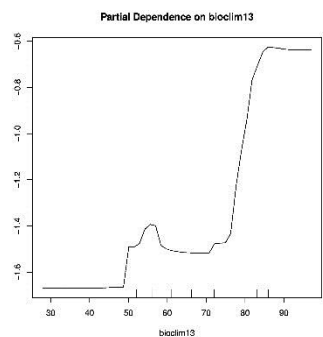
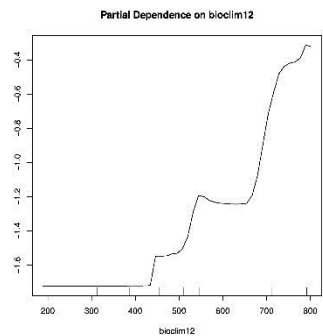
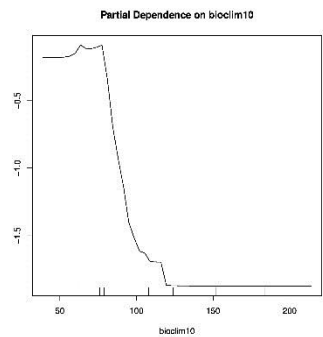
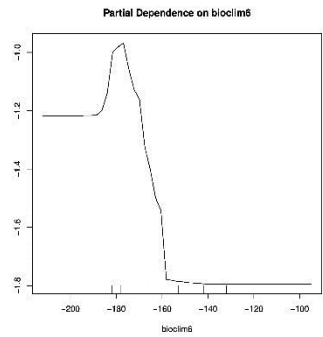
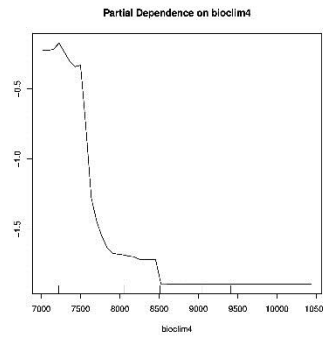
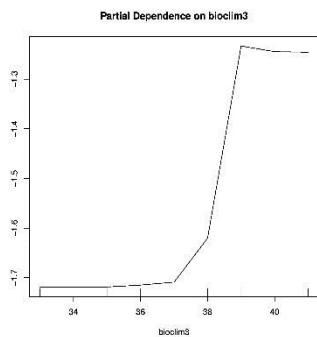
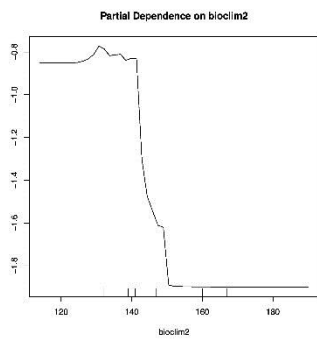
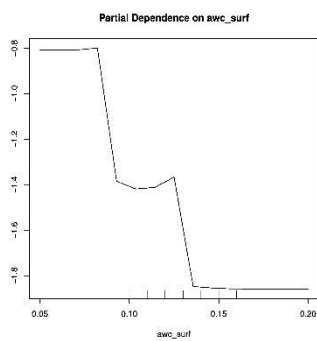
## Predictor Variable Importance:

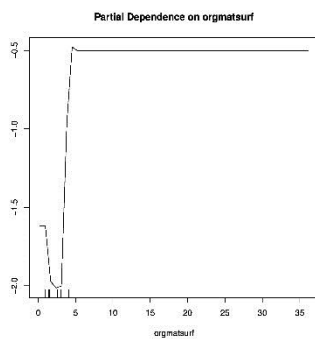
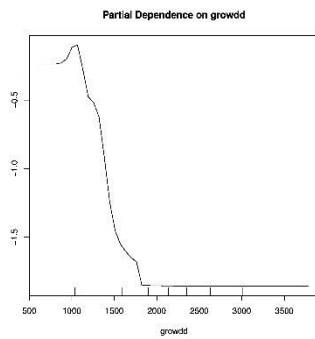
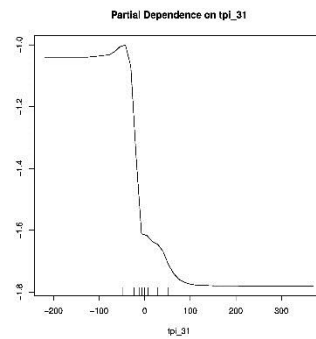
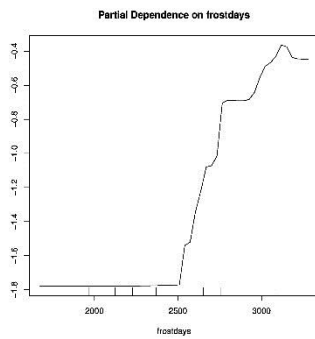
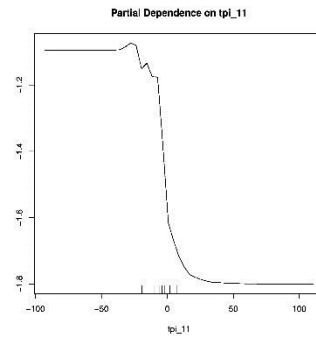
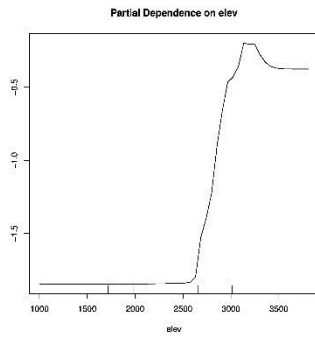
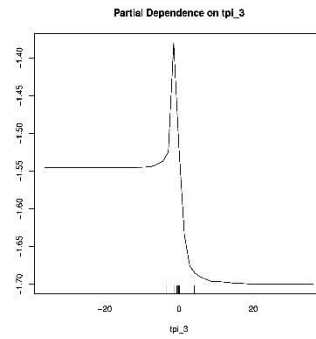
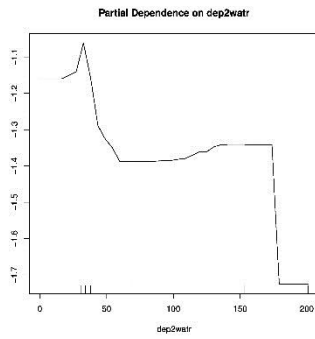
The graph below indicates the relative importance of predictors in modeling distribution for this species. “MeanDecreaseAccuracy” calculates importance by permuting (i.e., randomizing) values for the predictor and measuring the resulting decrease in model accuracy. This measure is typically a more reliable indicator of importance than “MeanDecreaseGini,” which measures improvement in a model due to splits based on the predictor. In both graphs, the further to the right the point falls on the graph, the higher the relative importance of the corresponding predictor. See Appendix 1 of this report for a detailed description of each predictor.



## Partial Plots

Partial plots show the relationship between a predictor variable and the predicted probability of occurrence, holding all other predictors at their average values. Probability values on the y-axis are unscaled; higher values on this axis indicate a higher relative probability of occurrence.

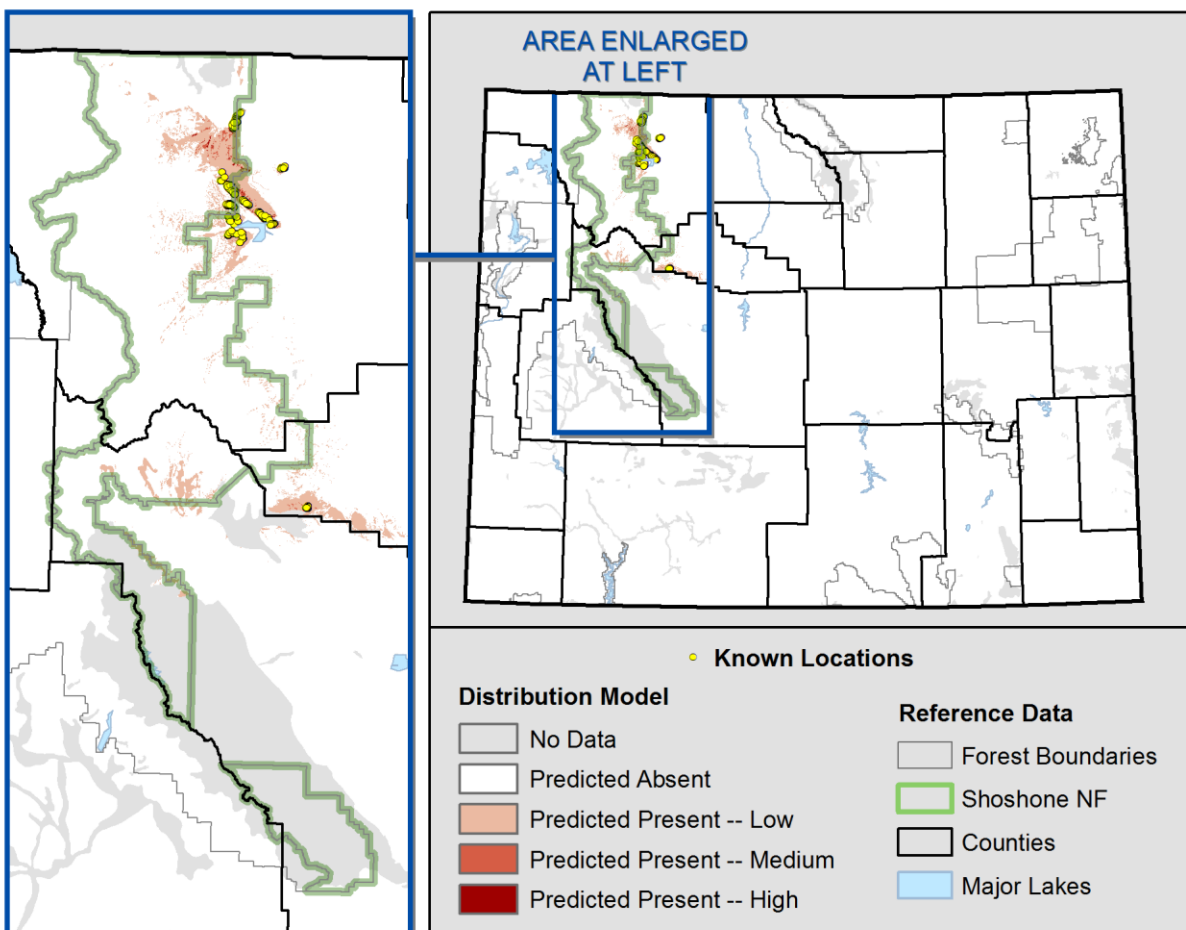






# Shoshonea (*Shoshonea pulvinata*)

Model version: 2016-06-24



## Model Information

- **Algorithm:** Random Forest
- **Software:** R version 3.3.0 (2016-05-03); randomForest package v. 4.6.12
- **Binary Threshold (MaxTSS):** 0.463
- **Reclassification Table for Four-Category Version:**

From	To	Becomes
0	0.408	Predicted Absent (0)
0.408	0.888	Low (1)
0.888	0.986	Medium (2)
0.986	1	High (3)

## Model Details

- **Number of Locations:** 51
- **Out-of-Bag Error:** 4.0%
- **TSS:** 88.9%
- **Kappa:** 89.2%
- **Sensitivity:** 91.4%
- **Specificity:** 97.5%

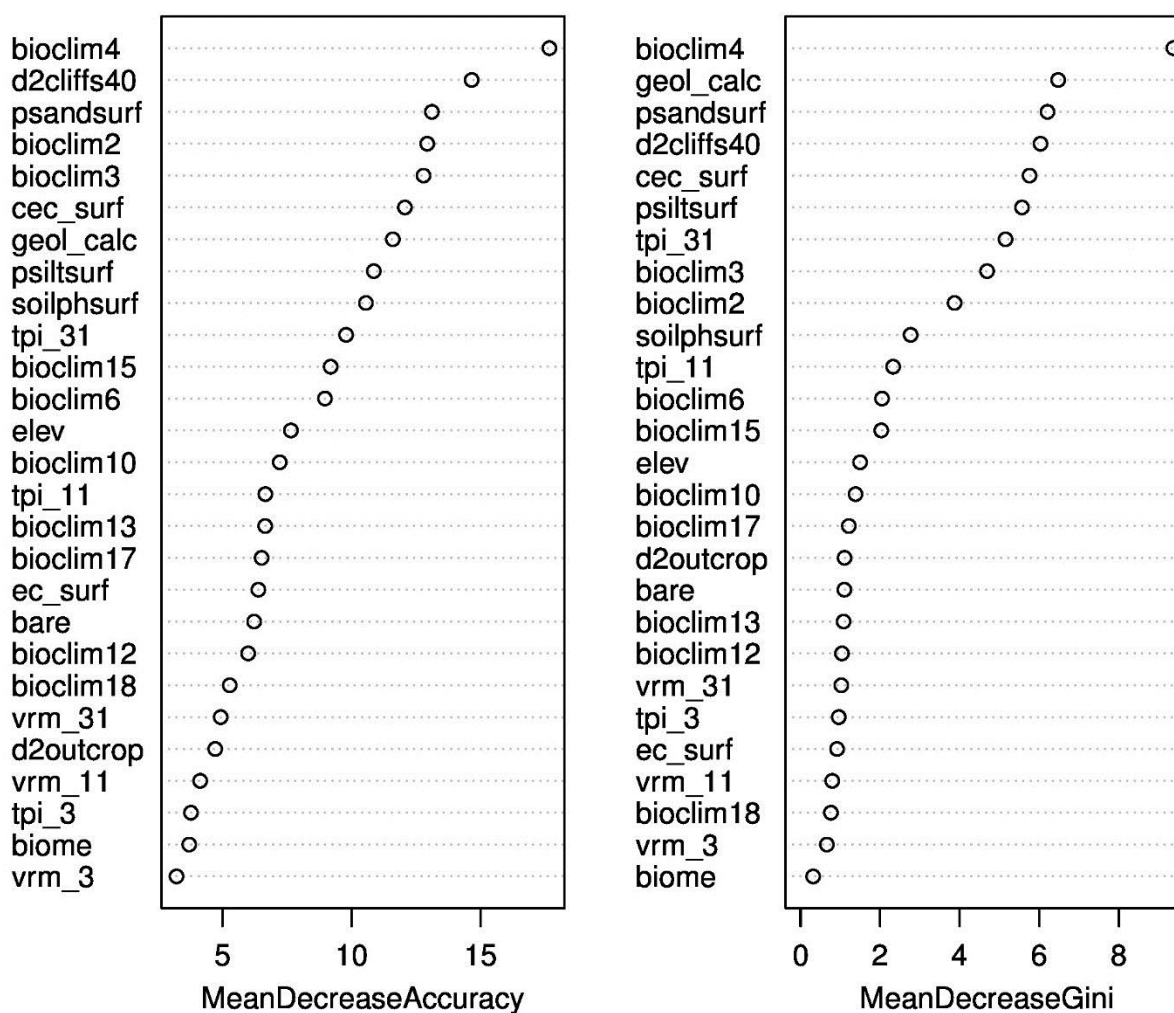
## Model Comments:

Regionally endemic plant species that are restricted to specific soil conditions are difficult to model because statewide data are coarsely mapped and categorical. The statewide soils layer was parameterized to produce layers with gradients reflecting different soil properties. In addition, for

calciphilic species such as *Shoshonea*, a surrogate layer was developed from bedrock geology layers to reflect calcium carbonate content. The geological complexity and crudeness of the surrogate layer might account for the breadth of low probability potential habitat.

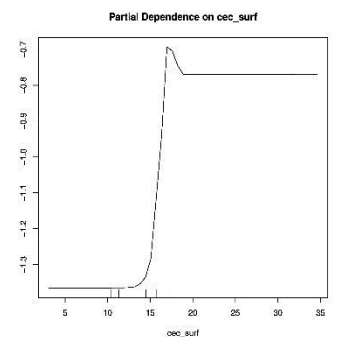
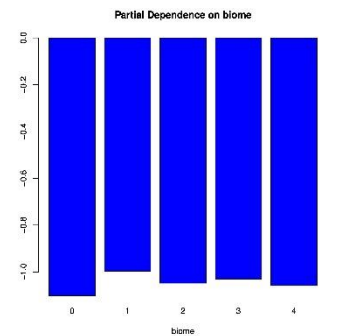
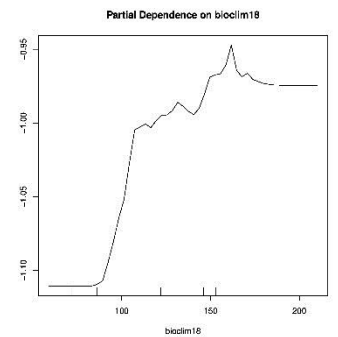
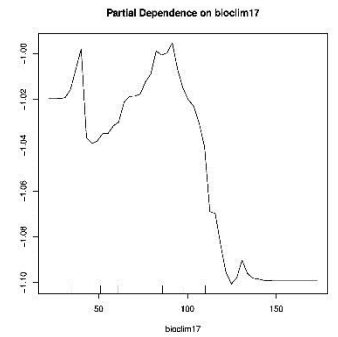
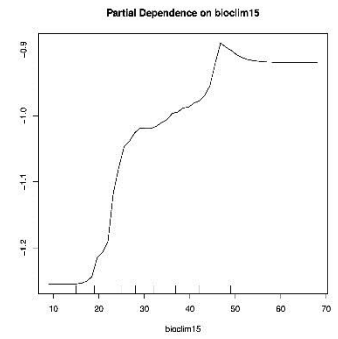
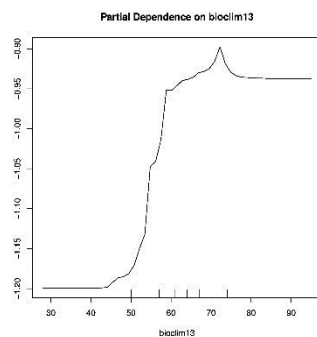
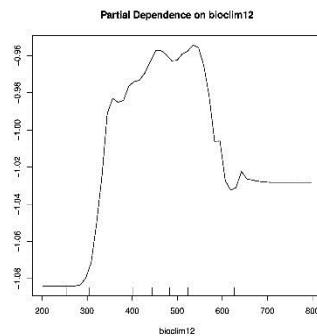
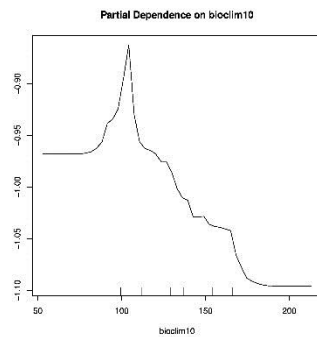
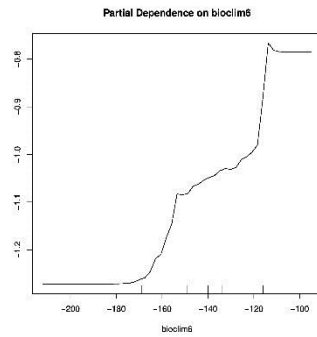
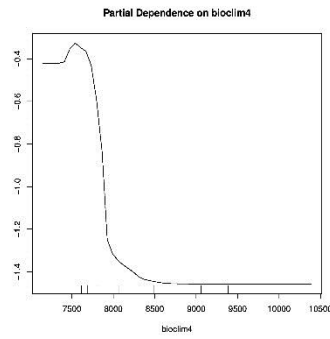
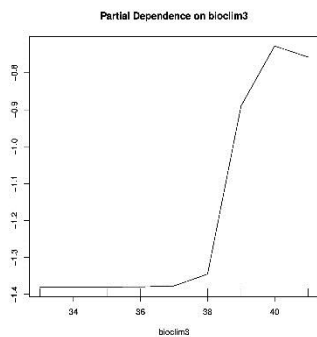
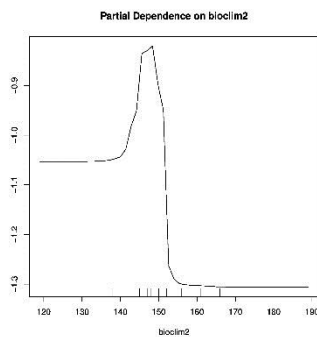
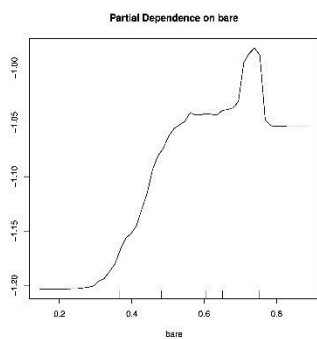
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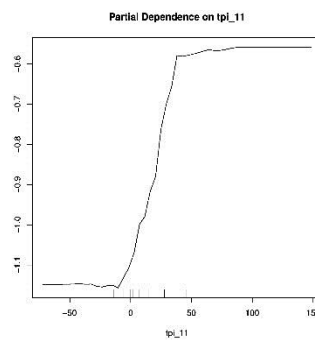
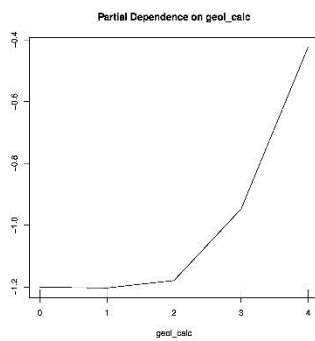
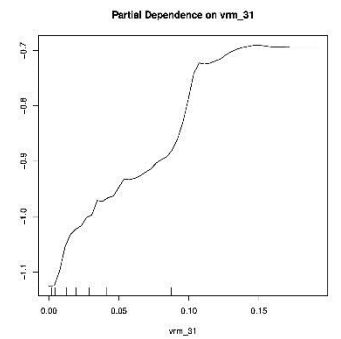
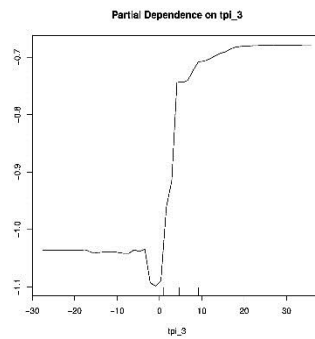
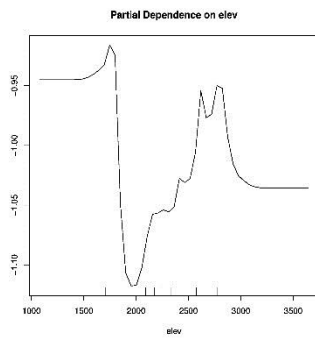
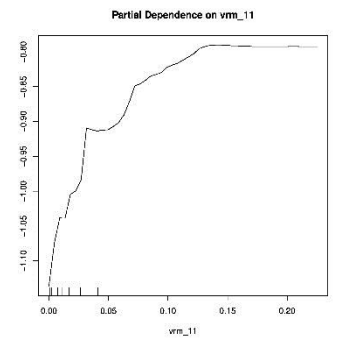
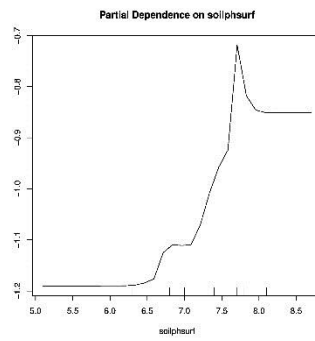
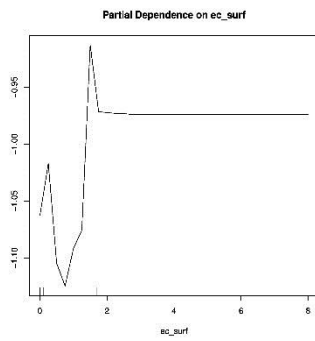
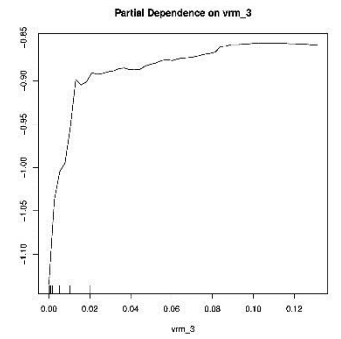
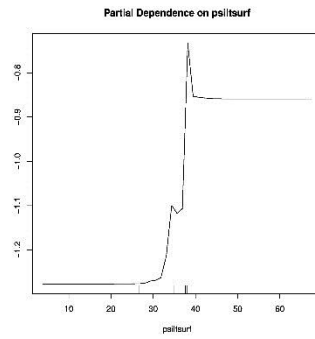
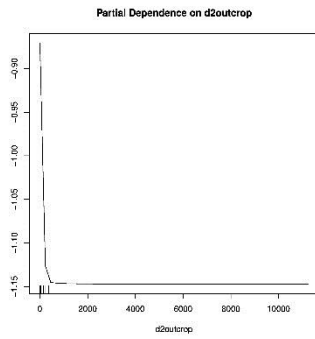
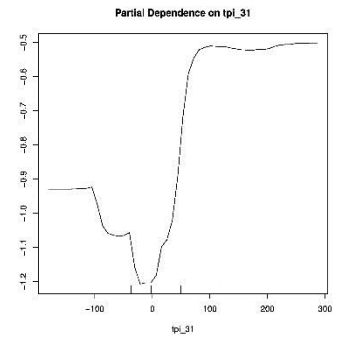
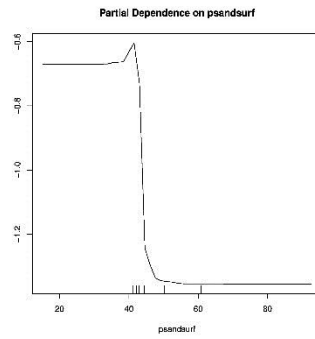
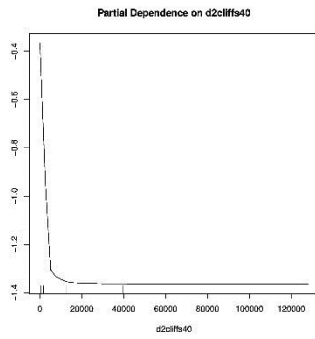
The graph below indicates the relative importance of predictors in modeling distribution for this species. “MeanDecreaseAccuracy” calculates importance by permuting (i.e., randomizing) values for the predictor and measuring the resulting decrease in model accuracy. This measure is typically a more reliable indicator of importance than “MeanDecreaseGini,” which measures improvement in a model due to splits based on the predictor. In both graphs, the further to the right the point falls on the graph, the higher the relative importance of the corresponding predictor. See Appendix 1 of this report for a detailed description of each predictor.



## Partial Plots

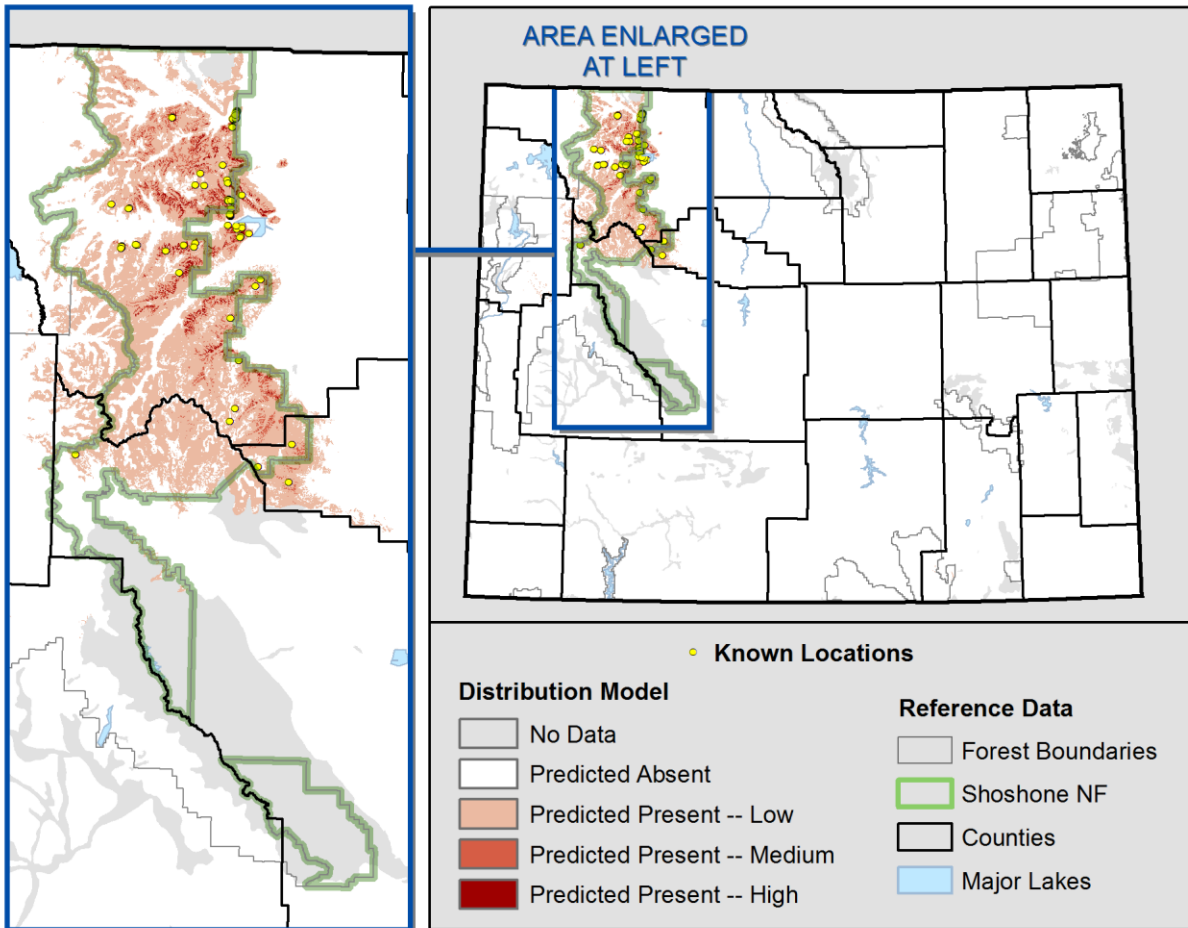
Partial plots show the relationship between a predictor variable and the predicted probability of occurrence, holding all other predictors at their average values. Probability values on the y-axis are unscaled; higher values on this axis indicate a higher relative probability of occurrence.





# Snow paintbrush (*Castilleja nivea*)

Model version: 2016-06-22



## Model Information

- Algorithm:** Random Forest
- Software:** R version 3.3.0 (2016-05-03); randomForest package v. 4.6.12
- Binary Threshold (MaxTSS):** 0.703
- Reclassification Table for Four-Category Version:**

From	To	Becomes
0	0.448	Predicted Absent (0)
0.448	0.814	Low (1)
0.814	0.938	Medium (2)
0.938	1	High (3)

## Model Details

- Number of Locations:** 50
- Out-of-Bag Error:** 8.3%
- TSS:** 79.5%
- Kappa:** 78.2%
- Sensitivity:** 85.8%
- Specificity:** 93.7%

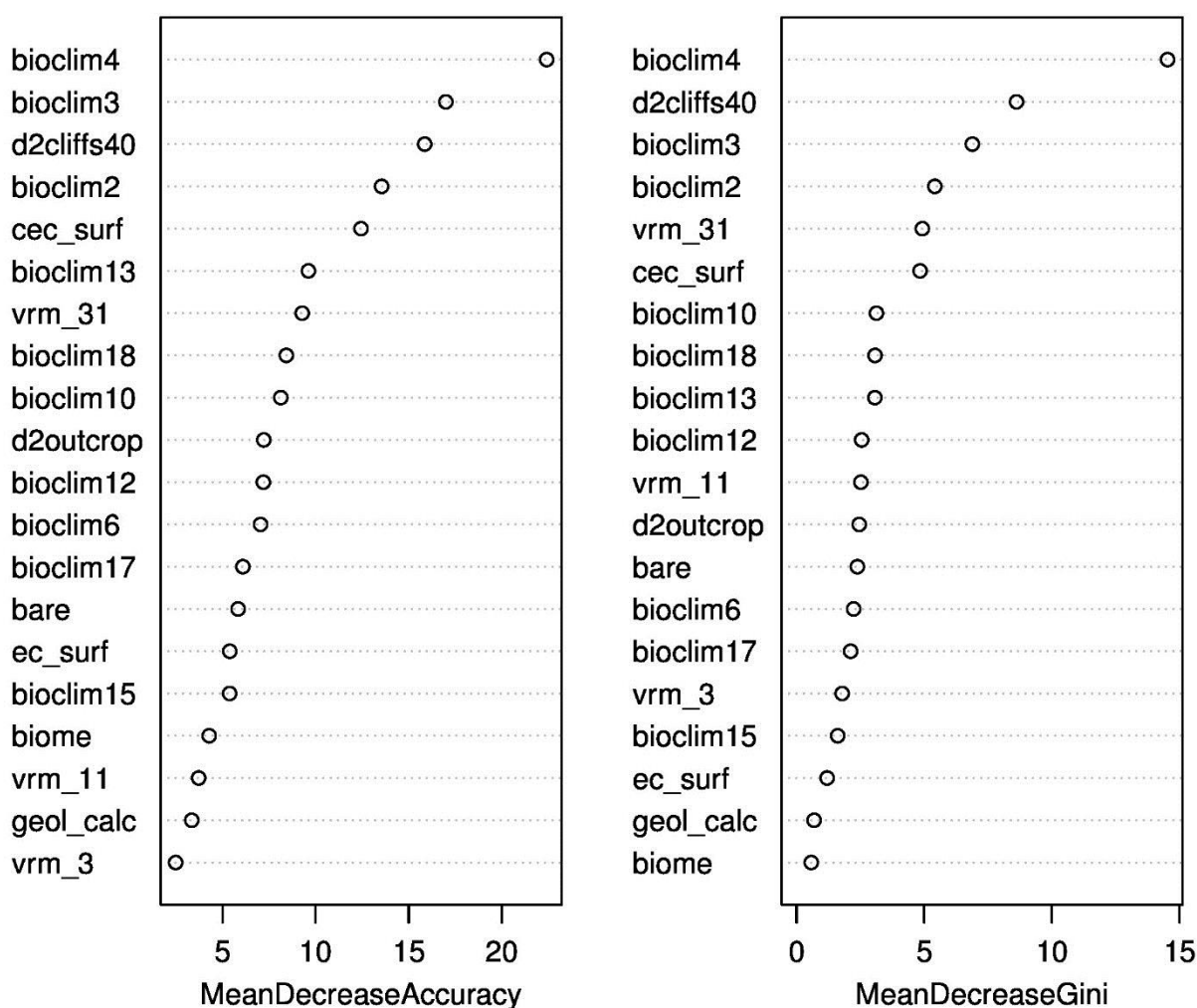
## Model Comments:

Regionally endemic plant species that are restricted to specific soil conditions are difficult to model because statewide data are coarsely mapped and categorical. The statewide soils layer was parameterized to produce layers with gradients reflecting different soil properties. In addition, for

calciphilic species such as Snow paintbrush, a surrogate layer was developed from bedrock geology layers to reflect calcium carbonate content. The geological complexity and crudeness of the surrogate layer might account for the breadth of low probability potential habitat.

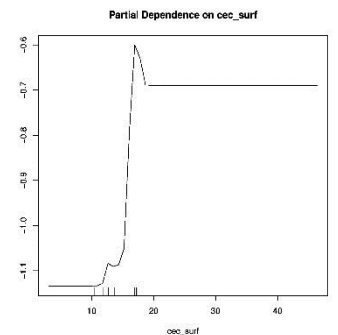
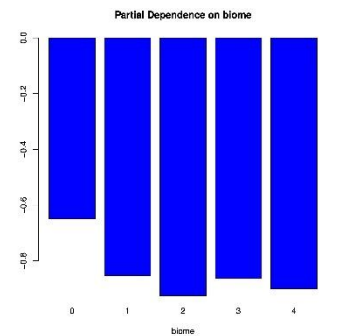
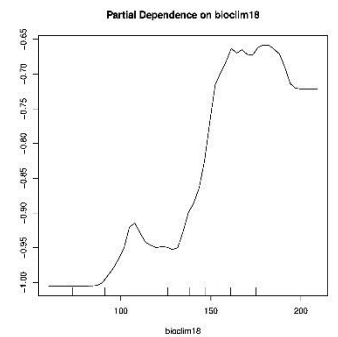
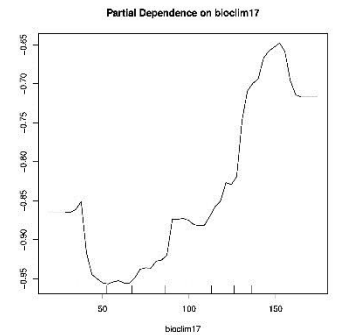
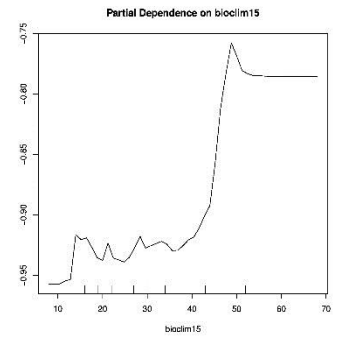
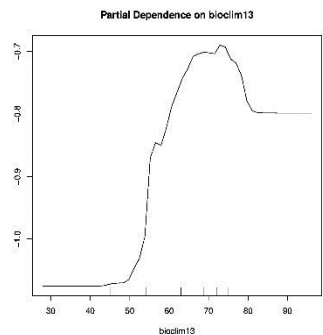
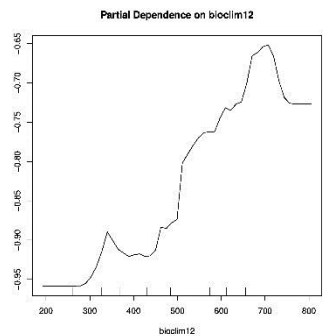
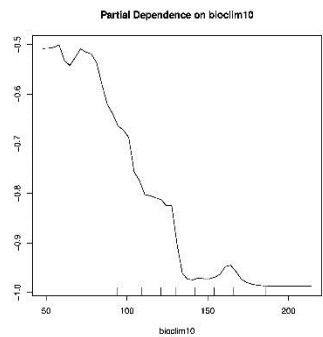
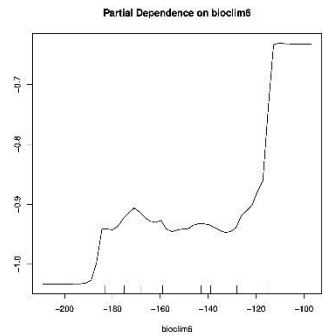
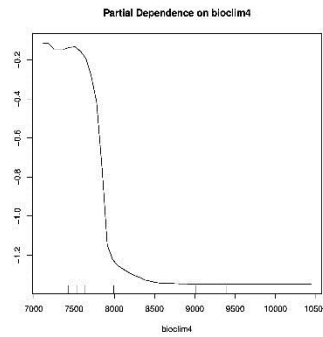
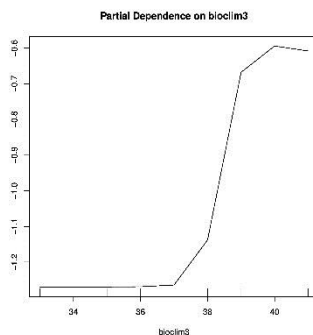
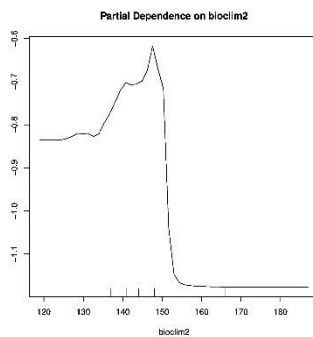
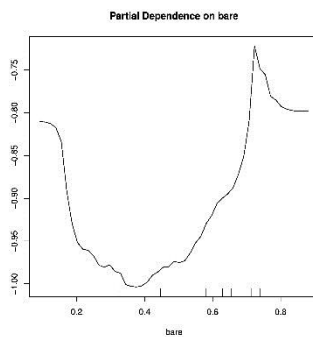
## Predictor Variable Importance:

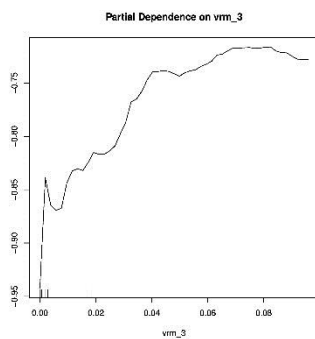
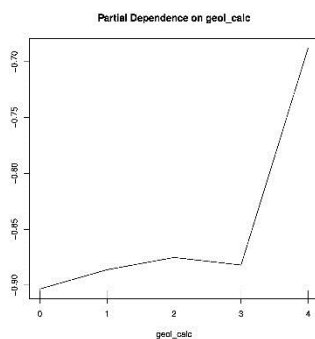
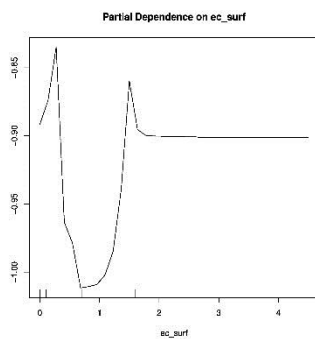
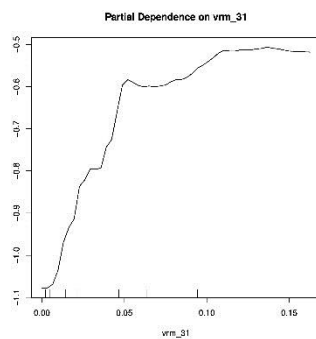
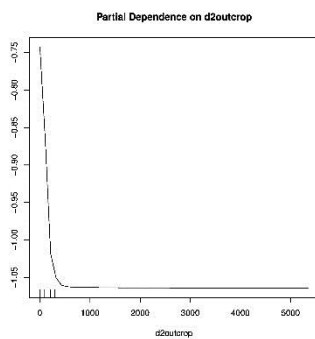
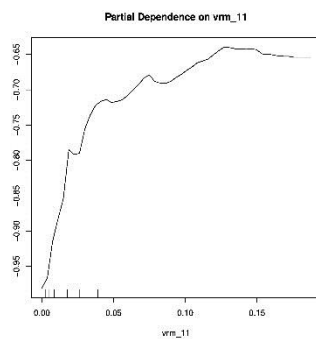
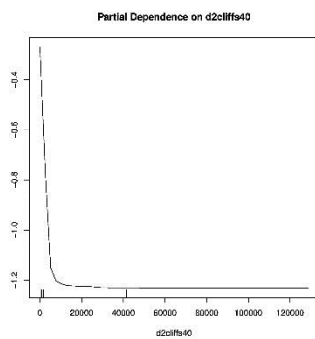
The graph below indicates the relative importance of predictors in modeling distribution for this species. “MeanDecreaseAccuracy” calculates importance by permuting (i.e., randomizing) values for the predictor and measuring the resulting decrease in model accuracy. This measure is typically a more reliable indicator of importance than “MeanDecreaseGini,” which measures improvement in a model due to splits based on the predictor. In both graphs, the further to the right the point falls on the graph, the higher the relative importance of the corresponding predictor. See Appendix 1 of this report for a detailed description of each predictor.



## Partial Plots

Partial plots show the relationship between a predictor variable and the predicted probability of occurrence, holding all other predictors at their average values. Probability values on the y-axis are unscaled; higher values on this axis indicate a higher relative probability of occurrence.

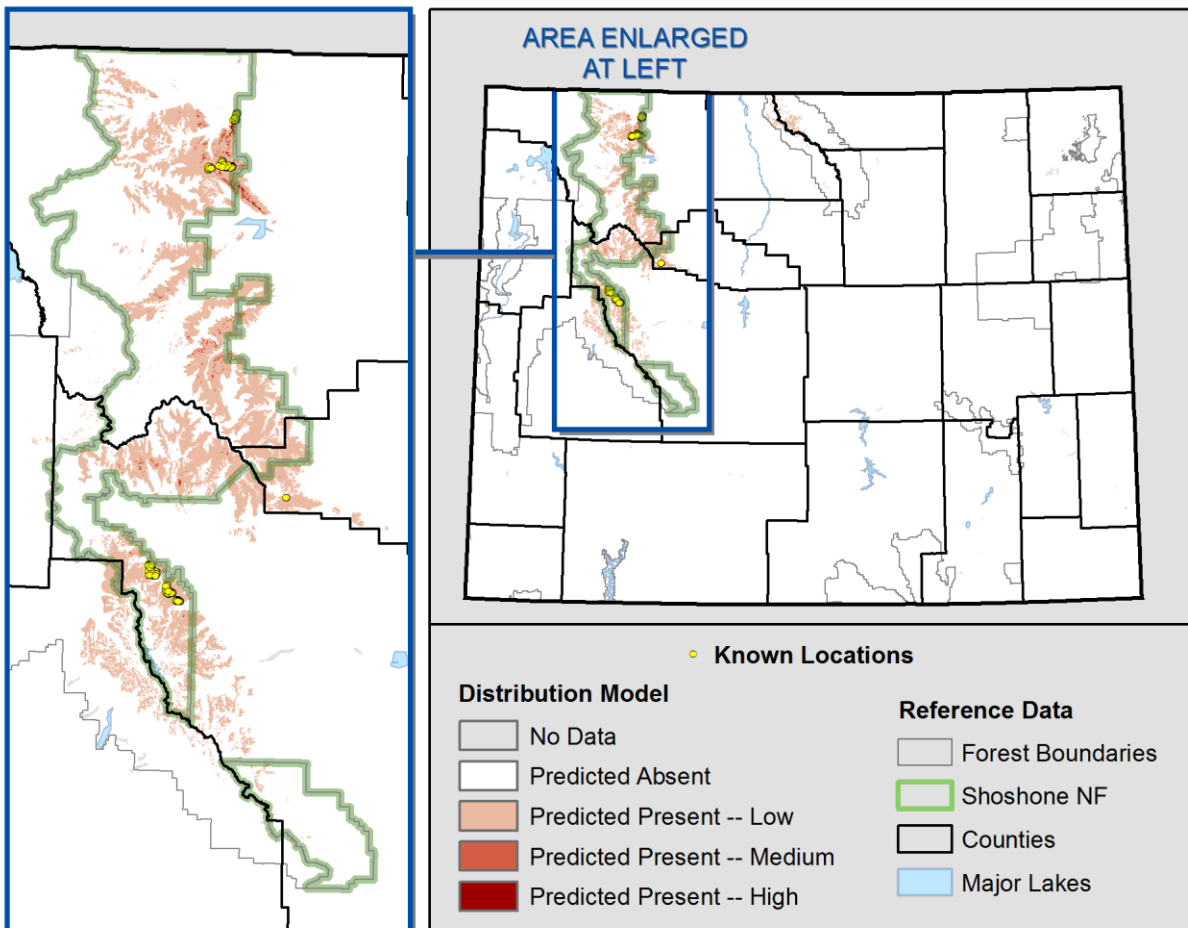






# Sweet-flowered rock jasmine (*Androsace chamaejasme* var. *carinata*)

Model version: 2016-06-22



## Model Information

- Algorithm:** Random Forest
- Software:** R version 3.3.0 (2016-05-03); randomForest package v. 4.6.12
- Binary Threshold (MaxTSS):** 0.657
- Reclassification Table for Four-Category Version:**

From	To	Becomes
0	0.550	Predicted Absent (0)
0.550	0.880	Low (1)
0.880	0.960	Medium (2)
0.960	1	High (3)

## Model Details

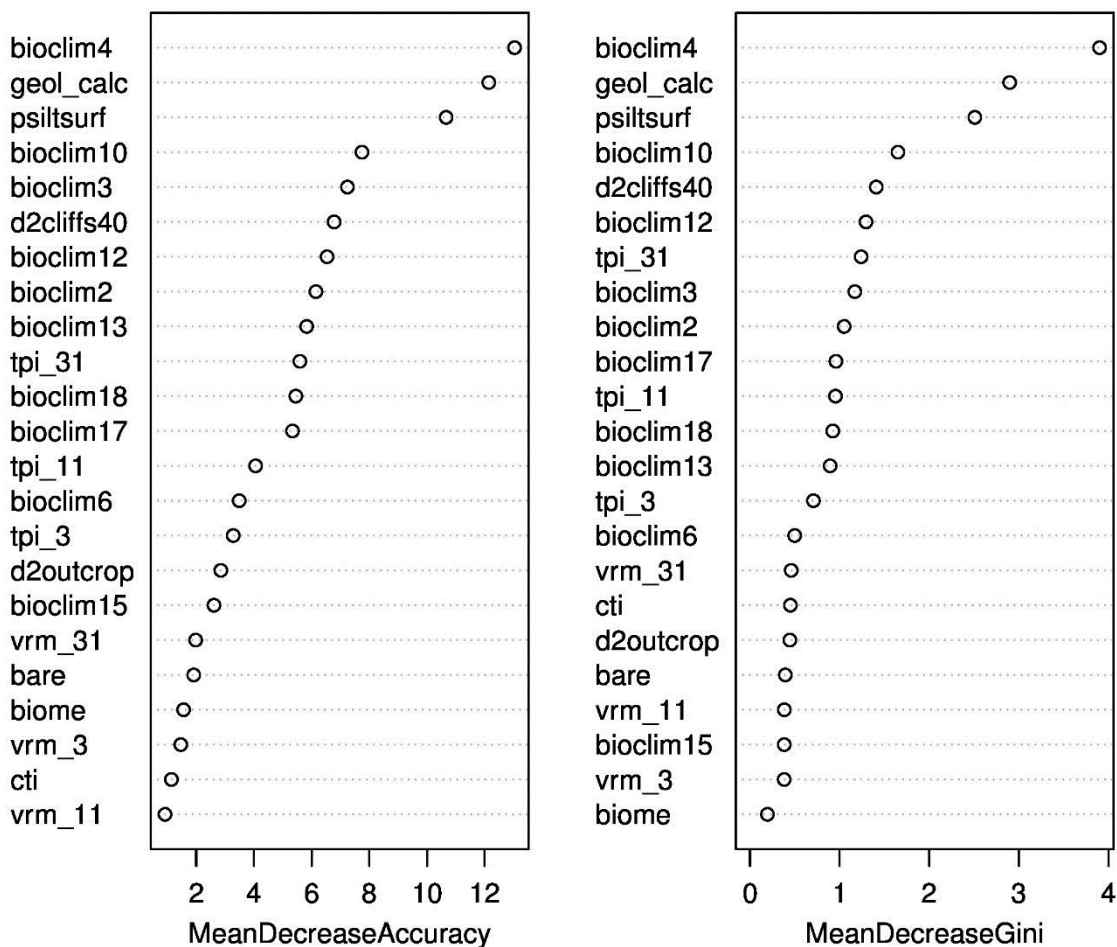
- Number of Locations:** 17
- Out-of-Bag Error:** 5.6%
- TSS:** 86.2%
- Kappa:** 85.3%
- Sensitivity:** 90.4%
- Specificity:** 95.8%

## Model Comments:

Rare plant species that are restricted to specific soil conditions are difficult to model because statewide data are coarsely mapped and categorical. The statewide soils layer was parameterized to produce layers with gradients reflecting different soil properties. In addition, for calciphilic species such as Sweet-flowered rock jasmine, a surrogate layer was developed from bedrock geology layers to reflect calcium carbonate content. The geological complexity of the settings where it occurs and crudeness of the surrogate layer might account for the uninterrupted blocks of high probability potential habitat.

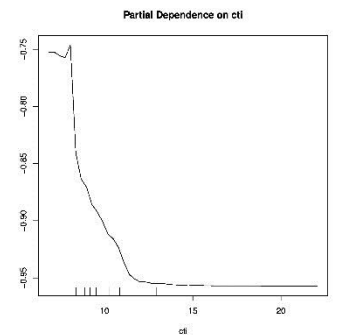
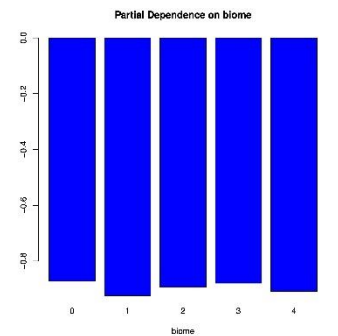
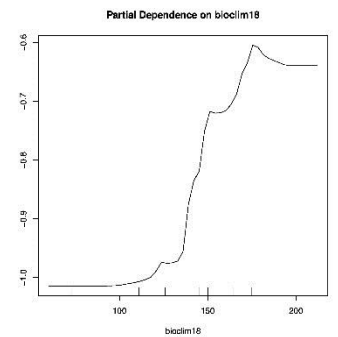
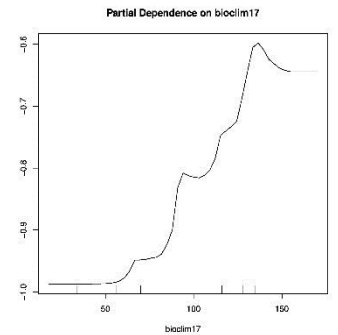
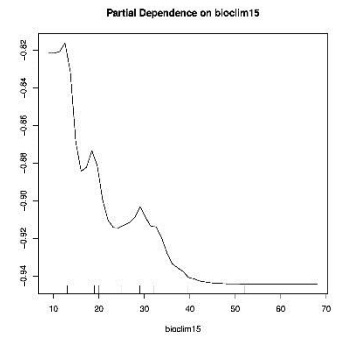
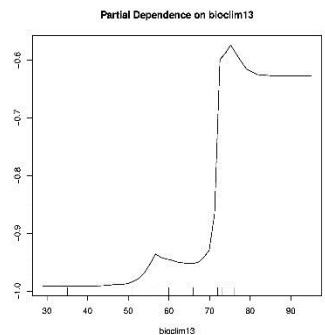
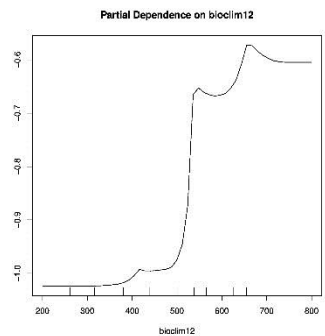
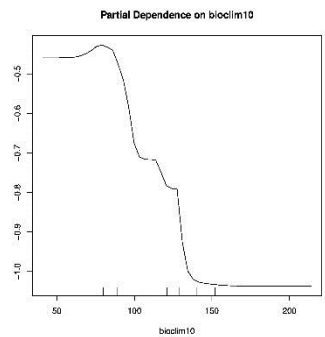
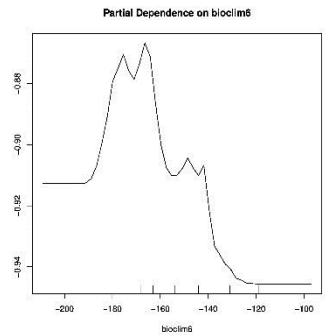
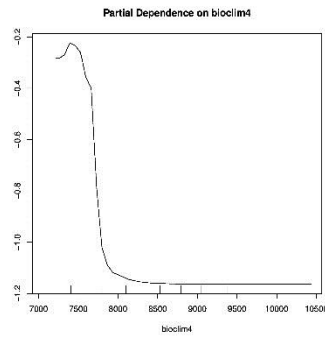
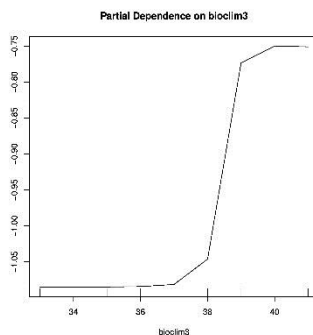
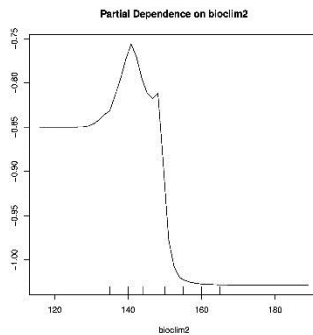
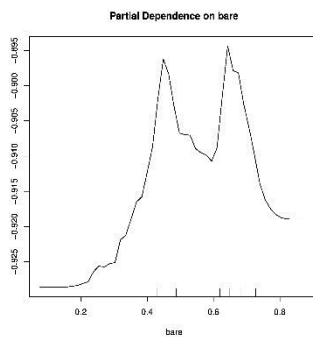
## Predictor Variable Importance:

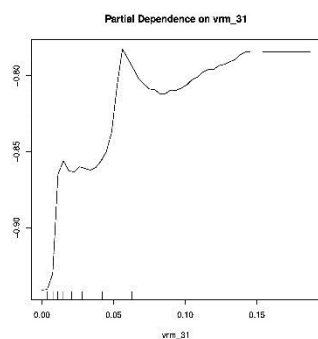
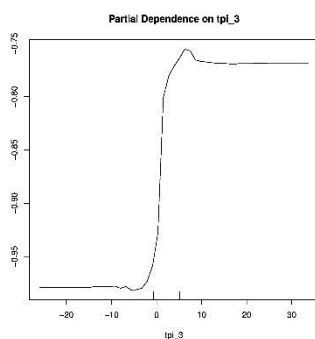
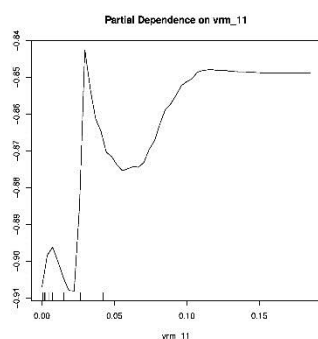
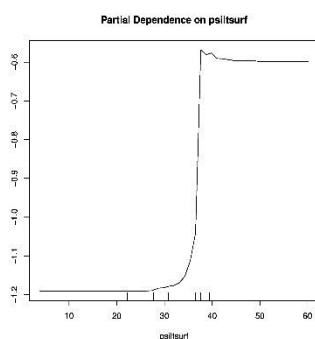
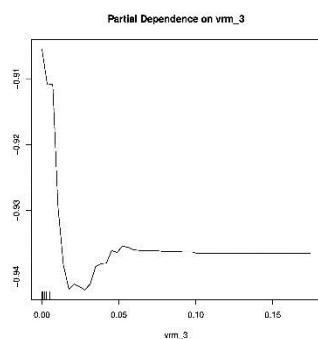
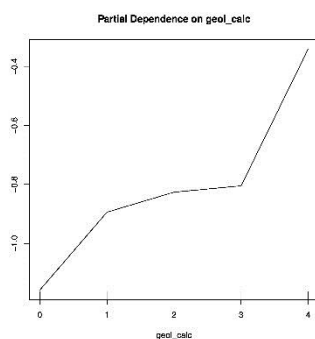
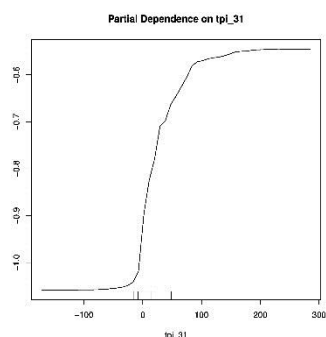
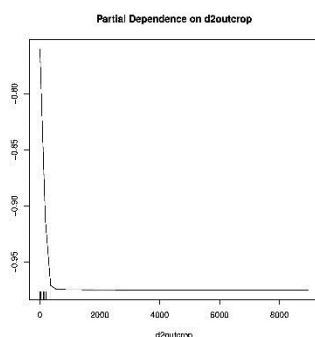
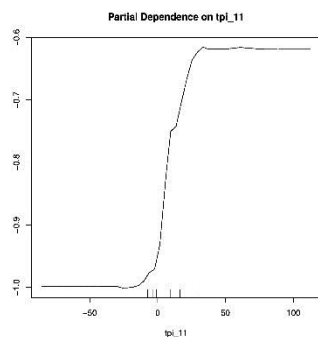
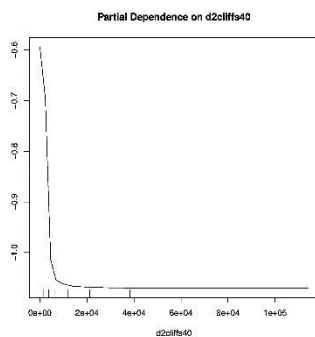
The graph below indicates the relative importance of predictors in modeling distribution for this species. “MeanDecreaseAccuracy” calculates importance by permuting (i.e., randomizing) values for the predictor and measuring the resulting decrease in model accuracy. This measure is typically a more reliable indicator of importance than “MeanDecreaseGini,” which measures improvement in a model due to splits based on the predictor. In both graphs, the further to the right the point falls on the graph, the higher the relative importance of the corresponding predictor. See Appendix 1 of this report for a detailed description of each predictor.



## Partial Plots

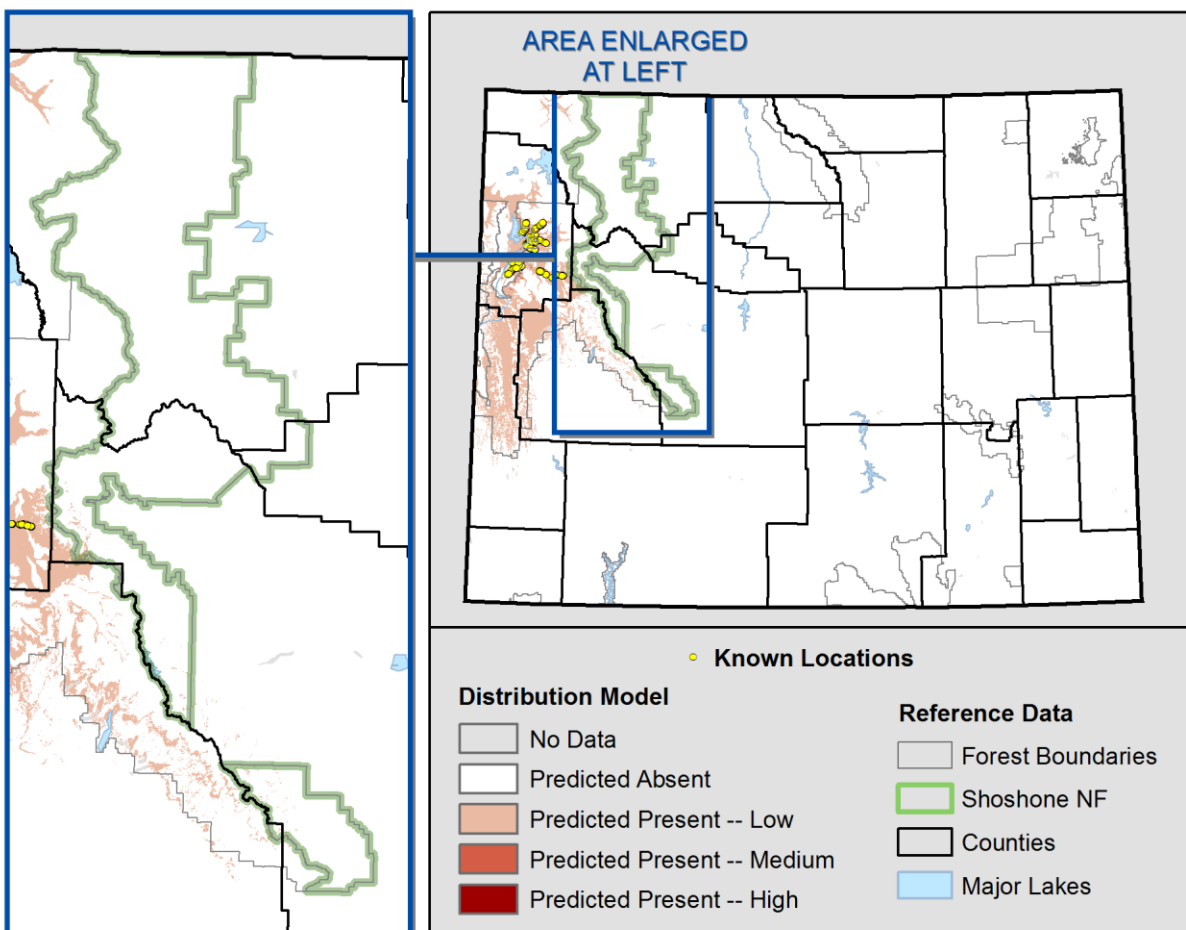
Partial plots show the relationship between a predictor variable and the predicted probability of occurrence, holding all other predictors at their average values. Probability values on the y-axis are unscaled; higher values on this axis indicate a higher relative probability of occurrence.





# Teton wire-lettuce (*Stephanomeria fluminea*)

Model version: 2016-06-24



## Model Information

- **Algorithm:** Random Forest
- **Software:** R version 3.3.0 (2016-05-03); randomForest package v. 4.6.12
- **Binary Threshold (MaxTSS):** 0.322
- **Reclassification Table for Four-Category Version:**

From	To	Becomes
0	0.230	Predicted Absent (0)
0.230	0.942	Low (1)
0.942	0.994	Medium (2)
0.994	1	High (3)

## Model Details

- **Number of Locations:** 36
- **Out-of-Bag Error:** 3.3%
- **TSS:** 91.5%
- **Kappa:** 91.3%
- **Sensitivity:** 93.8%
- **Specificity:** 97.7%

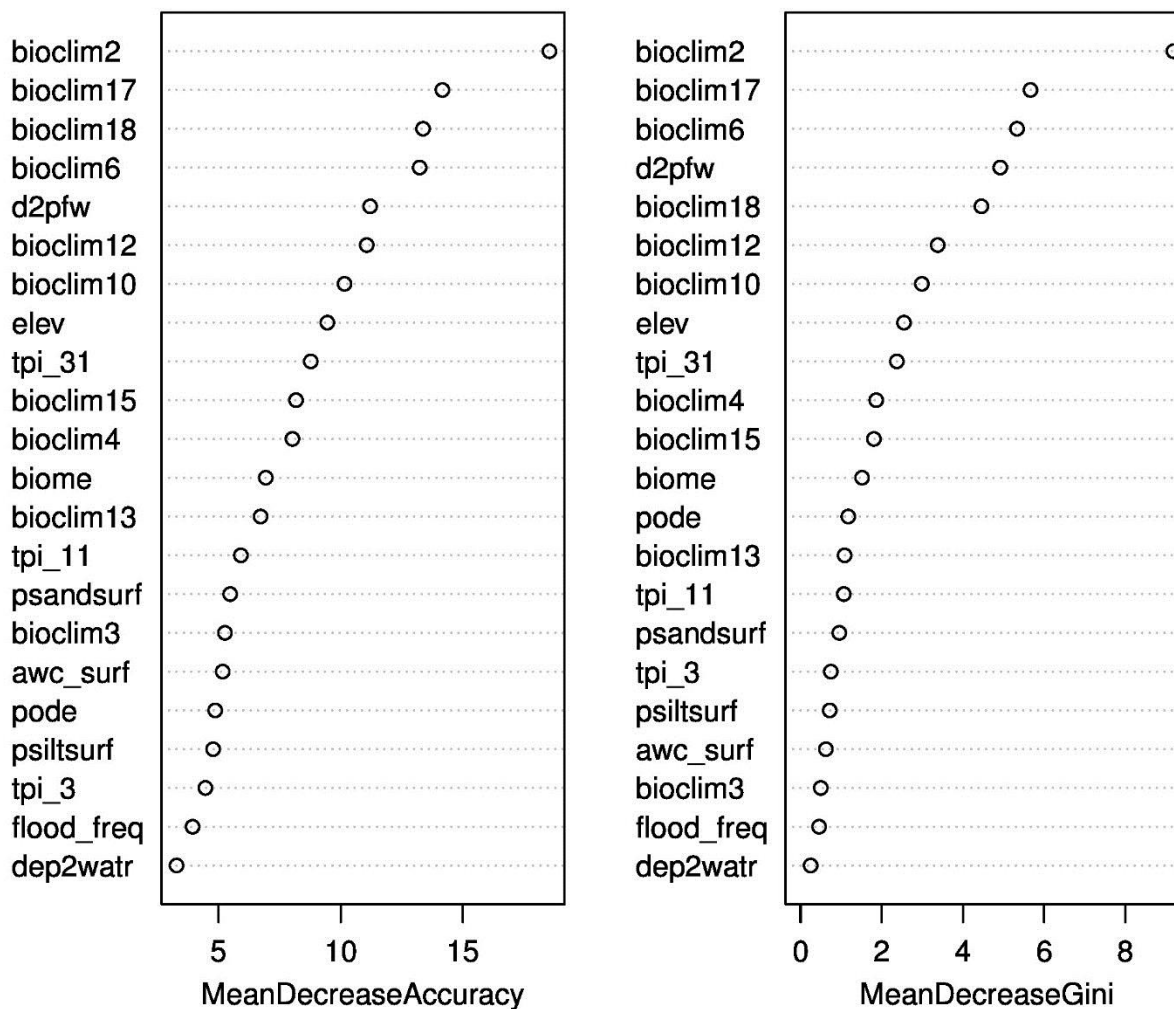
## Model Comments:

Endemic plant species that are restricted to specific riparian settings and hydrological conditions are difficult to model because statewide data are coarsely mapped and categorical. A layer was developed that combines layers representing riverine and palustrine settings along a distance gradient. Almost like

a fish, Teton wire-lettuce also occupies a specific range of stream orders, as well as early-succession conditions.

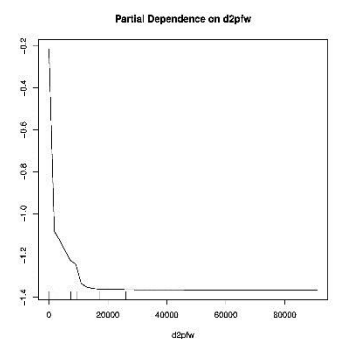
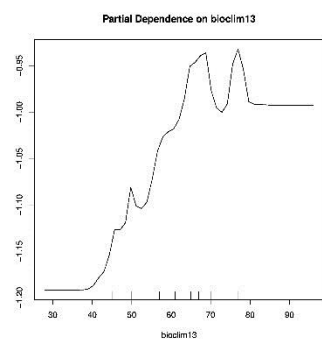
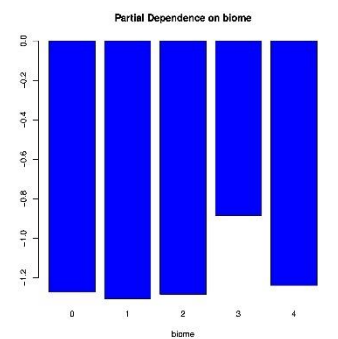
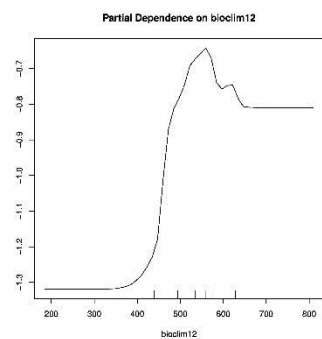
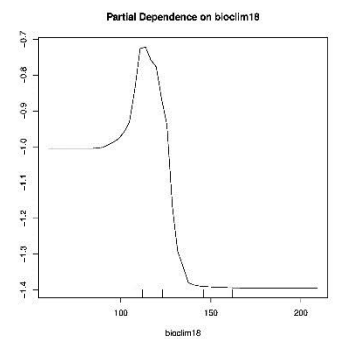
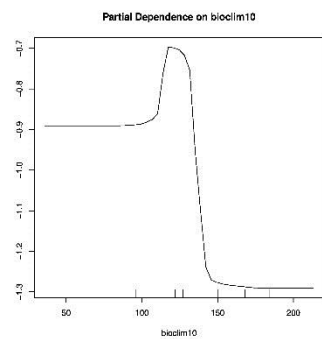
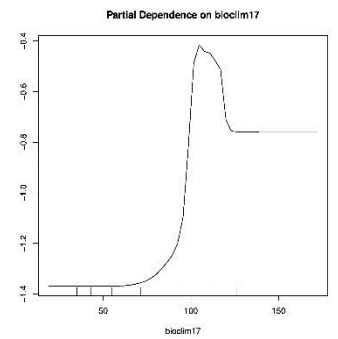
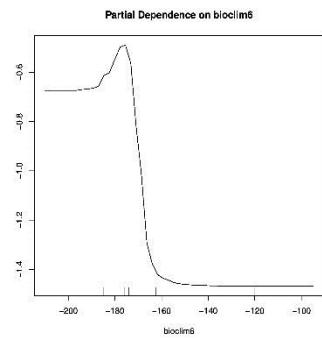
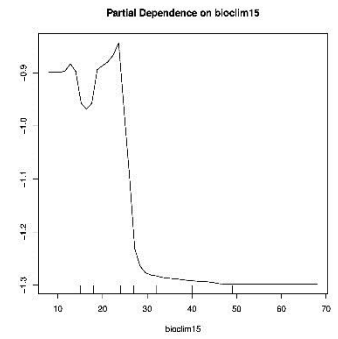
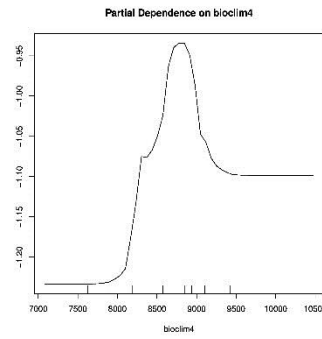
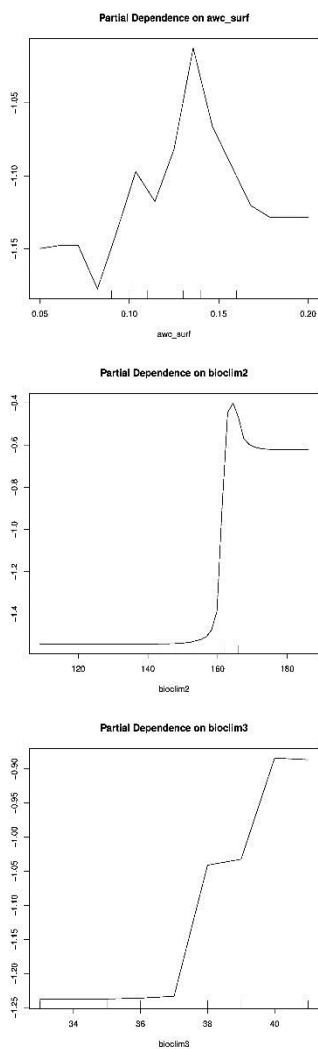
## Predictor Variable Importance:

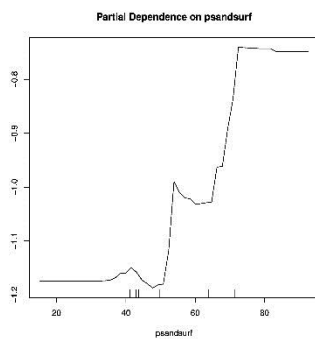
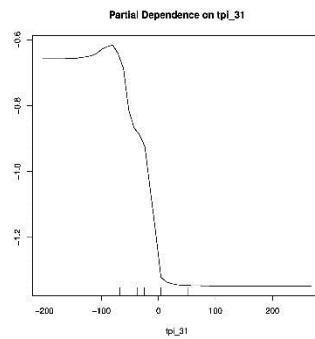
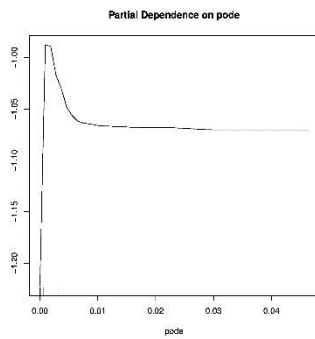
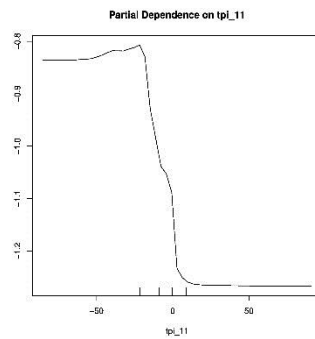
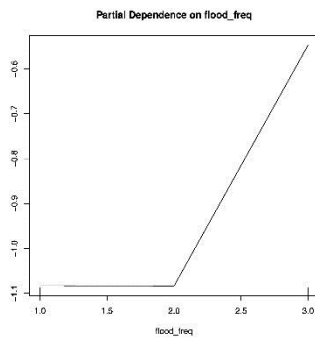
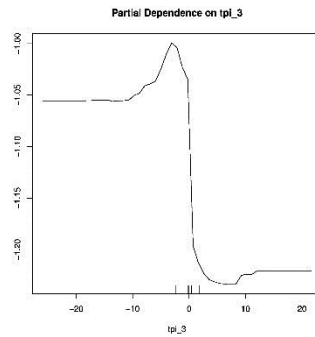
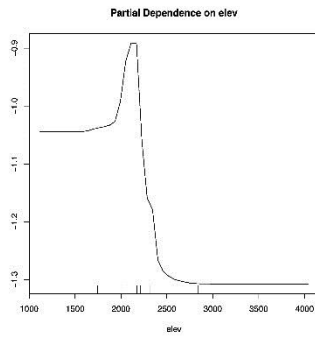
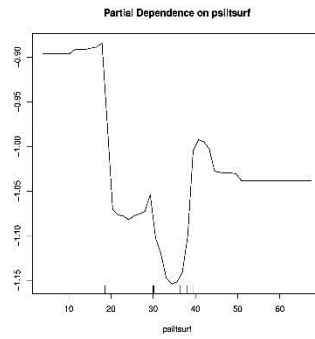
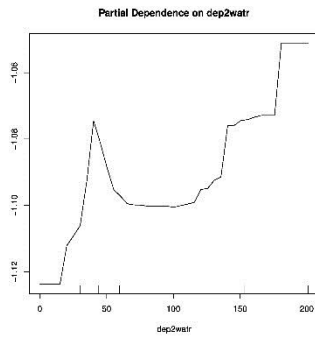
The graph below indicates the relative importance of predictors in modeling distribution for this species. “MeanDecreaseAccuracy” calculates importance by permuting (i.e., randomizing) values for the predictor and measuring the resulting decrease in model accuracy. This measure is typically a more reliable indicator of importance than “MeanDecreaseGini,” which measures improvement in a model due to splits based on the predictor. In both graphs, the further to the right the point falls on the graph, the higher the relative importance of the corresponding predictor. See Appendix 1 of this report for a detailed description of each predictor.



## Partial Plots

Partial plots show the relationship between a predictor variable and the predicted probability of occurrence, holding all other predictors at their average values. Probability values on the y-axis are unscaled; higher values on this axis indicate a higher relative probability of occurrence.

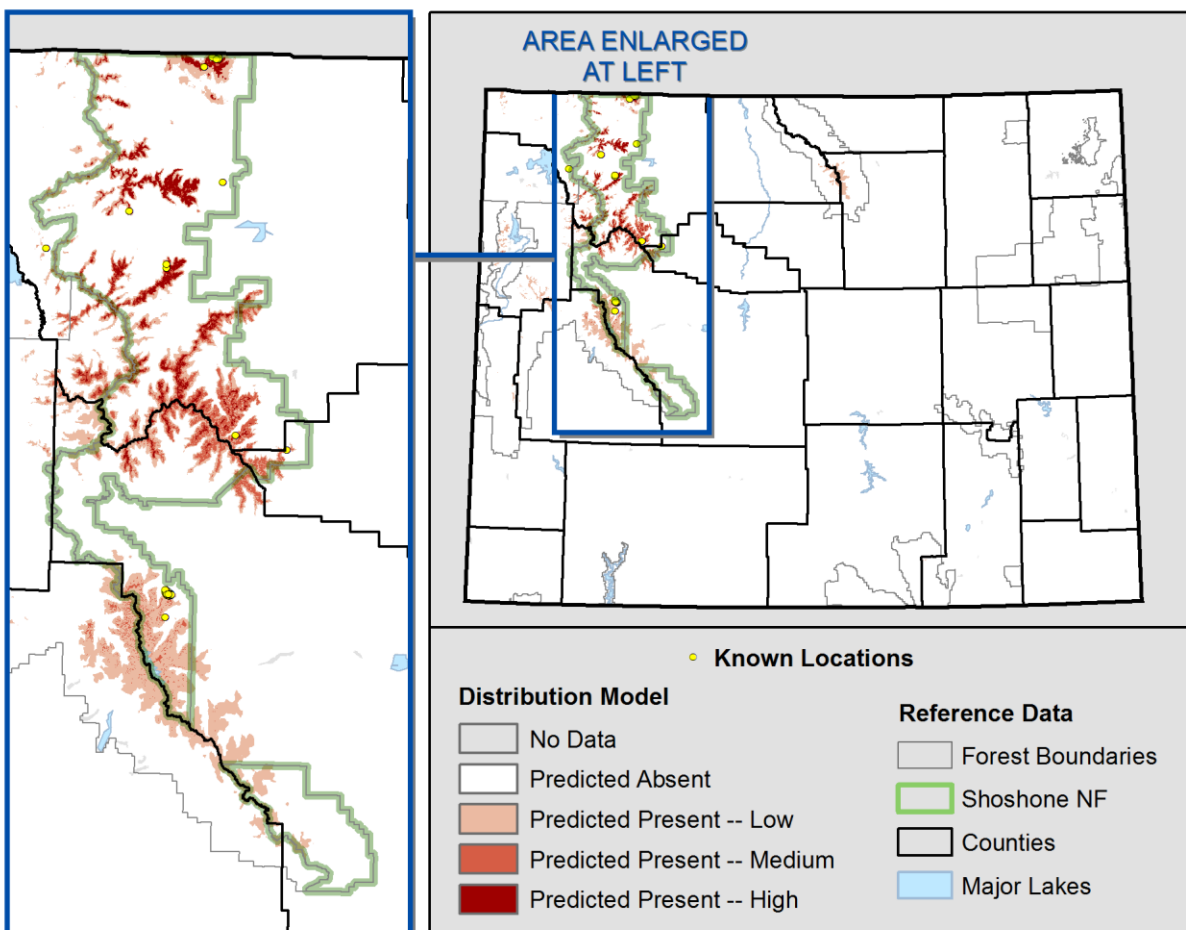






# Trelease's whitlow-grass (*Draba paysonii* var. *treleasei*)

Model version: 2016-06-23



## Model Information

- Algorithm:** Random Forest
- Software:** R version 3.3.0 (2016-05-03); randomForest package v. 4.6.12
- Binary Threshold (MaxTSS):** 0.627
- Reclassification Table for Four-Category Version:**

From	To	Becomes
0	0.566	Predicted Absent (0)
0.566	0.886	Low (1)
0.886	0.988	Medium (2)
0.988	1	High (3)

## Model Details

- Number of Locations:** 14
- Out-of-Bag Error:** 12.1%
- TSS:** 69.0%
- Kappa:** 68.2%
- Sensitivity:** 77.6%
- Specificity:** 91.4%

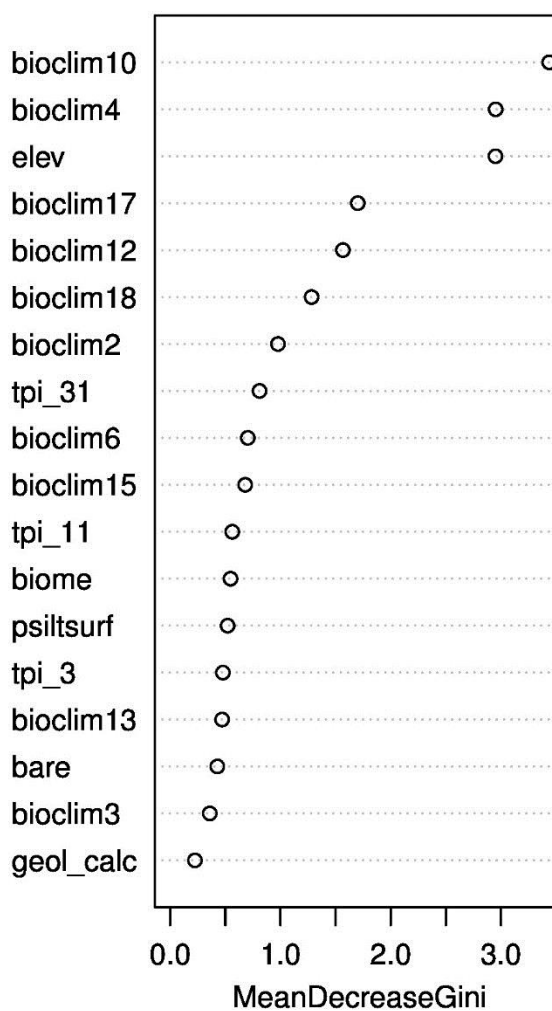
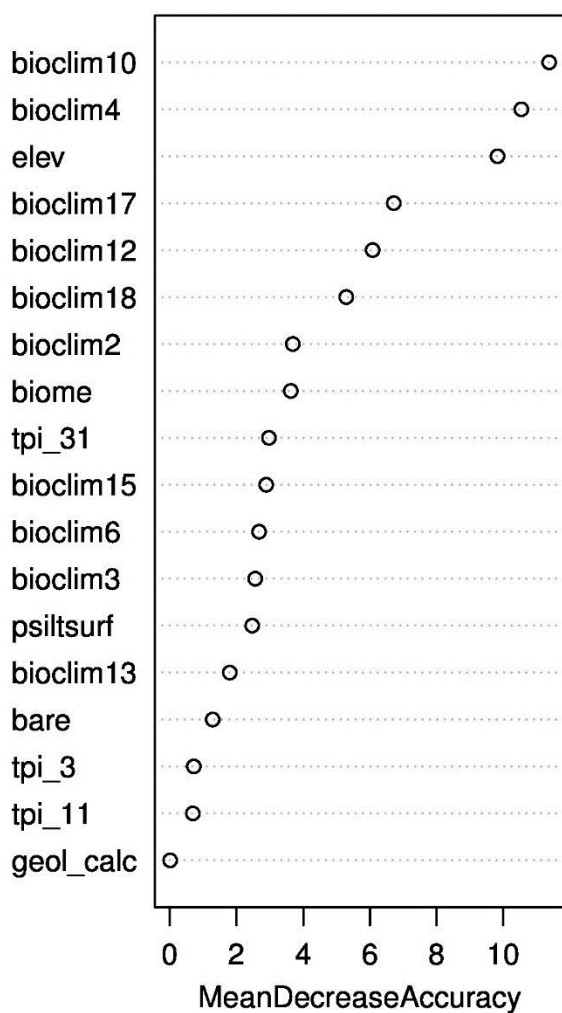
## Model Comments:

Rare alpine plant species that are restricted to certain soil conditions are difficult to model because statewide data are coarsely mapped and categorical. The statewide soils layer was parameterized to produce layers with gradients reflecting different soil properties. For species such as Trelease's whitlow-

grass that occupy more than one substrate (both limestone and volcanics), no single surrogate layer will improve model performance. The geological complexity of the settings where it occurs and crudeness of the surrogate layer might further contribute to overpredicting high probability potential habitat.

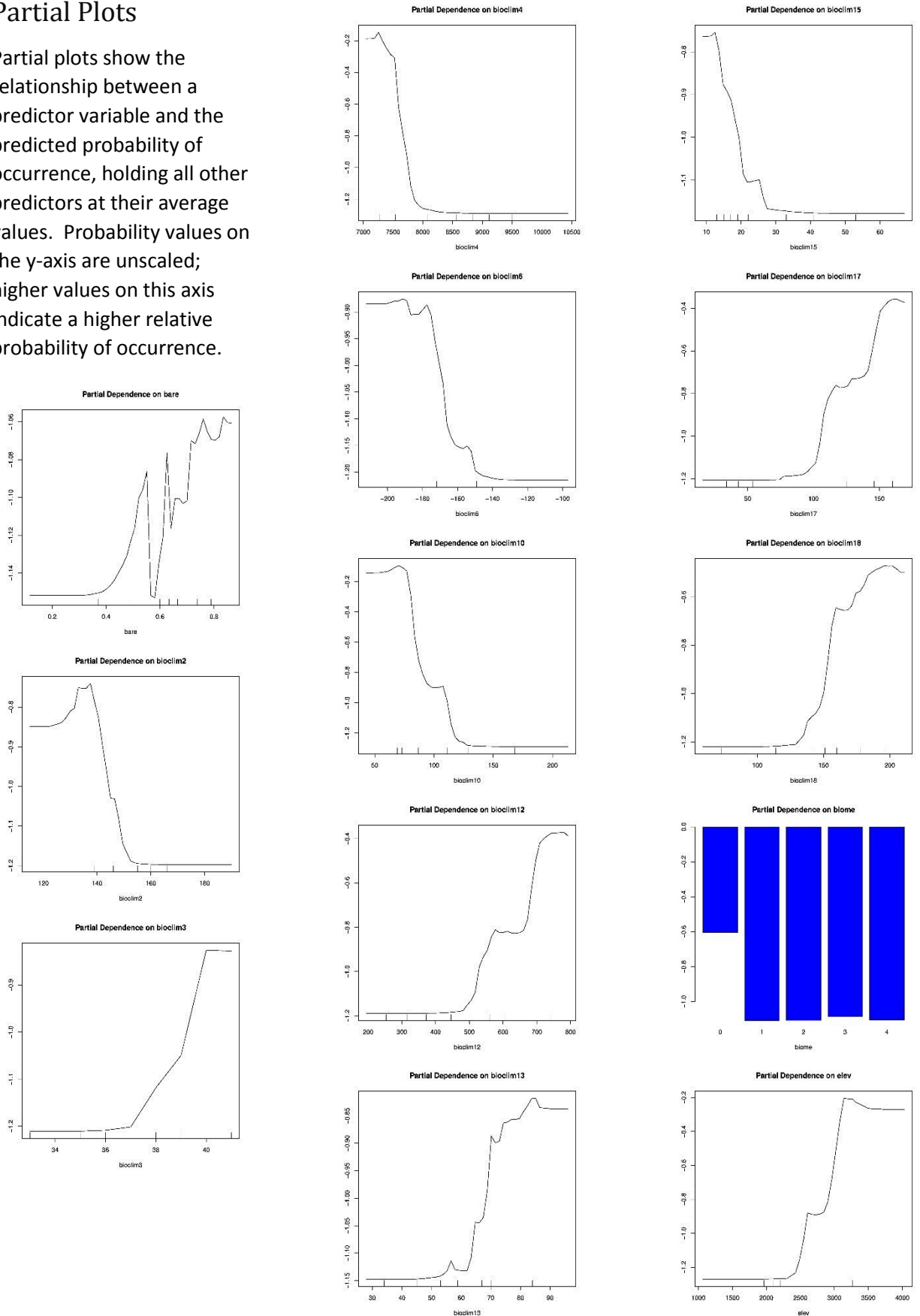
### Predictor Variable Importance:

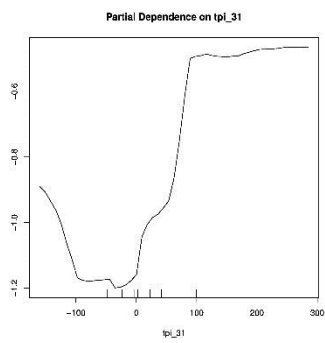
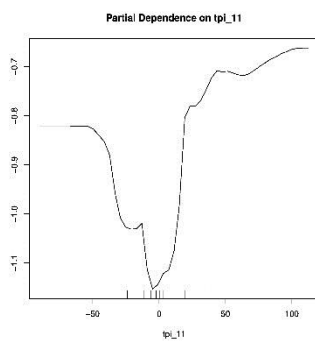
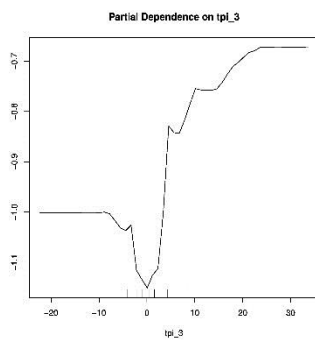
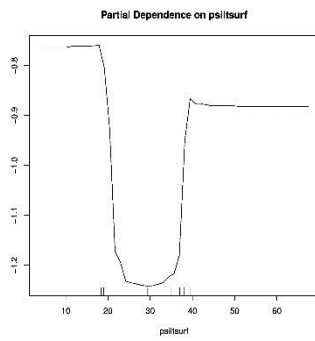
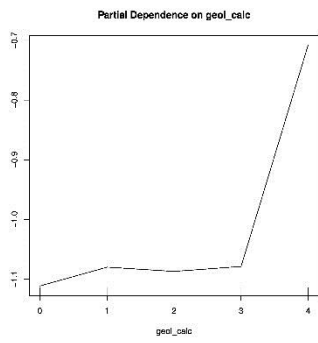
The graph below indicates the relative importance of predictors in modeling distribution for this species. “MeanDecreaseAccuracy” calculates importance by permuting (i.e., randomizing) values for the predictor and measuring the resulting decrease in model accuracy. This measure is typically a more reliable indicator of importance than “MeanDecreaseGini,” which measures improvement in a model due to splits based on the predictor. In both graphs, the further to the right the point falls on the graph, the higher the relative importance of the corresponding predictor. See Appendix 1 of this report for a detailed description of each predictor.



## Partial Plots

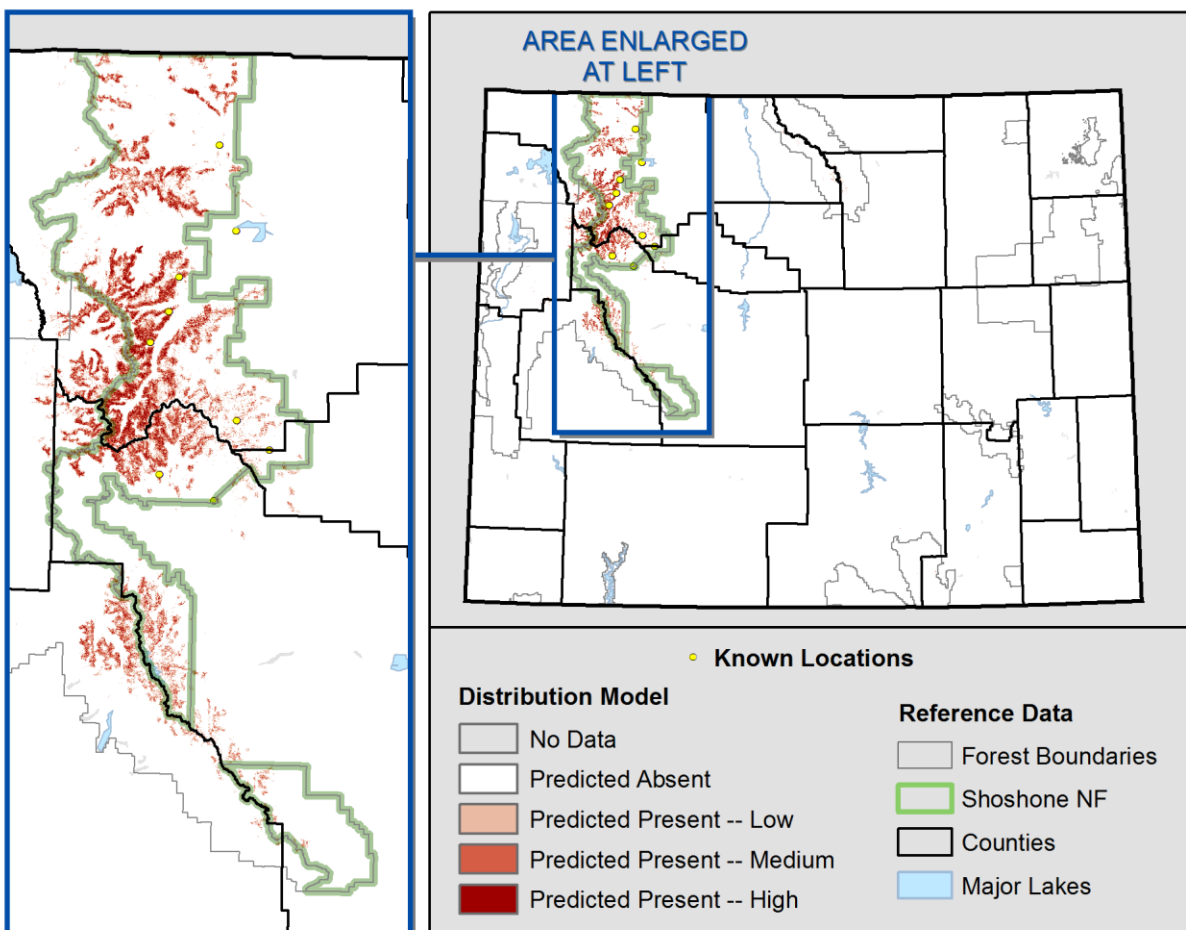
Partial plots show the relationship between a predictor variable and the predicted probability of occurrence, holding all other predictors at their average values. Probability values on the y-axis are unscaled; higher values on this axis indicate a higher relative probability of occurrence.





# Twinleaf cinquefoil (*Potentilla subjuga*)

Model version: 2016-06-24



## Model Information

- **Algorithm:** Random Forest
- **Software:** R version 3.3.0 (2016-05-03); randomForest package v. 4.6.12
- **Binary Threshold (MaxTSS):** 0.713
- **Reclassification Table for Four-Category Version:**

From	To	Becomes
0	0.714	Predicted Absent (0)
0.714	0.750	Low (1)
0.750	0.854	Medium (2)
0.854	1	High (3)

## Model Details

- **Number of Locations:** 9
- **Out-of-Bag Error:** 20.4%
- **TSS:** 34.7%
- **Kappa:** 38.9%
- **Sensitivity:** 42.9%
- **Specificity:** 91.8%

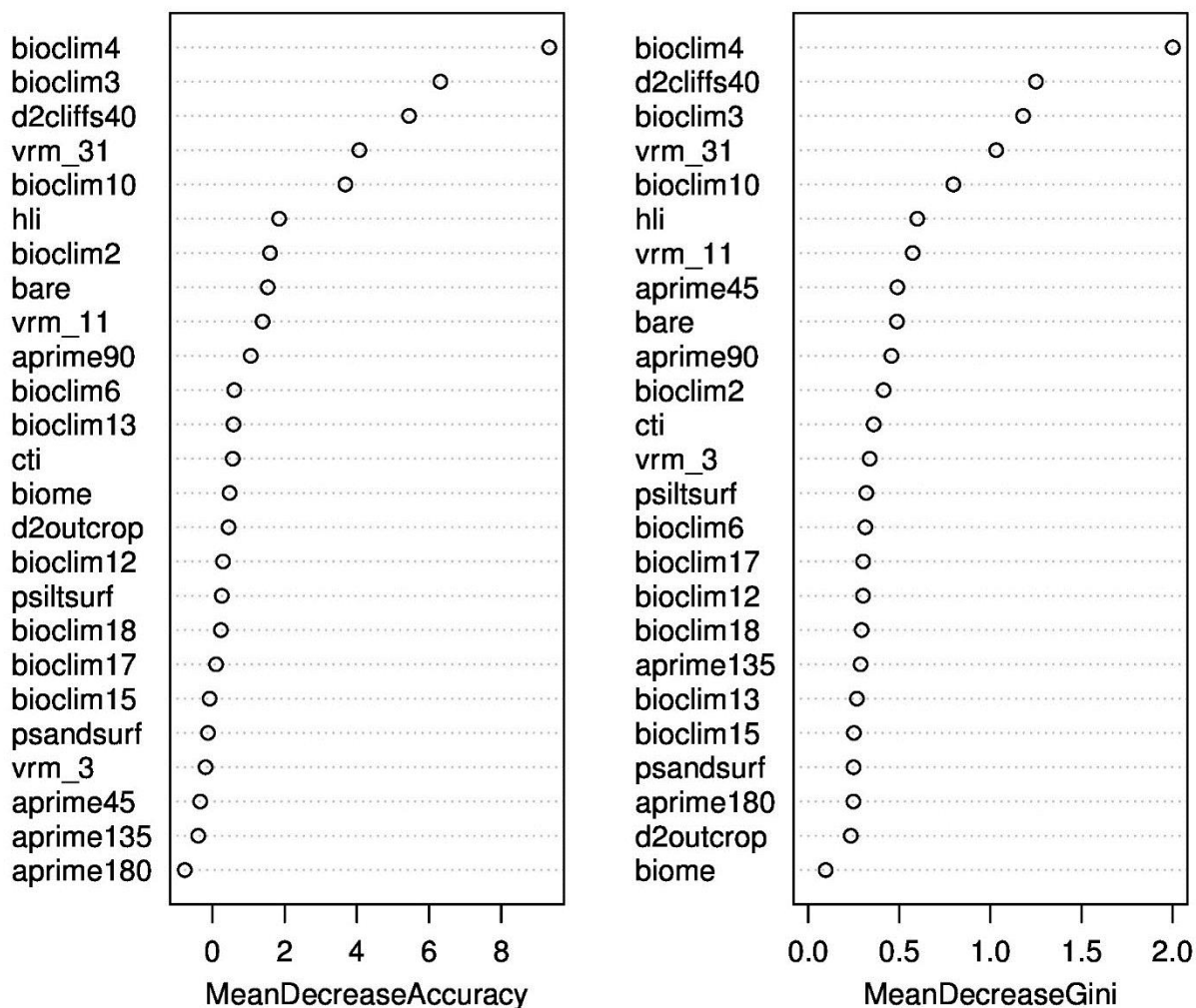
## Model Comments:

The habitat information for this species is not very complete because it is known mainly from collection records rather than surveys, records that tend to be relatively imprecise. This made it difficult to flag specific environmental layers for modelling and probably accounts for overpredicting potential habitat.

The positive data represent a species that is being described as a new species endemic to SNF, making it a priority to collect more complete and detailed distribution and habitat information.

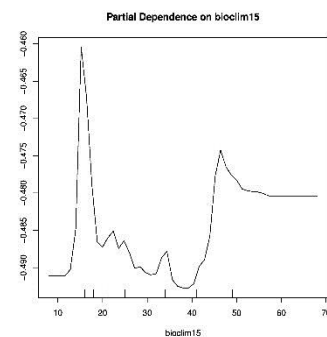
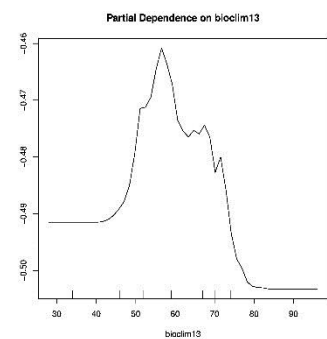
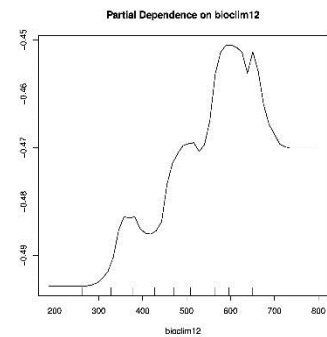
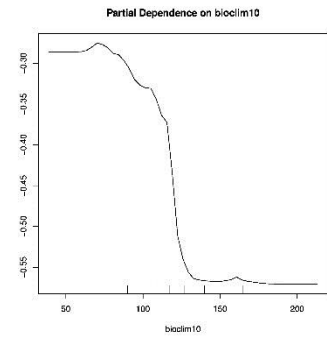
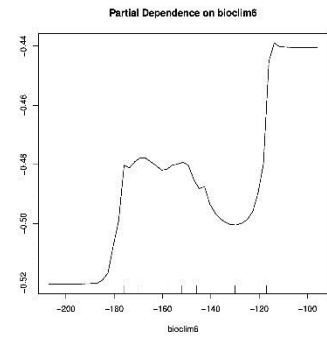
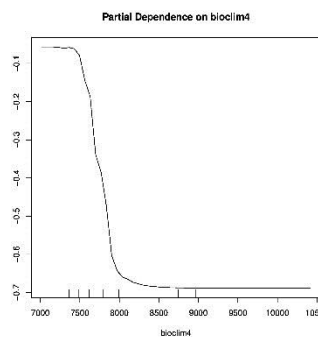
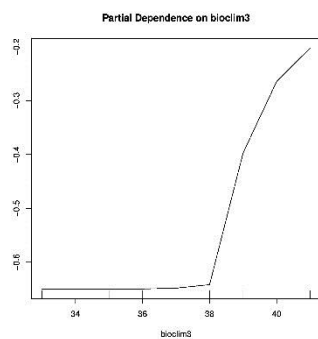
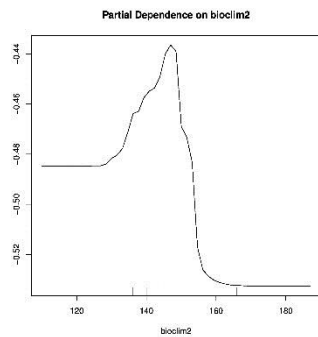
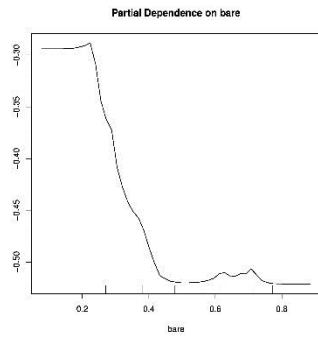
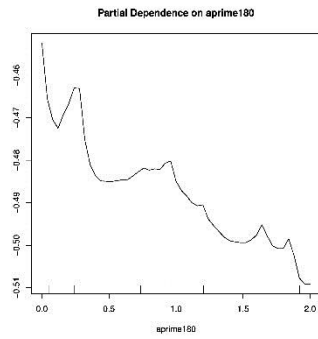
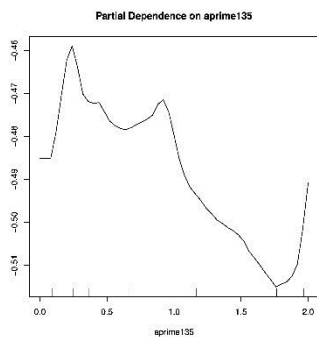
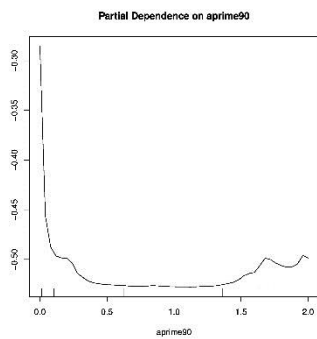
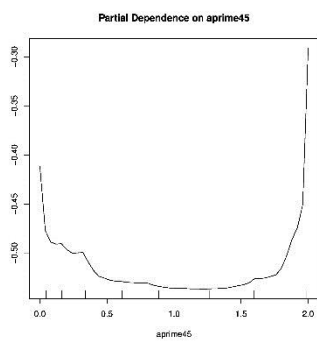
## Predictor Variable Importance:

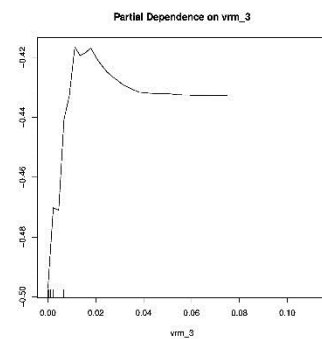
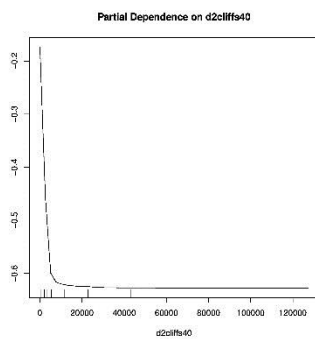
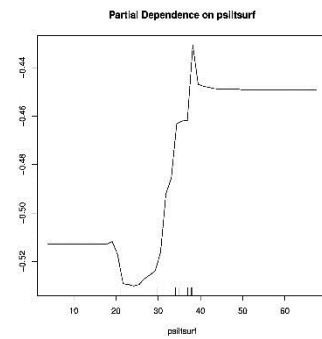
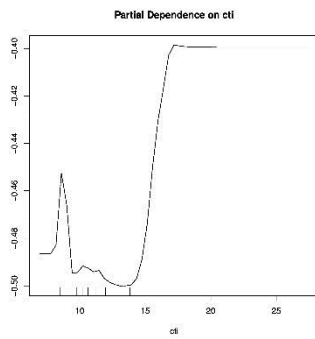
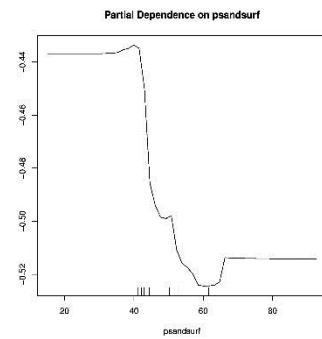
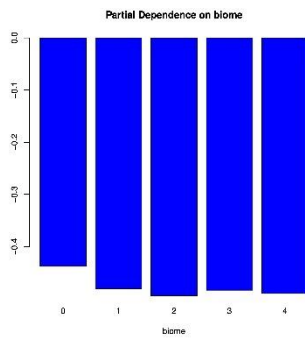
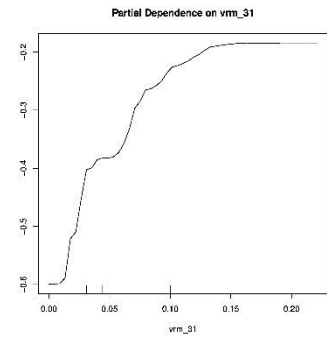
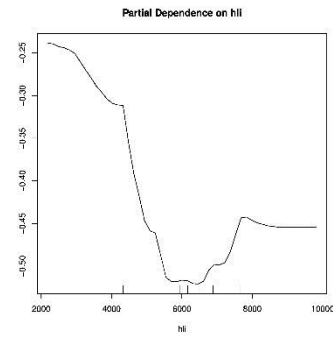
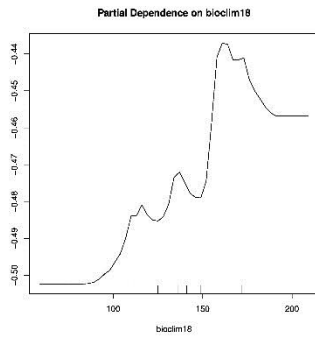
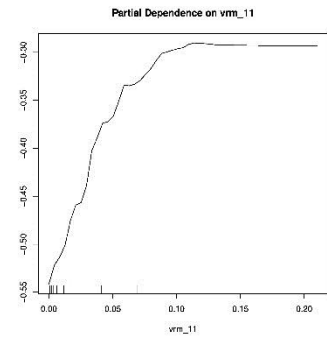
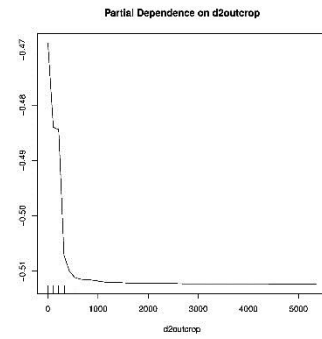
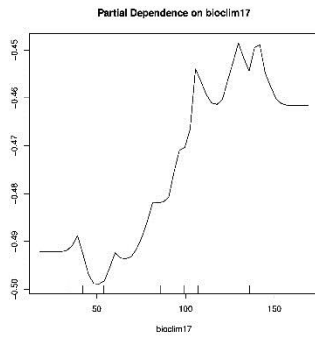
The graph below indicates the relative importance of predictors in modeling distribution for this species. “MeanDecreaseAccuracy” calculates importance by permuting (i.e., randomizing) values for the predictor and measuring the resulting decrease in model accuracy. This measure is typically a more reliable indicator of importance than “MeanDecreaseGini,” which measures improvement in a model due to splits based on the predictor. In both graphs, the further to the right the point falls on the graph, the higher the relative importance of the corresponding predictor. See Appendix 1 of this report for a detailed description of each predictor.



## Partial Plots

Partial plots show the relationship between a predictor variable and the predicted probability of occurrence, holding all other predictors at their average values. Probability values on the y-axis are unscaled; higher values on this axis indicate a higher relative probability of occurrence.

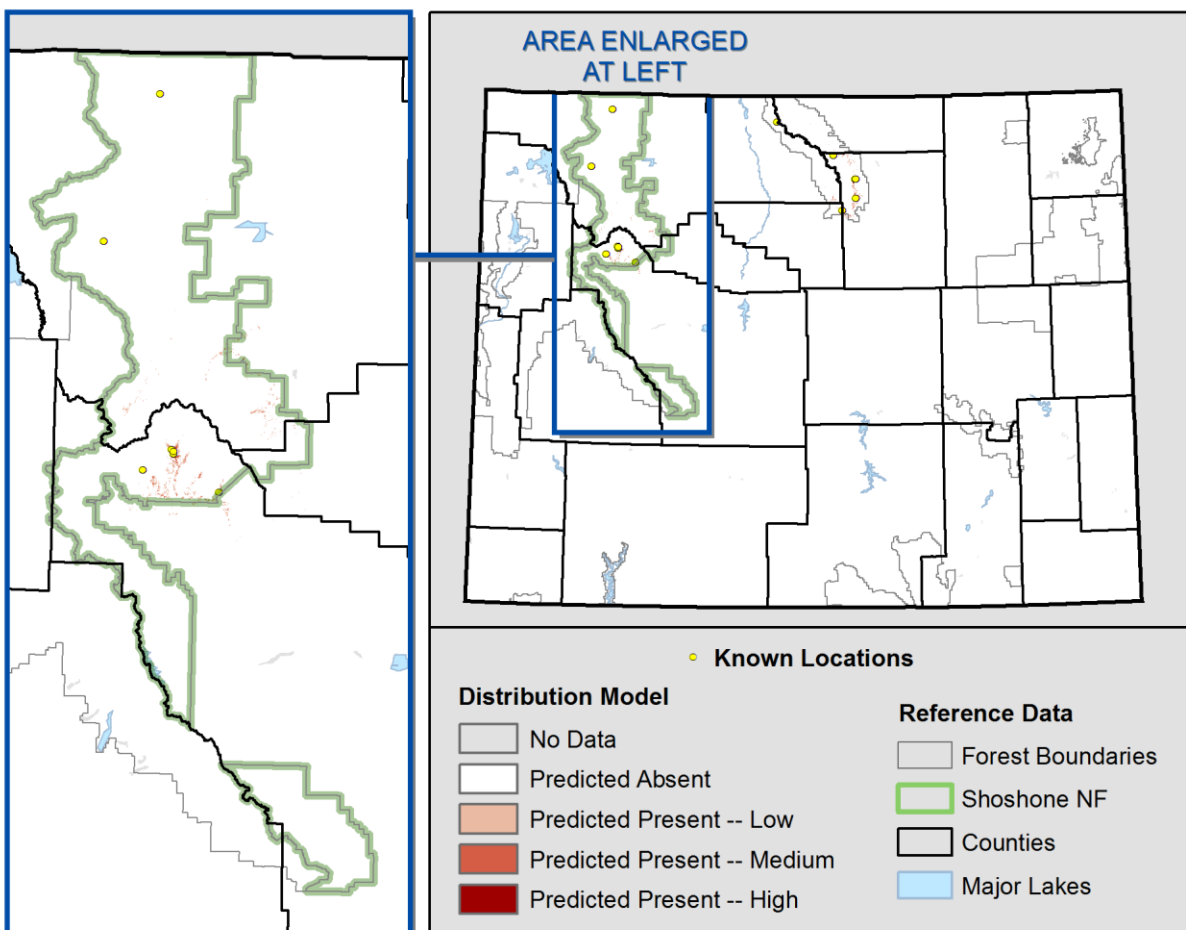






# Upward-lobe moonwort (*Botrychium ascendens*)

Model version: 2016-06-22



## Model Information

- **Algorithm:** Random Forest
- **Software:** R version 3.3.0 (2016-05-03); randomForest package v. 4.6.12
- **Binary Threshold (MaxTSS):** 0.620
- **Reclassification Table for Four-Category Version:**

From	To	Becomes
0	0.634	Predicted Absent (0)
0.634	0.730	Low (1)
0.730	0.922	Medium (2)
0.922	1	High (3)

## Model Details

- **Number of Locations:** 14
- **Out-of-Bag Error:** 9.8%
- **TSS:** 69.8%
- **Kappa:** 72.8%
- **Sensitivity:** 74.3%
- **Specificity:** 95.5%

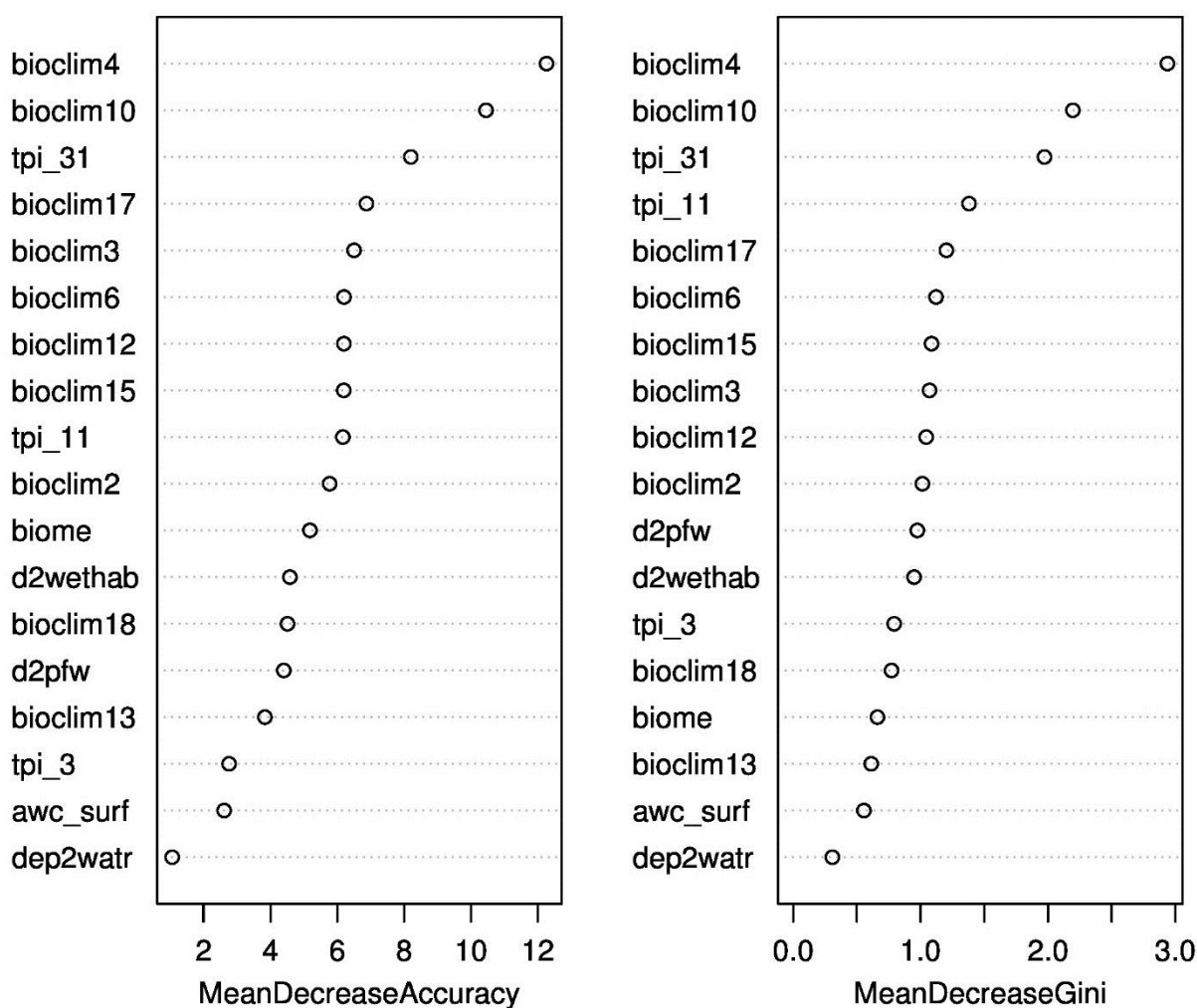
## Model Comments:

Rare wetland plant species that occupy microhabitat are difficult to model. A layer was developed that combines layers representing riverine and palustrine settings along a distance gradient. Upward-lobed moonwort is particularly difficult to model because it occupies the transition zones between wetland

and upland, and in different settings (meadow, thicket, wet forest). Furthermore, the presence data has an extra element of uncertainty because the species is difficult to detect. It is small and has a narrow phenology window. The output shows high probability locations in a highly pixelated pattern.

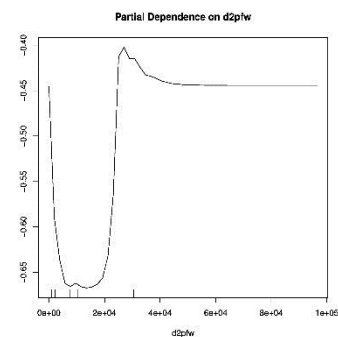
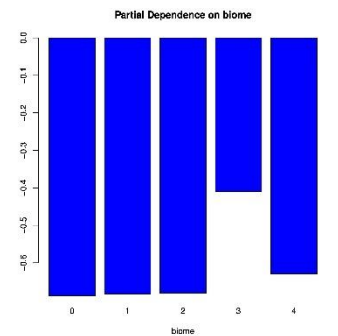
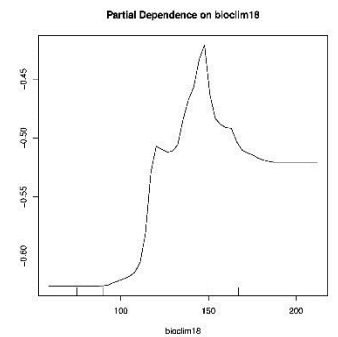
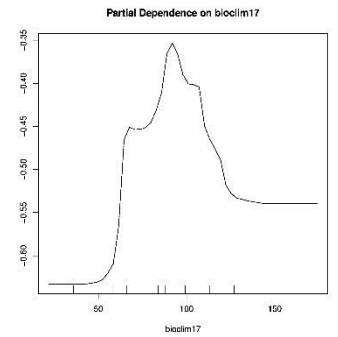
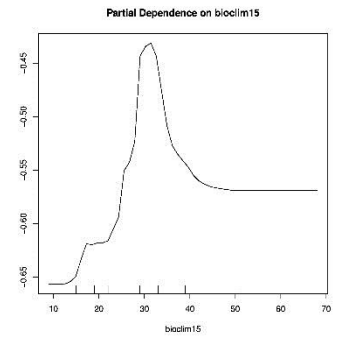
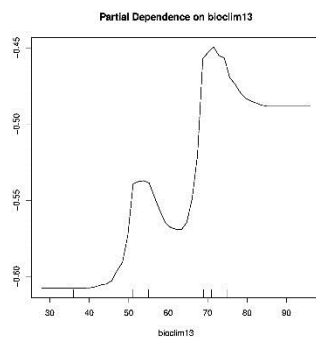
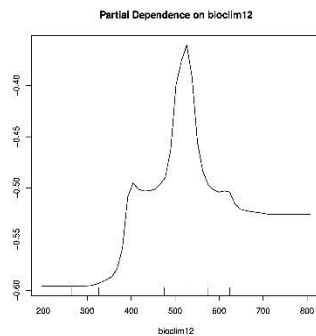
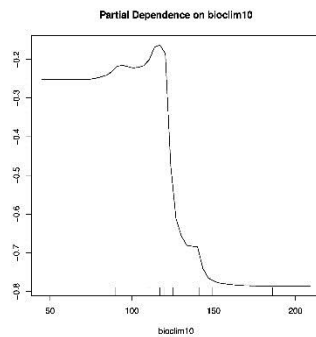
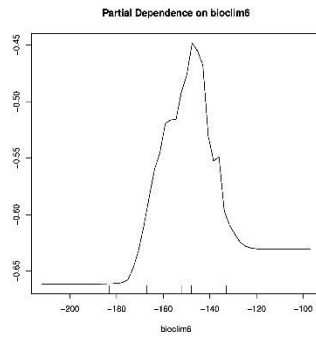
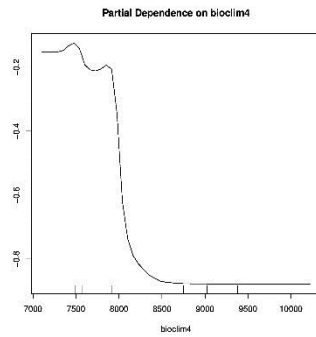
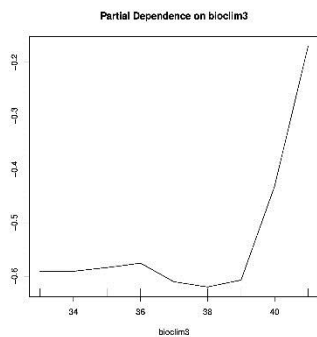
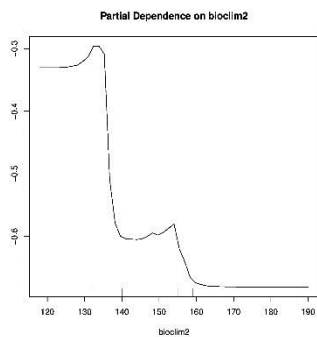
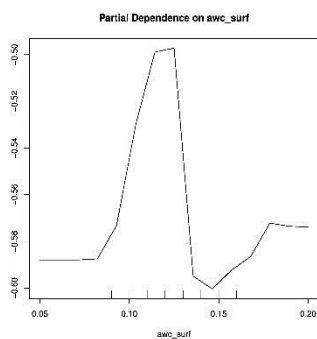
## Predictor Variable Importance:

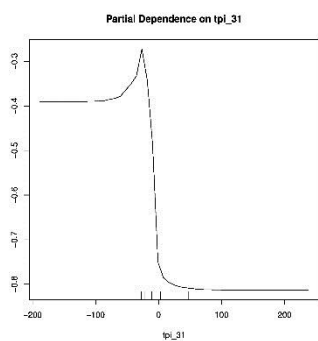
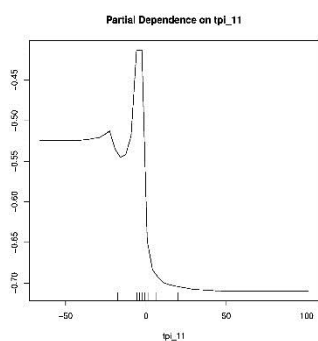
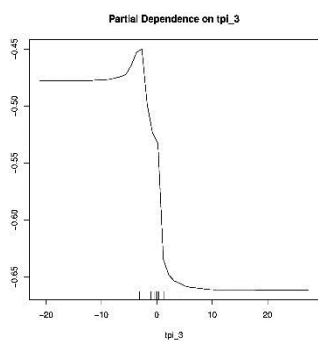
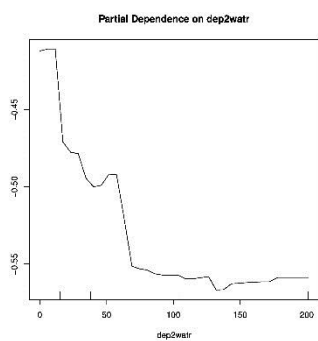
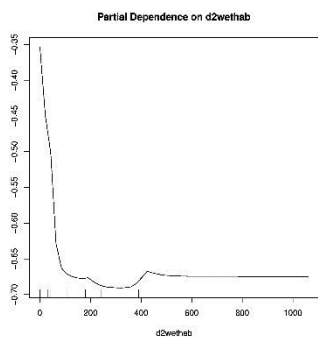
The graph below indicates the relative importance of predictors in modeling distribution for this species. “MeanDecreaseAccuracy” calculates importance by permuting (i.e., randomizing) values for the predictor and measuring the resulting decrease in model accuracy. This measure is typically a more reliable indicator of importance than “MeanDecreaseGini,” which measures improvement in a model due to splits based on the predictor. In both graphs, the further to the right the point falls on the graph, the higher the relative importance of the corresponding predictor. See Appendix 1 of this report for a detailed description of each predictor.



## Partial Plots

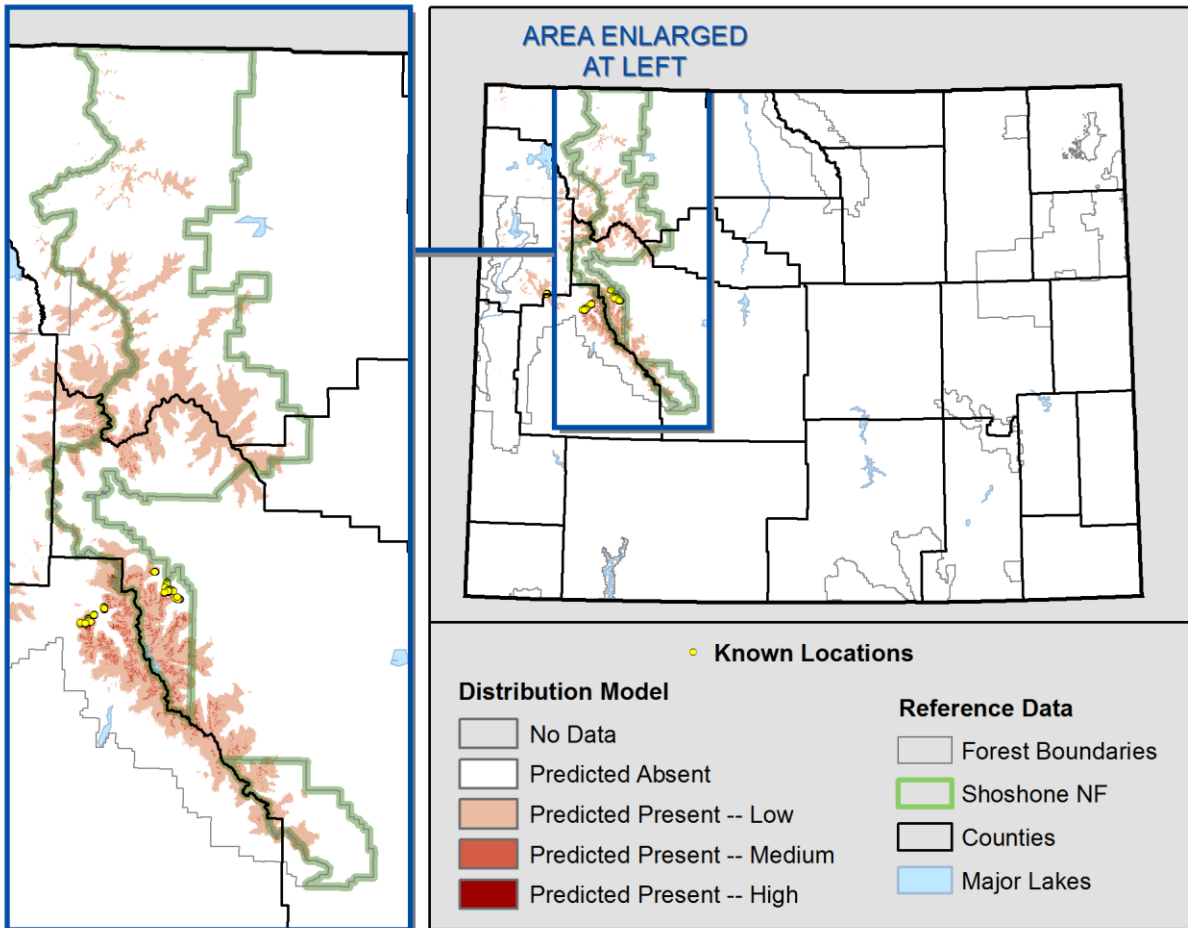
Partial plots show the relationship between a predictor variable and the predicted probability of occurrence, holding all other predictors at their average values. Probability values on the y-axis are unscaled; higher values on this axis indicate a higher relative probability of occurrence.





# Weber's saw-wort (*Saussurea weberi*)

Model version: 2016-06-24



## Model Information

- **Algorithm:** Random Forest
- **Software:** R version 3.3.0 (2016-05-03); randomForest package v. 4.6.12
- **Binary Threshold (MaxTSS):** 0.360
- **Reclassification Table for Four-Category Version:**

From	To	Becomes
0	0.360	Predicted Absent (0)
0.360	0.872	Low (1)
0.872	0.982	Medium (2)
0.982	1	High (3)

## Model Details

- **Number of Locations:** 15
- **Out-of-Bag Error:** 5.5%
- **TSS:** 86.4%
- **Kappa:** 85.6%
- **Sensitivity:** 90.5%
- **Specificity:** 95.9%

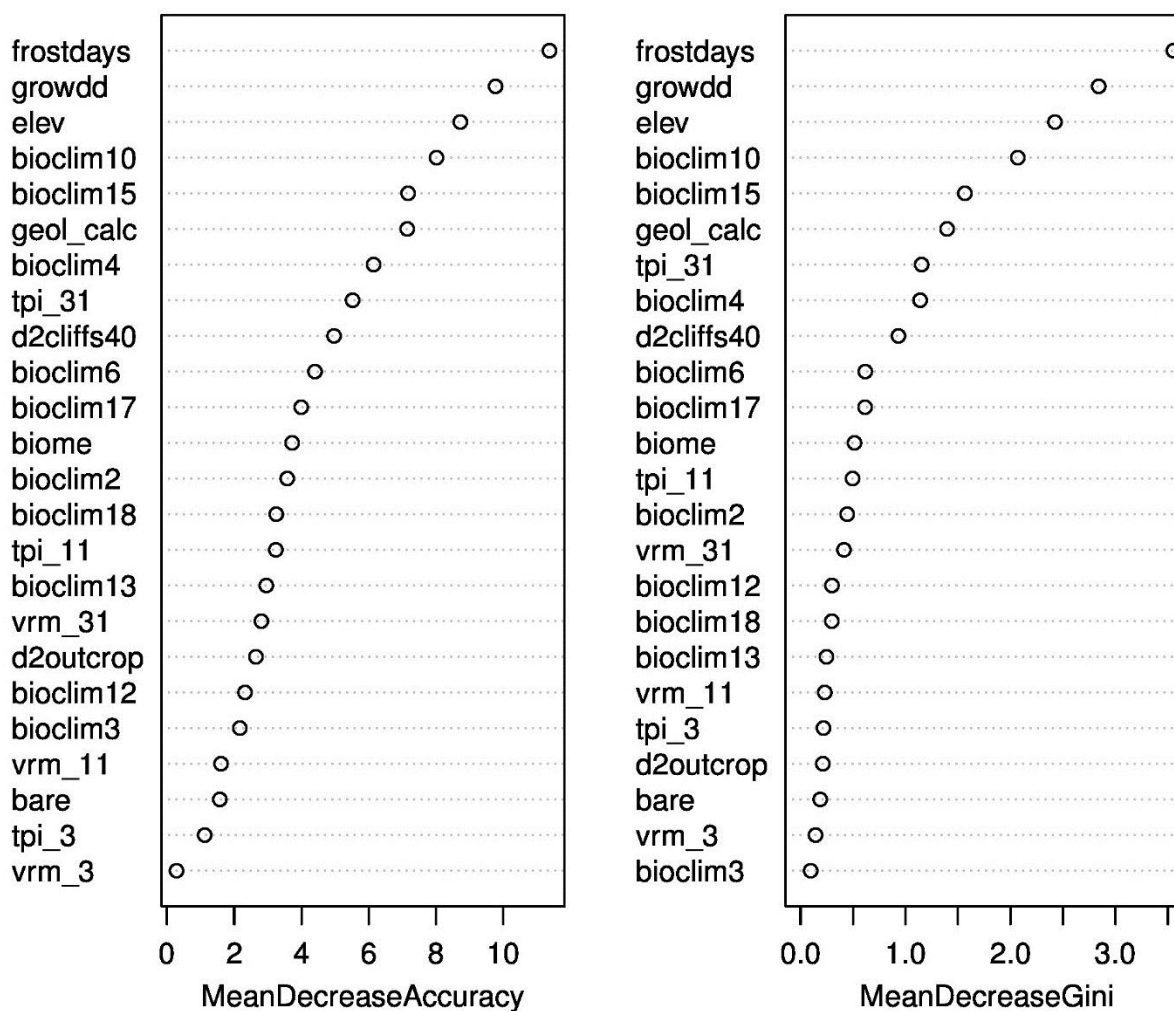
## Model Comments:

Regionally endemic alpine plant species that are restricted to specific soil conditions are difficult to model because statewide data are coarsely mapped and categorical. The statewide soils layer was parameterized to produce layers with gradients reflecting different soil properties. In addition, for

calciphilic species such as Weber's saw-wort, a surrogate layer was developed from bedrock geology layers to reflect calcium carbonate content. The geological complexity of the settings where it occurs and crudeness of the surrogate layer might further contribute to overpredicting low probability potential habitat.

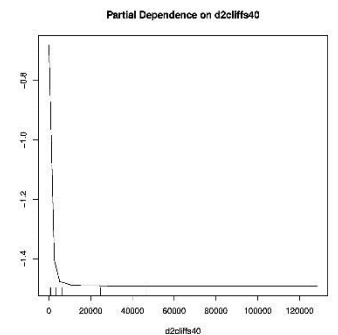
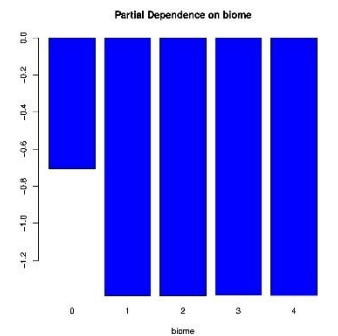
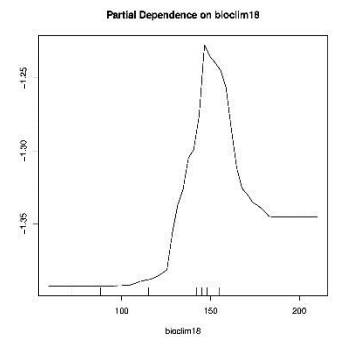
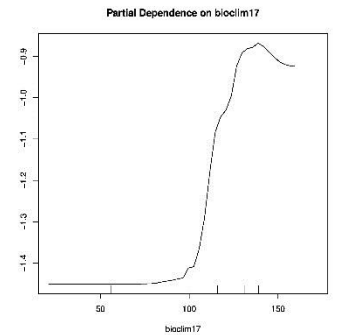
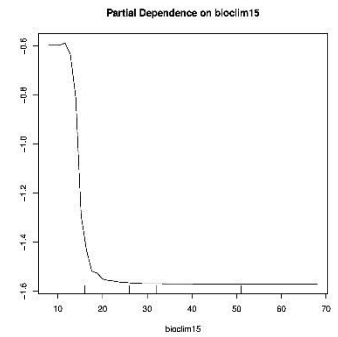
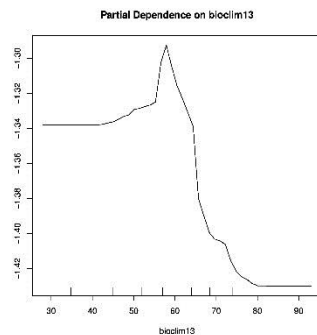
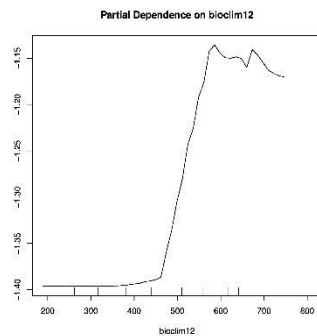
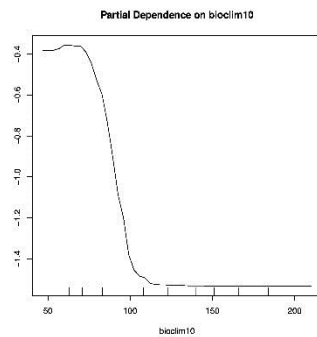
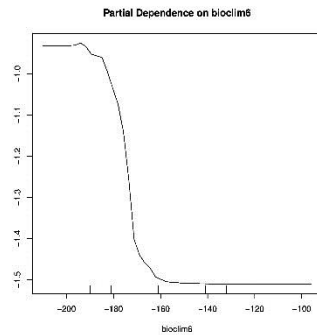
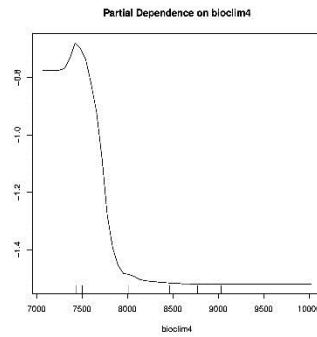
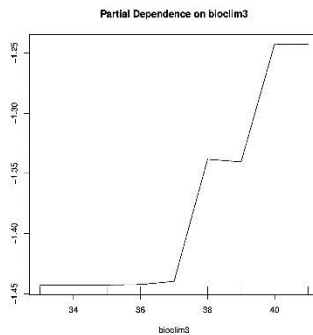
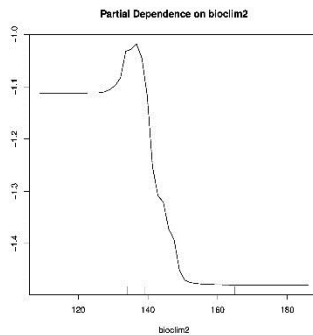
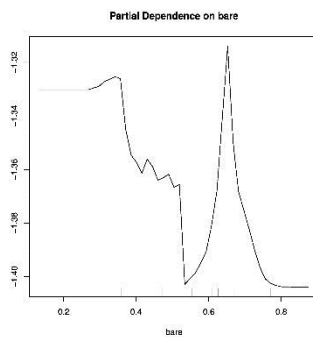
## Predictor Variable Importance:

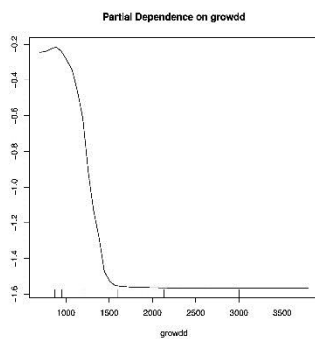
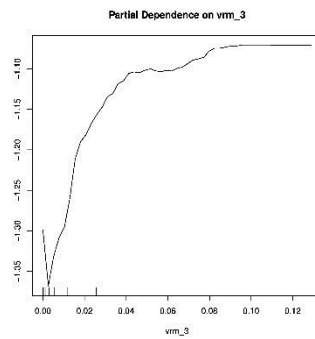
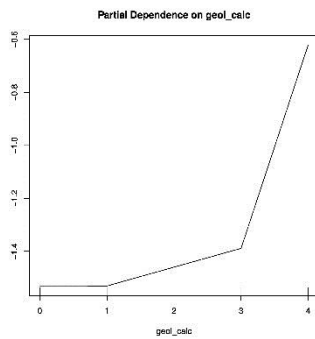
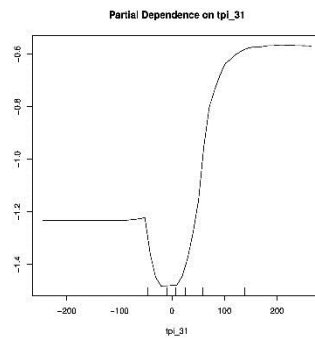
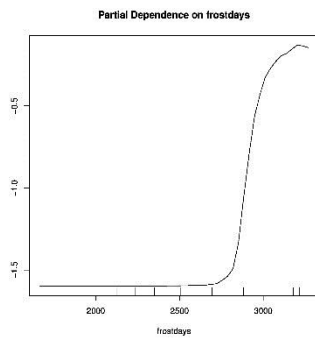
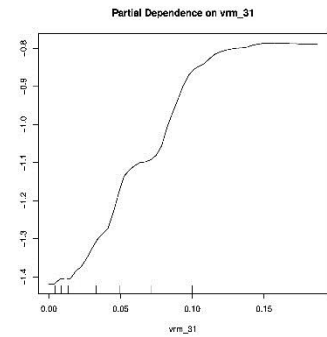
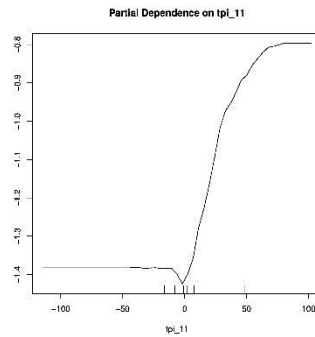
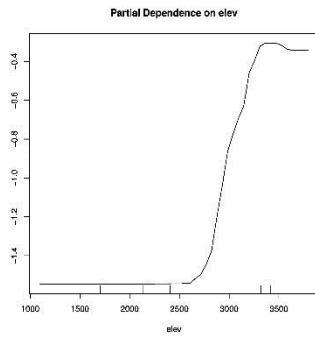
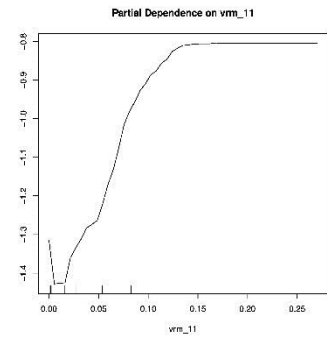
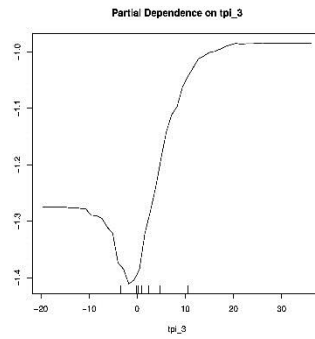
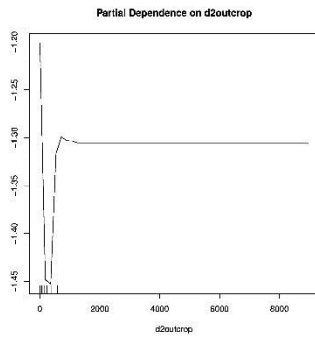
The graph below indicates the relative importance of predictors in modeling distribution for this species. “MeanDecreaseAccuracy” calculates importance by permuting (i.e., randomizing) values for the predictor and measuring the resulting decrease in model accuracy. This measure is typically a more reliable indicator of importance than “MeanDecreaseGini,” which measures improvement in a model due to splits based on the predictor. In both graphs, the further to the right the point falls on the graph, the higher the relative importance of the corresponding predictor. See Appendix 1 of this report for a detailed description of each predictor.



## Partial Plots

Partial plots show the relationship between a predictor variable and the predicted probability of occurrence, holding all other predictors at their average values. Probability values on the y-axis are unscaled; higher values on this axis indicate a higher relative probability of occurrence.

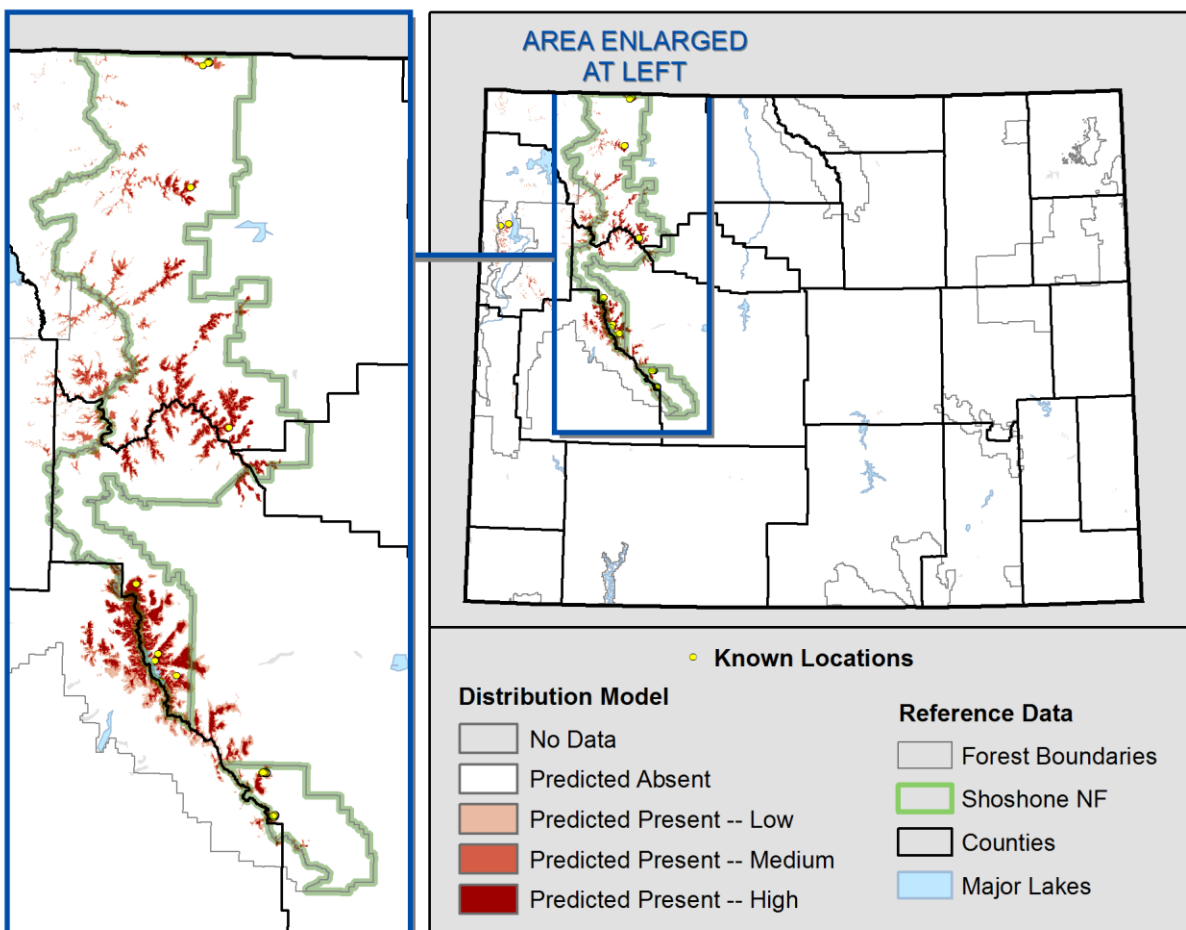






# White Arctic Whitlow-grass (*Draba fladnizensis*)

Model version: 2016-06-22



## Model Information

- **Algorithm:** Random Forest
- **Software:** R version 3.3.0 (2016-05-03); randomForest package v. 4.6.12
- **Binary Threshold (MaxTSS):** 0.747
- **Reclassification Table for Four-Category Version:**

From	To	Becomes
0	0.726	Predicted Absent (0)
0.726	0.836	Low (1)
0.836	0.982	Medium (2)
0.982	1	High (3)

## Model Details

- **Number of Locations:** 14
- **Out-of-Bag Error:** 11.7%
- **TSS:** 68.5%
- **Kappa:** 68.7%
- **Sensitivity:** 76.3%
- **Specificity:** 92.3%

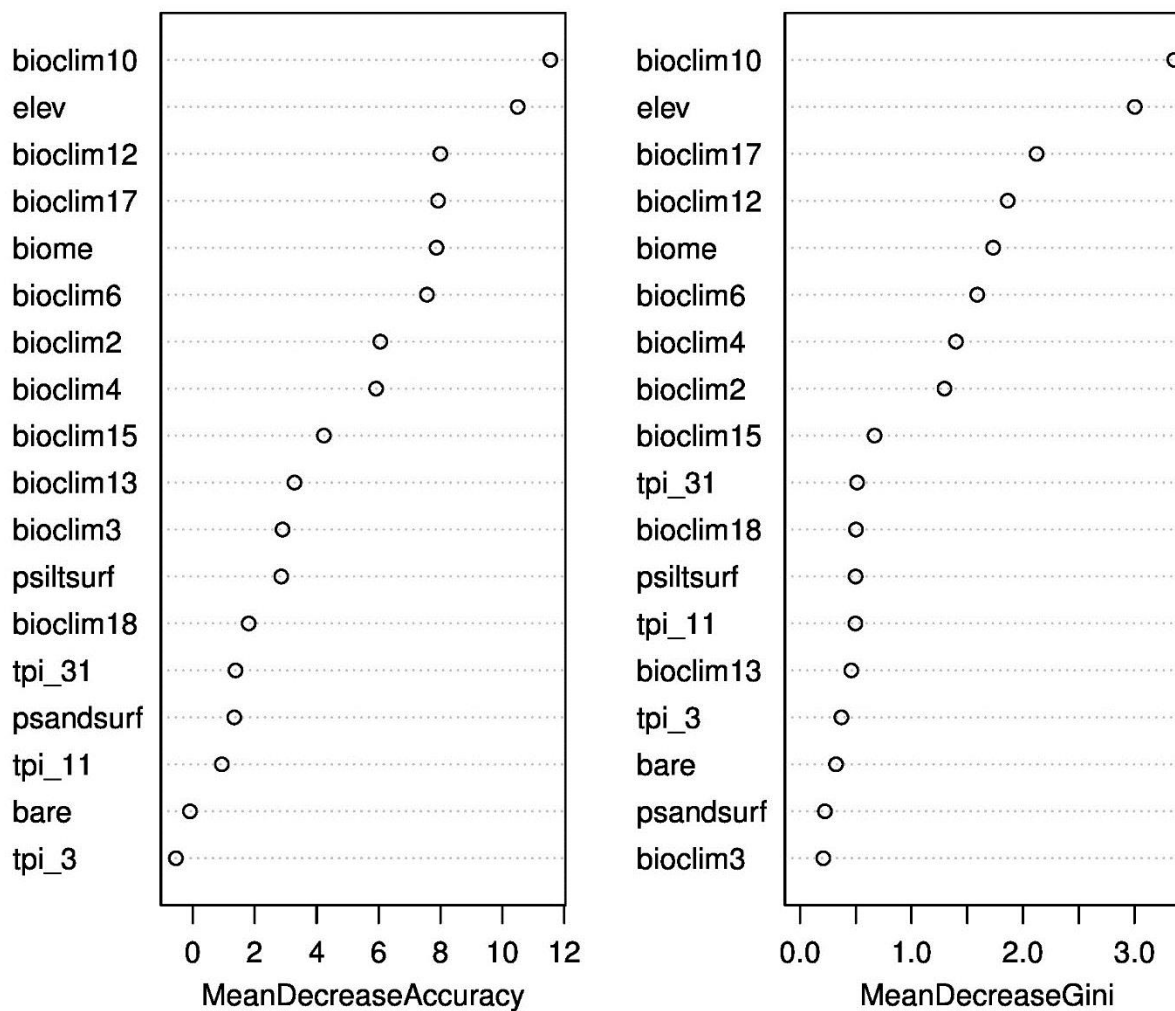
## Model Comments:

The habitat information on this alpine species is not very complete and it was difficult to flag specific environmental layers for modelling. The geological complexity of the settings where it occurs and

crudeness of the surrogate layer might also contribute to the output pattern with uninterrupted blocks of high probability potential habitat.

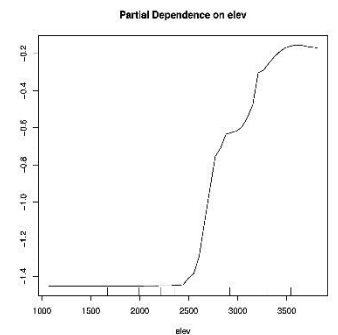
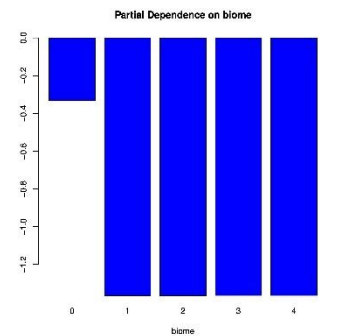
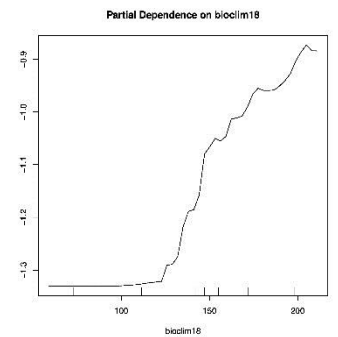
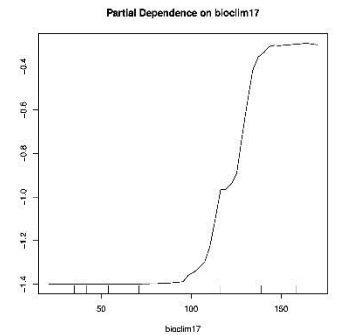
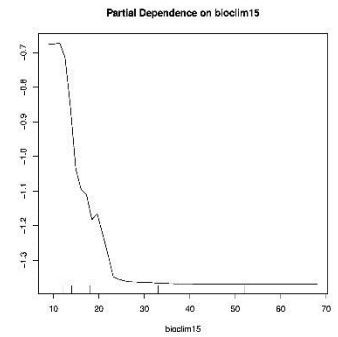
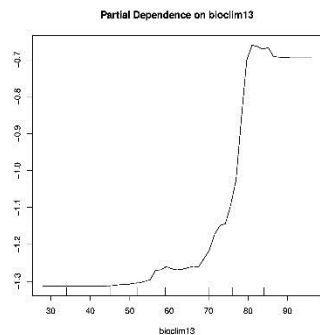
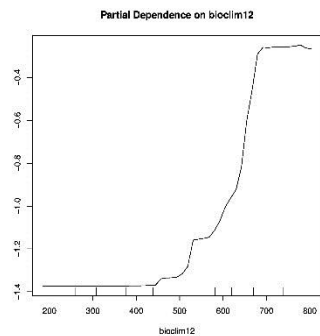
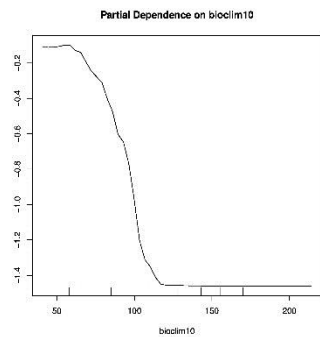
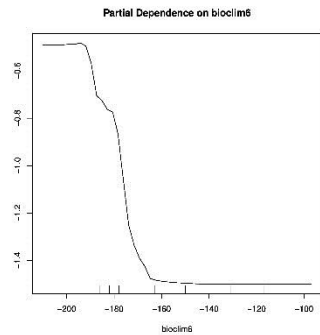
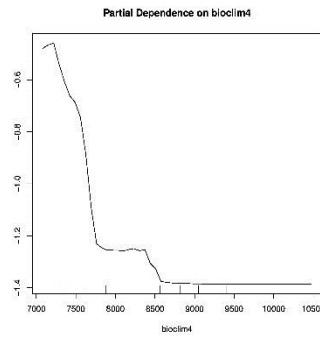
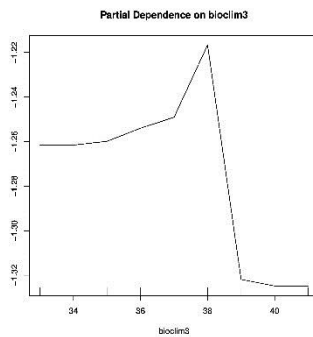
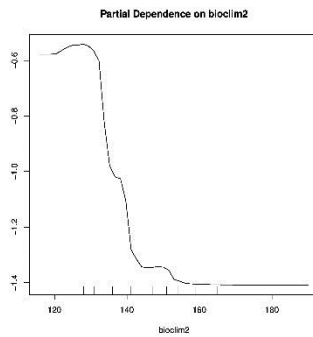
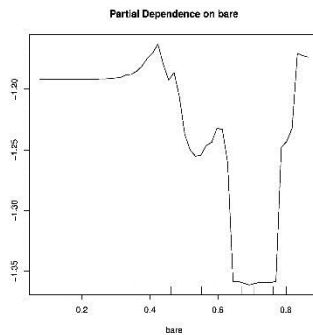
## Predictor Variable Importance:

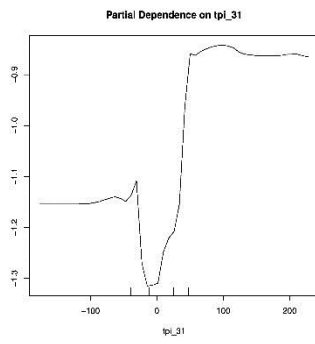
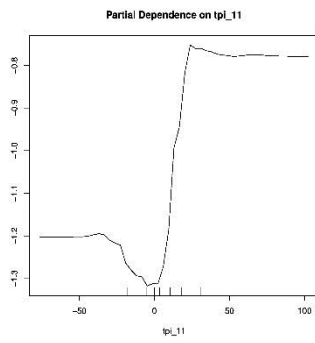
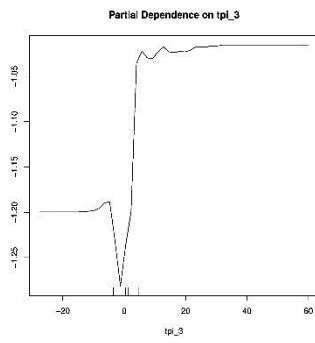
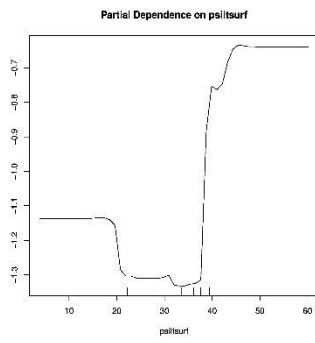
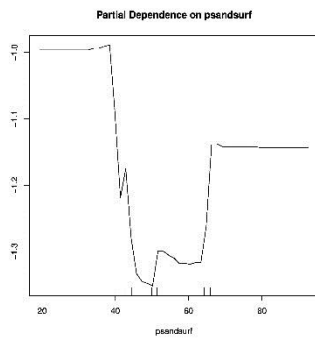
The graph below indicates the relative importance of predictors in modeling distribution for this species. “MeanDecreaseAccuracy” calculates importance by permuting (i.e., randomizing) values for the predictor and measuring the resulting decrease in model accuracy. This measure is typically a more reliable indicator of importance than “MeanDecreaseGini,” which measures improvement in a model due to splits based on the predictor. In both graphs, the further to the right the point falls on the graph, the higher the relative importance of the corresponding predictor. See Appendix 1 of this report for a detailed description of each predictor.



## Partial Plots

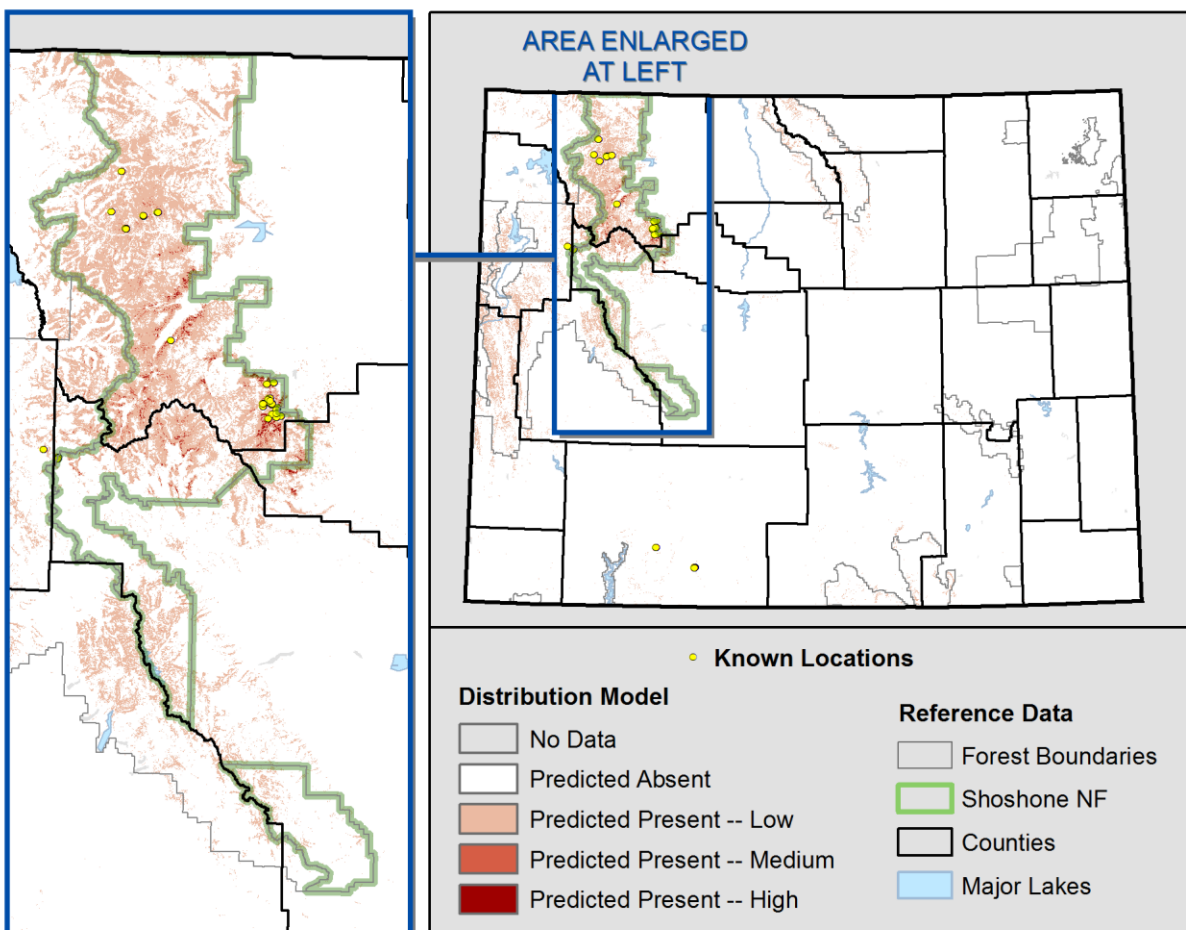
Partial plots show the relationship between a predictor variable and the predicted probability of occurrence, holding all other predictors at their average values. Probability values on the y-axis are unscaled; higher values on this axis indicate a higher relative probability of occurrence.





# Wyoming tansymustard (*Descurainia torulosa*)

Model version: 2016-06-22



## Model Information

- **Algorithm:** Random Forest
- **Software:** R version 3.3.0 (2016-05-03); randomForest package v. 4.6.12
- **Binary Threshold (MaxTSS):** 0.543
- **Reclassification Table for Four-Category Version:**

From	To	Becomes
0	0.416	Predicted Absent (0)
0.416	0.830	Low (1)
0.830	0.928	Medium (2)
0.928	1	High (3)

## Model Details

- **Number of Locations:** 30
- **Out-of-Bag Error:** 7.4%
- **TSS:** 81.1%
- **Kappa:** 80.3%
- **Sensitivity:** 86.5 %
- **Specificity:** 94.6%

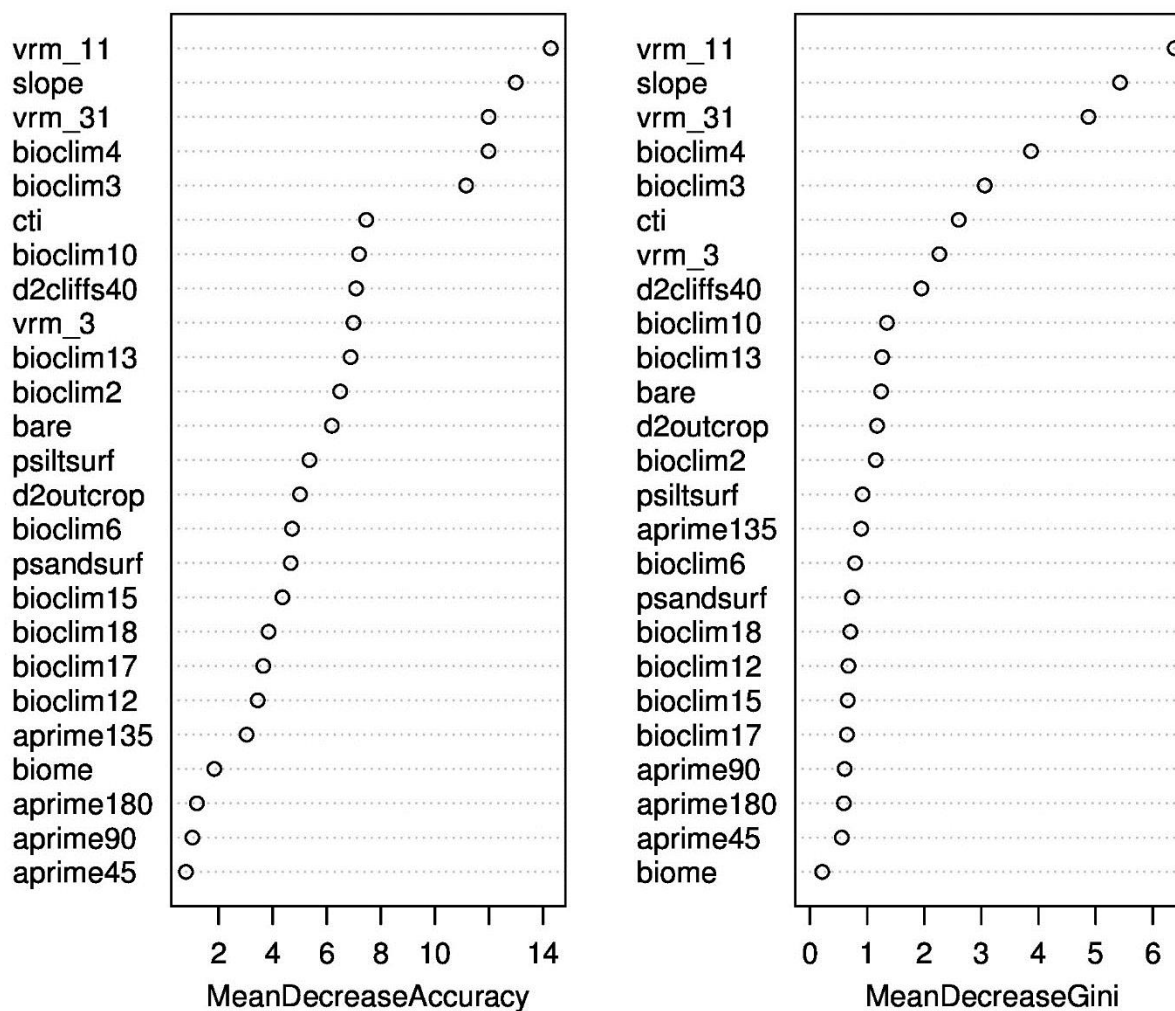
## Model Comments:

Endemic plant species that are adapted to microhabitat conditions are difficult to model because statewide data do not exist. This is especially true for Wyoming tansymustard because it is in cliff microhabitats of both mountains and basins, and on coarse-textured substrate of sandstone or volcanic

breccia. The model is based on presence points followings RM treatment, possibly subject to further taxonomic work.

## Predictor Variable Importance:

The graph below indicates the relative importance of predictors in modeling distribution for this species. “MeanDecreaseAccuracy” calculates importance by permuting (i.e., randomizing) values for the predictor and measuring the resulting decrease in model accuracy. This measure is typically a more reliable indicator of importance than “MeanDecreaseGini,” which measures improvement in a model due to splits based on the predictor. In both graphs, the further to the right the point falls on the graph, the higher the relative importance of the corresponding predictor. See Appendix 1 of this report for a detailed description of each predictor.



## Partial Plots

Partial plots show the relationship between a predictor variable and the predicted probability of occurrence, holding all other predictors at their average values. Probability values on the y-axis are unscaled; higher values on this axis indicate a higher relative probability of occurrence.

