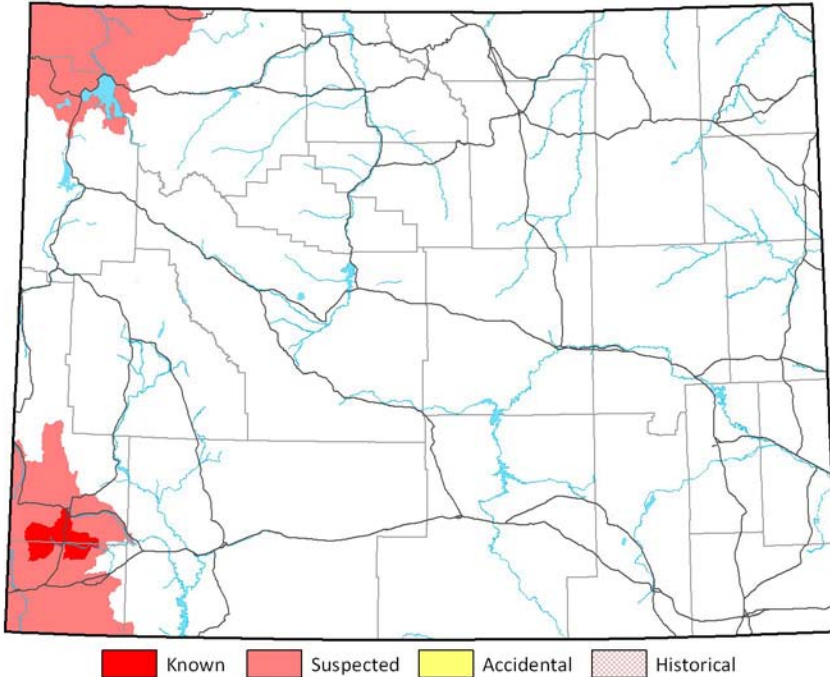


Preble's Shrew (*Sorex preblei*) Range Map and Distribution Model Summary

August 20, 2010

This report presents range and distribution of Preble's Shrew (AMABA01030) in Wyoming (see Keinath et al. 2010b). Similar reports were developed by the Wyoming Natural Diversity Database for terrestrial vertebrate species of conservation need in Wyoming's State Wildlife Action Plan. This effort was supported by the Wyoming Game and Fish Department and the U.S. Geological Survey.

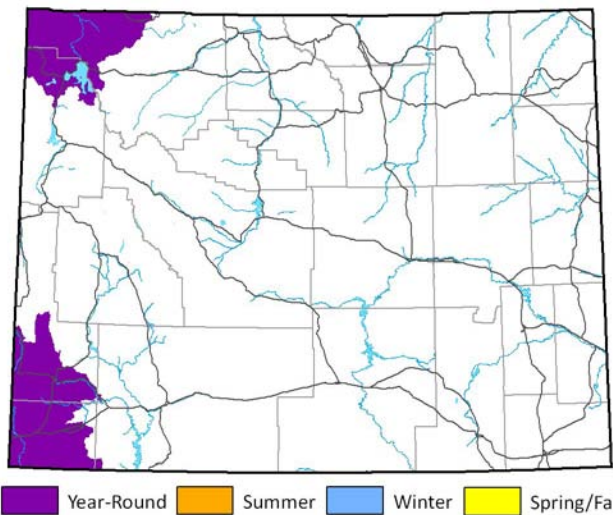
Range Map - Occupancy



Range Notes

- Version: 2010-01-19
- Proportion of range deemed known based on documented occurrences: 0.029
- Details of range map creation noted in Keinath et al. (2010a).

Range Map - Seasonality



Maps, models and report were created by and are available from the Wyoming Natural Diversity Database. (<http://uwadmnweb.uwyo.edu/wyndd/>).

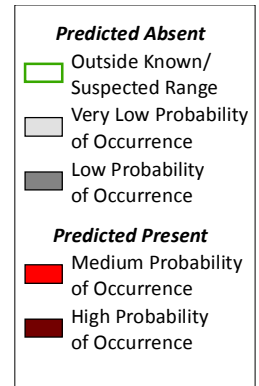
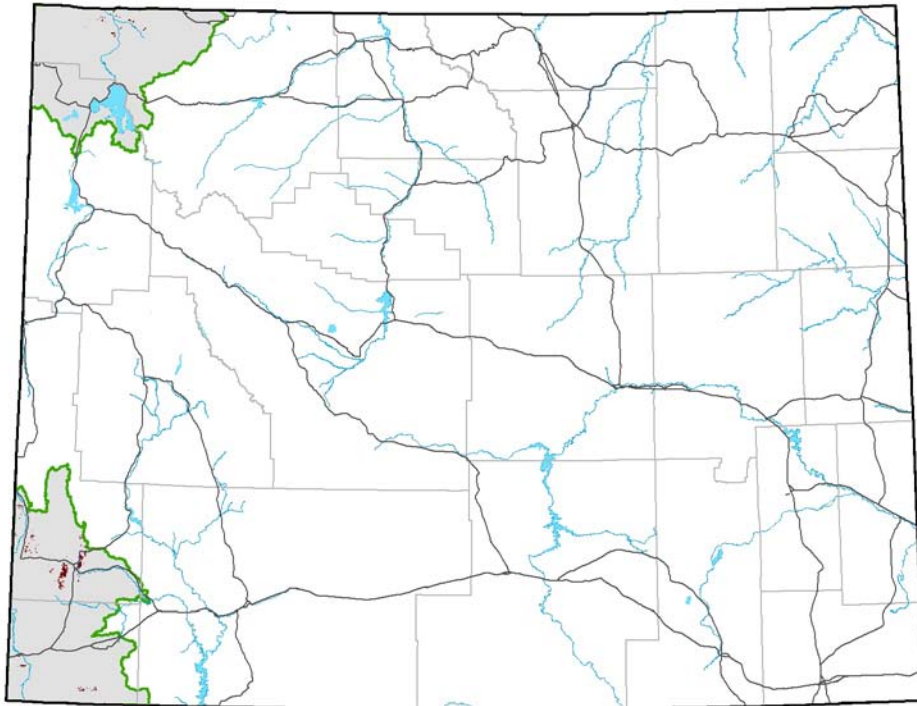
Doug Keinath, Senior Zoologist

Mark Andersen, GIS Specialist

© 2010, WYNDD

Distribution Model (Version: Wed Dec 09 12:34:38 MST 2009)

Details of distribution model creation are presented in Keinath et al. (2010b)



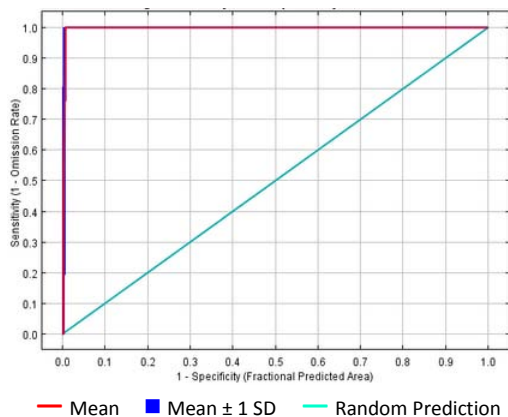
Model Parameters

- Season Modeled: Year-Round
- Algorithm: Maxent version 3.3.1
- Feature Types: Linear
- Binary Threshold Rule: Maximum training sensitivity plus specificity
- Binary Threshold Value: 0.5997990
- High-Probability Threshold Value: 0.6061181
- Low-Probability Threshold Value: 0.5997990

Model Quality Summary

Overall Assessment of Model Quality: LOW
 Expert Assessment: Low
 Occurrence Sample Size: Very Low
 Quality of Occurrences: Low
 Positive Success Rate: Low
 Test AUC and Model Gain: Low

Model Evaluation - ROC Plot



Model Evaluation Statistics

Final Model Statistics

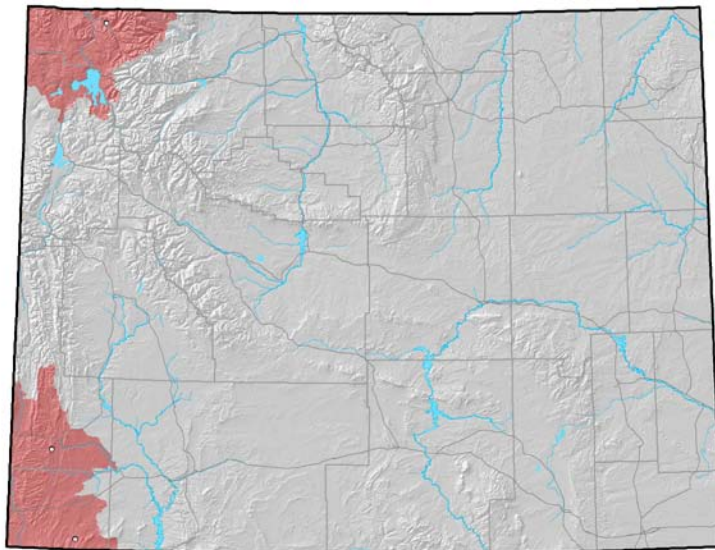
Training AUC: 0.999
 Regularized Training Gain: 4.889

Cross-Validation Statistics

- Average Test AUC: 0.299 ± 0.482
- Upper Bound on Test AUC: 0.995
- Average Test Gain: 1.296 ± 2.142
- Omission Error (fraction of test points omitted during 3-fold cross validation): 1.00 ± 0.00

Occurrence Data for Distribution Model

Occurrence Map



Points Used in Modeling, by Year of Observation

- Pre-1985
- 1985 or Later

■ Known and Suspected Range

Occurrence Summary Statistics

- Number of Occurrences in AWVED master dataset: 6
- Number of Occurrences used to create distribution model: 3
- Average Point Quality Index (highest quality is 12.00): 4.33 ± 3.51
- Most recent occurrence used: 1983
- Oldest occurrence used: 1948
- Occurrence File:
LOCAL_SAMPLE_POINTS.csv

Comments

The model for this species is based on a small sample size of occurrence locations, which often results in low model quality. Collection of additional, high-quality occurrence locations could greatly improve the modeled distribution for this species.

References

- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010a. Range maps for Wyoming's species of greatest conservation need. Report prepared for the Wyoming Game and Fish Department by the Wyoming Natural Diversity Database, Laramie, Wyoming. January 19, 2010.
- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010b. Range and modeled distribution of Wyoming's species of greatest conservation need. Report prepared by the Wyoming Natural Diversity Database, Laramie Wyoming for the Wyoming Game and Fish Department, Cheyenne, Wyoming and the U.S. Geological Survey, Fort Collins, Colorado. August 20, 2010.

Predictor Variables used in the Distribution Model

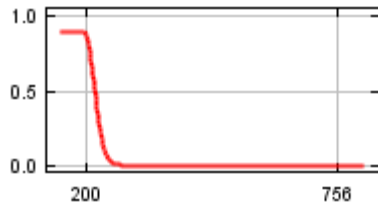
Percent Contribution (PC) to final model

<i>Environmental Variable</i>	<i>PC</i>
Variation of monthly precipitation	84
Conifer Index	8
A ¹ (Transformed Aspect)	6
Cottonwood Index	2
Distance to Water	0
Distance to Permanent Standing Water	0

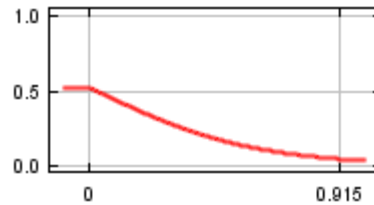
Response Curves

Each curve shows dependence of predicted suitability on input values of a single predictor variable considering correlations with others. Suitability is on the vertical axis (units: probability). Variable values are on the horizontal axis (units based on inputs; see Keinath et al 2010b for details).

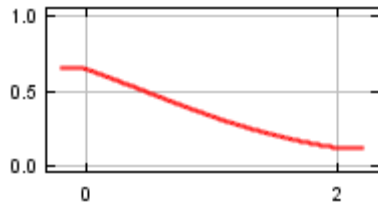
Variation of monthly precipitation



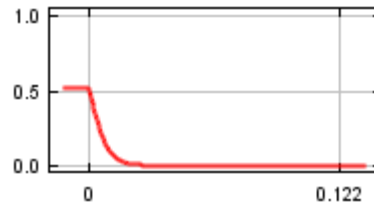
Conifer Index



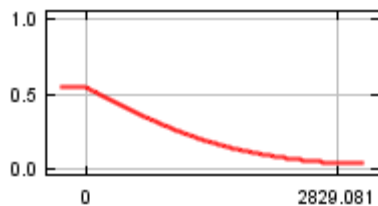
A¹ (Transformed Aspect)



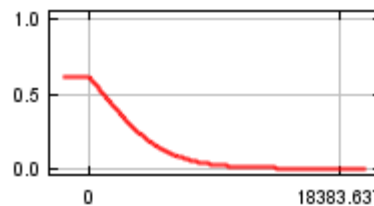
Cottonwood Index



Distance to Water



Distance to Permanent Standing Water

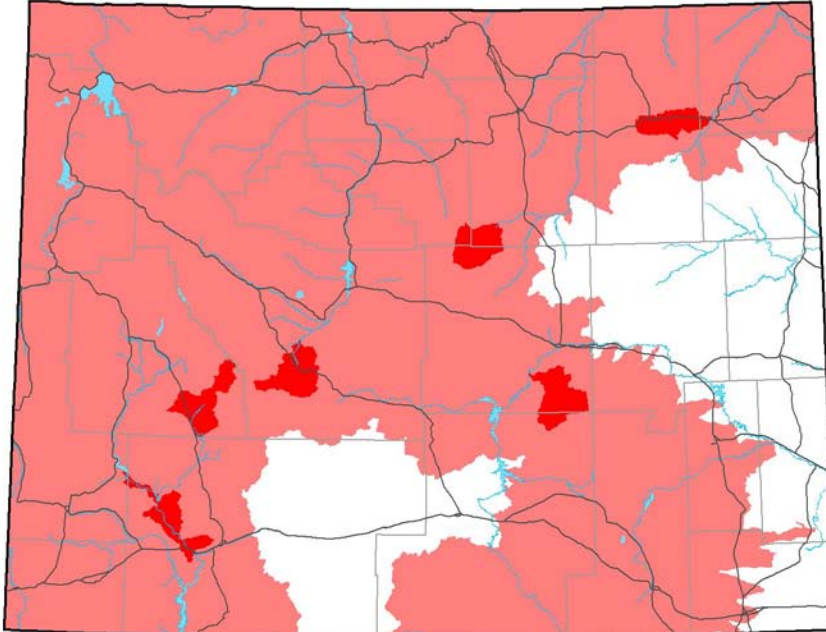


Vagrant Shrew (*Sorex vagrans*) Range Map and Distribution Model Summary

August 20, 2010

This report presents range and distribution of Vagrant Shrew (AMABA01070) in Wyoming (see Keinath et al. 2010b). Similar reports were developed by the Wyoming Natural Diversity Database for terrestrial vertebrate species of conservation need in Wyoming's State Wildlife Action Plan. This effort was supported by the Wyoming Game and Fish Department and the U.S. Geological Survey.

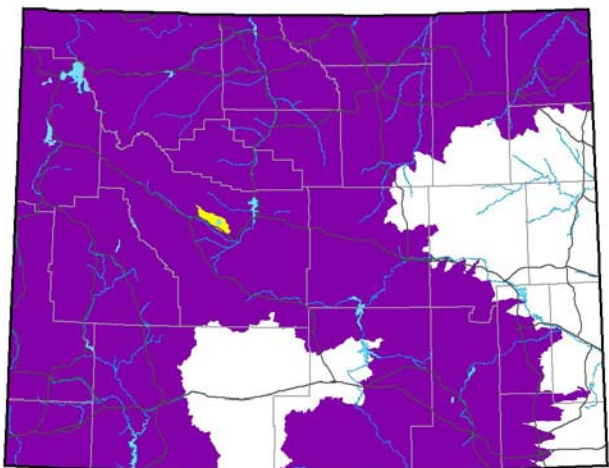
Range Map - Occupancy



Range Notes

- Version: 2010-01-19
- Proportion of range deemed known based on documented occurrences: 0.018
- Details of range map creation noted in Keinath et al. (2010a).

Range Map - Seasonality



Maps, models and report were created by and are available from the Wyoming Natural Diversity Database. (<http://uwadmnweb.uwyo.edu/wyndd/>).

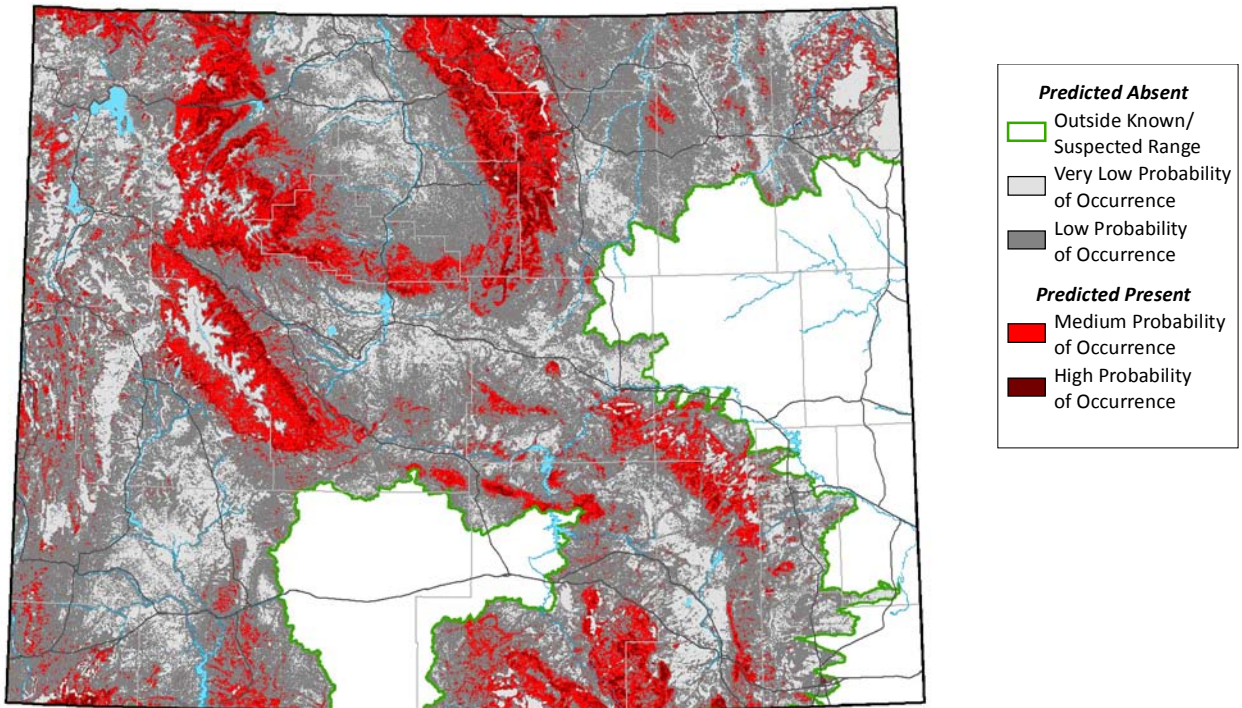
Doug Keinath, Senior Zoologist

Mark Andersen, GIS Specialist

© 2010, WYNDD

Distribution Model (Version: Fri Dec 04 14:32:40 MST 2009)

Details of distribution model creation are presented in Keinath et al. (2010b)



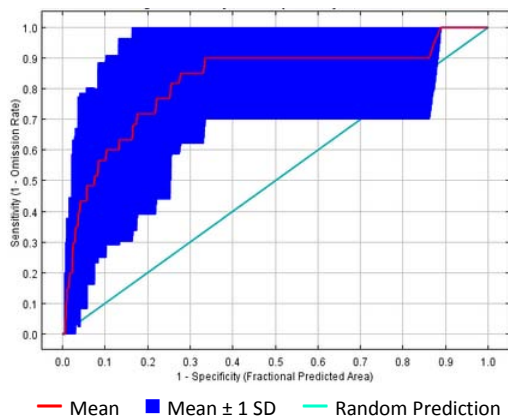
Model Parameters

- Season Modeled: Year-Round
- Algorithm: Maxent version 3.3.1
- Feature Types: Linear, Quadratic, Hinge
- Binary Threshold Rule: Maximum training sensitivity plus specificity
- Binary Threshold Value: 0.3339030
- High-Probability Threshold Value: 0.7551444
- Low-Probability Threshold Value: 0.0657726

Model Quality Summary

Overall Assessment of Model Quality: LOW
 Expert Assessment: Low
 Occurrence Sample Size: Medium
 Quality of Occurrences: Low
 Positive Success Rate: Low
 Test AUC and Model Gain: Medium

Model Evaluation - ROC Plot



Model Evaluation Statistics

Final Model Statistics

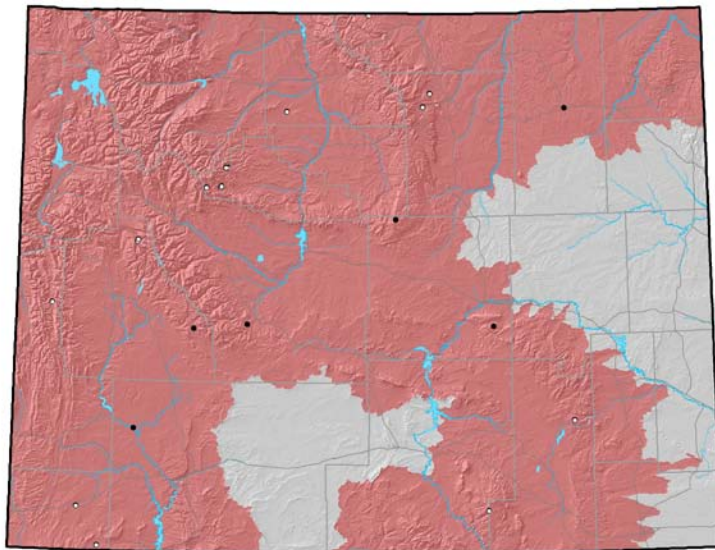
Training AUC: 0.909
 Regularized Training Gain: 1.067

Cross-Validation Statistics

- Average Test AUC: 0.823 ± 0.184
- Upper Bound on Test AUC: 0.846
- Average Test Gain: 0.758 ± 1.113
- Omission Error (fraction of test points omitted during 10-fold cross validation): 0.33 ± 0.33

Occurrence Data for Distribution Model

Occurrence Map



Points Used in Modeling, by Year of Observation

- Pre-1985
- 1985 or Later

Known and Suspected Range

Occurrence Summary Statistics

- Number of Occurrences in AWVED master dataset: 53
- Number of Occurrences used to create distribution model: 22
- Average Point Quality Index (highest quality is 12.00): 4.86 ± 1.04
- Most recent occurrence used: 1993
- Oldest occurrence used: 1939
- Occurrence File:
LOCAL_SAMPLE_POINTS.csv

Comments

There are no additional comments specific to this species range map or distribution model.

References

- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010a. Range maps for Wyoming's species of greatest conservation need. Report prepared for the Wyoming Game and Fish Department by the Wyoming Natural Diversity Database, Laramie, Wyoming. January 19, 2010.
- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010b. Range and modeled distribution of Wyoming's species of greatest conservation need. Report prepared by the Wyoming Natural Diversity Database, Laramie Wyoming for the Wyoming Game and Fish Department, Cheyenne, Wyoming and the U.S. Geological Survey, Fort Collins, Colorado. August 20, 2010.

Predictor Variables used in the Distribution Model

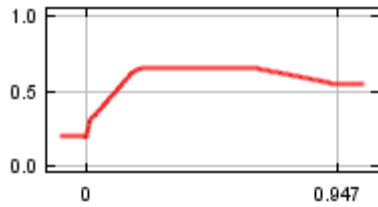
Percent Contribution (PC) to final model

<i>Environmental Variable</i>	<i>PC</i>
Forest Cover Index	24
Degree Slope	23
Percent Forest Cover	16
Shrub Cover Index	14
Deciduous Forest Index	13
Wettest quarter mean temperature	11

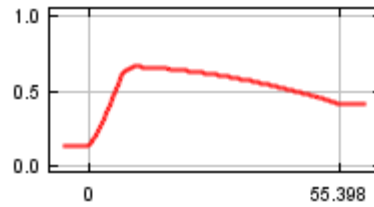
Response Curves

Each curve shows dependence of predicted suitability on input values of a single predictor variable considering correlations with others. Suitability is on the vertical axis (units: probability). Variable values are on the horizontal axis (units based on inputs; see Keinath et al 2010b for details).

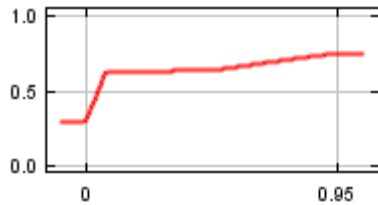
Forest Cover Index



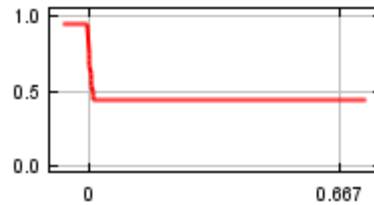
Degree Slope



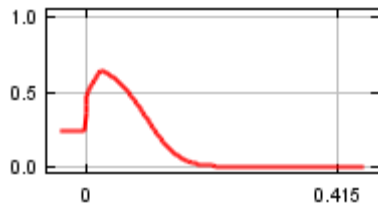
Percent Forest Cover



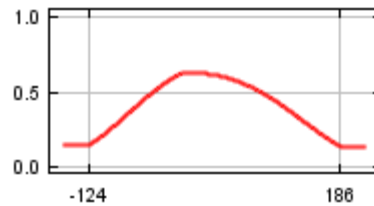
Shrub Cover Index



Deciduous Forest Index



Wettest quarter mean temperature

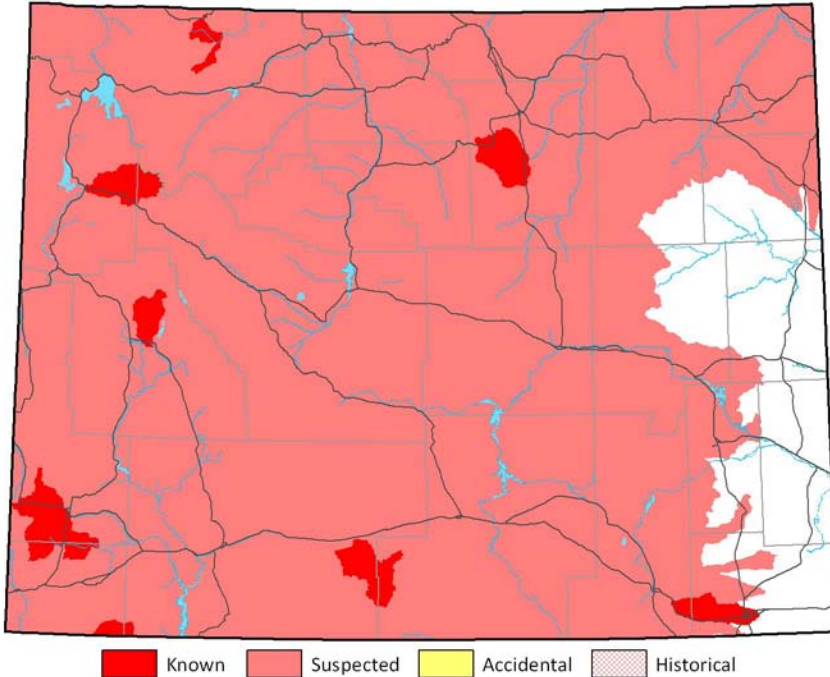


Dwarf Shrew (*Sorex nanus*) Range Map and Distribution Model Summary

August 20, 2010

This report presents range and distribution of Dwarf Shrew (AMABA01130) in Wyoming (see Keinath et al. 2010b). Similar reports were developed by the Wyoming Natural Diversity Database for terrestrial vertebrate species of conservation need in Wyoming's State Wildlife Action Plan. This effort was supported by the Wyoming Game and Fish Department and the U.S. Geological Survey.

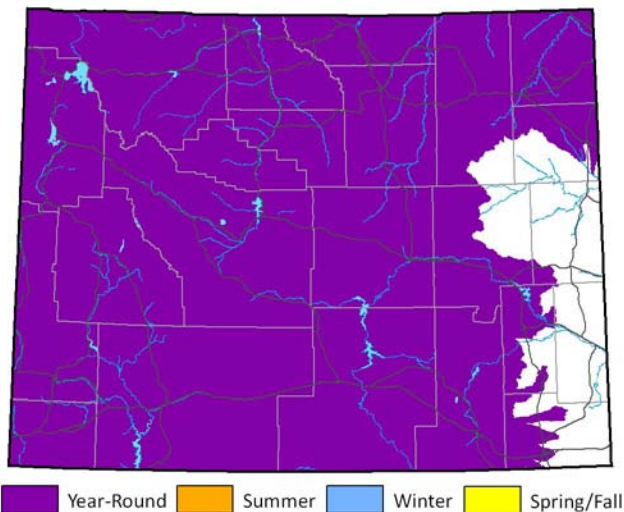
Range Map - Occupancy



Range Notes

- Version: 2010-01-19
- Proportion of range deemed known based on documented occurrences: 0.024
- Details of range map creation noted in Keinath et al. (2010a).

Range Map - Seasonality



Maps, models and report were created by and are available from the Wyoming Natural Diversity Database. (<http://uwadmnweb.uwyo.edu/wyndd/>).

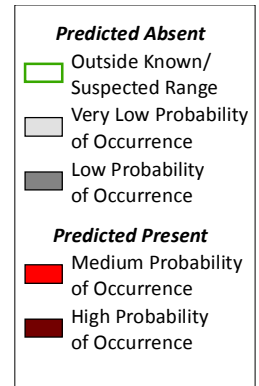
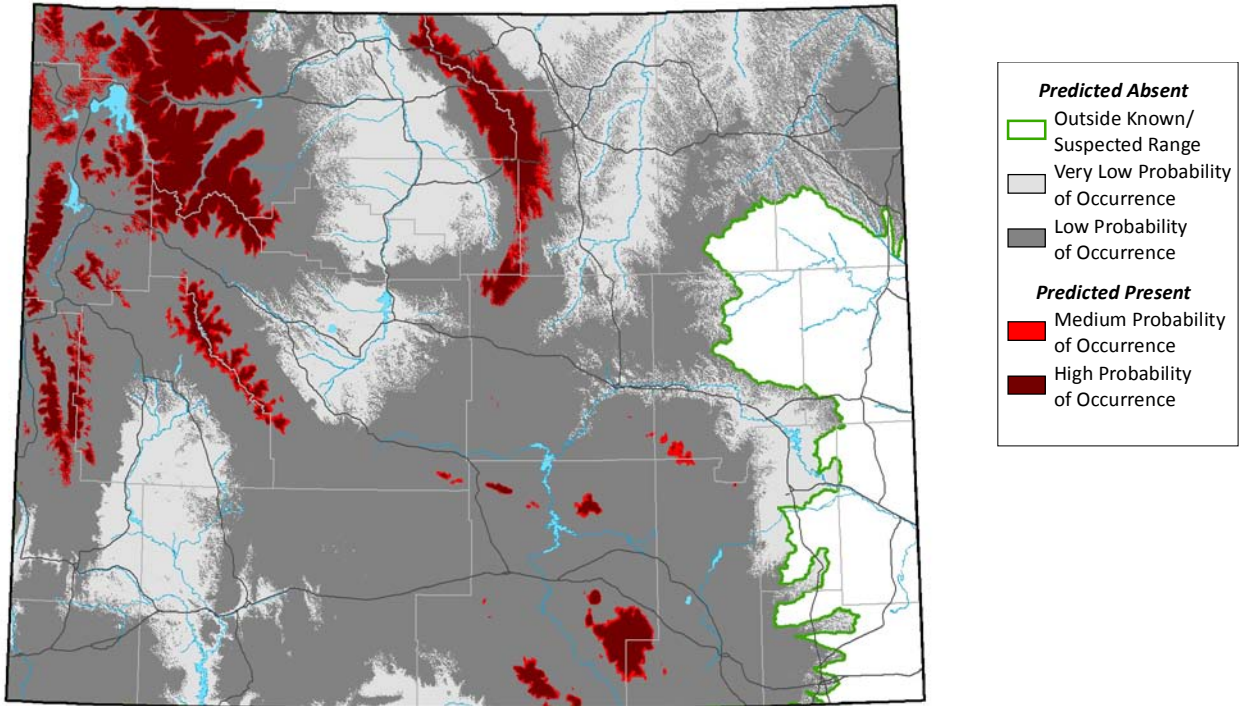
Doug Keinath, Senior Zoologist

Mark Andersen, GIS Specialist

© 2010, WYNDD

Distribution Model (Version: Thu Mar 18 02:13:52 MDT 2010)

Details of distribution model creation are presented in Keinath et al. (2010b)



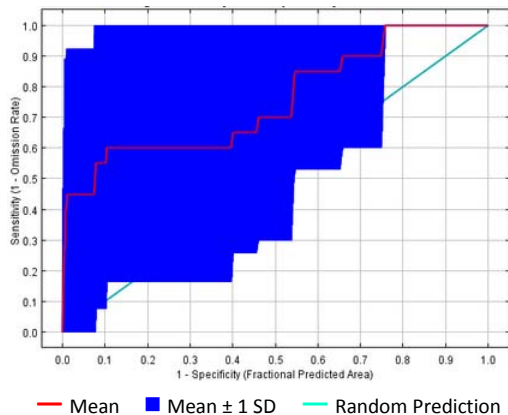
Model Parameters

- Season Modeled: Year-Round
- Algorithm: Maxent version 3.3.1
- Feature Types: Linear, Product
- Binary Threshold Rule: Maximum training sensitivity plus specificity
- Binary Threshold Value: 0.5905510
- High-Probability Threshold Value: 0.6448488
- Low-Probability Threshold Value: 0.1671536

Model Quality Summary

Overall Assessment of Model Quality: LOW
 Expert Assessment: Medium
 Occurrence Sample Size: Low
 Quality of Occurrences: Low
 Positive Success Rate: Low
 Test AUC and Model Gain: Medium

Model Evaluation - ROC Plot



Model Evaluation Statistics

Final Model Statistics

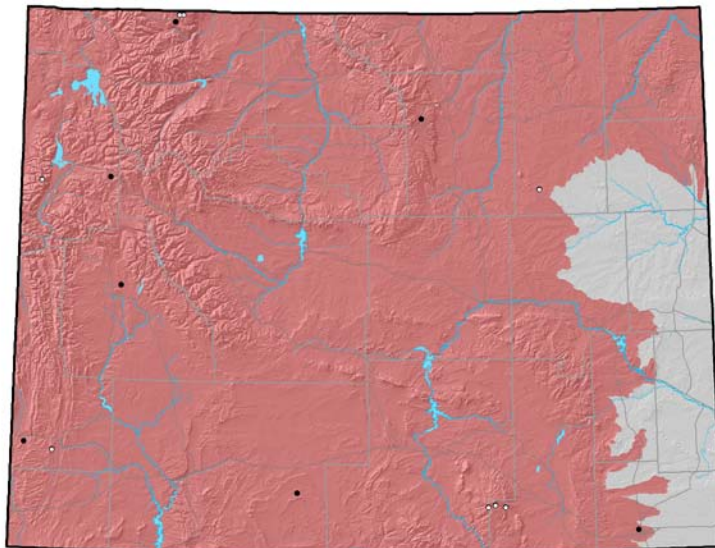
Training AUC: 0.812
 Regularized Training Gain: 0.640

Cross-Validation Statistics

- Average Test AUC: 0.754 ± 0.274
- Upper Bound on Test AUC: 0.777
- Average Test Gain: 0.784 ± 1.511
- Omission Error (fraction of test points omitted during 10-fold cross validation): 0.50 ± 0.47

Occurrence Data for Distribution Model

Occurrence Map



Points Used in Modeling, by Year of Observation

- Pre-1985
- 1985 or Later

Known and Suspected Range

Occurrence Summary Statistics

- Number of Occurrences in AWVED master dataset: 37
- Number of Occurrences used to create distribution model: 15
- Average Point Quality Index (highest quality is 12.00): 5.80 ± 1.70
- Most recent occurrence used: 1994
- Oldest occurrence used: 1949
- Occurrence File:
LOCAL_SAMPLE_POINTS_W_PD OG_2.csv

Comments

There are no additional comments specific to this species range map or distribution model.

References

- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010a. Range maps for Wyoming's species of greatest conservation need. Report prepared for the Wyoming Game and Fish Department by the Wyoming Natural Diversity Database, Laramie, Wyoming. January 19, 2010.
- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010b. Range and modeled distribution of Wyoming's species of greatest conservation need. Report prepared by the Wyoming Natural Diversity Database, Laramie Wyoming for the Wyoming Game and Fish Department, Cheyenne, Wyoming and the U.S. Geological Survey, Fort Collins, Colorado. August 20, 2010.

Predictor Variables used in the Distribution Model

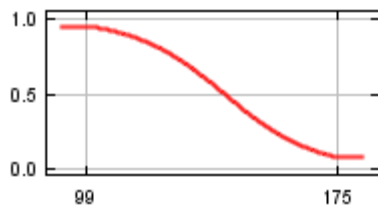
Percent Contribution (PC) to final model

<i>Environmental Variable</i>	<i>PC</i>
Mean diurnal temperature range	65
Warmest quarter mean temperature	35
Wettest quarter mean temperature	0
A ¹ (Transformed Aspect)	0
Potential for Rock Outcrop	0
Distance to Permanent Water	0

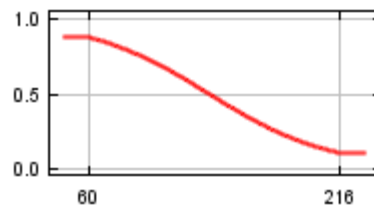
Response Curves

Each curve shows dependence of predicted suitability on input values of a single predictor variable considering correlations with others. Suitability is on the vertical axis (units: probability). Variable values are on the horizontal axis (units based on inputs; see Keinath et al 2010b for details).

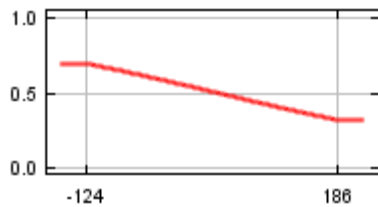
Mean diurnal temperature range



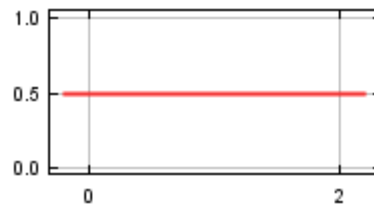
Warmest quarter mean temperature



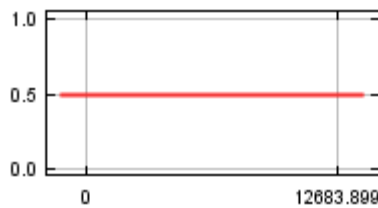
Wettest quarter mean temperature



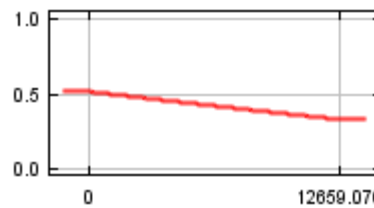
A¹ (Transformed Aspect)



Potential for Rock Outcrop



Distance to Permanent Water

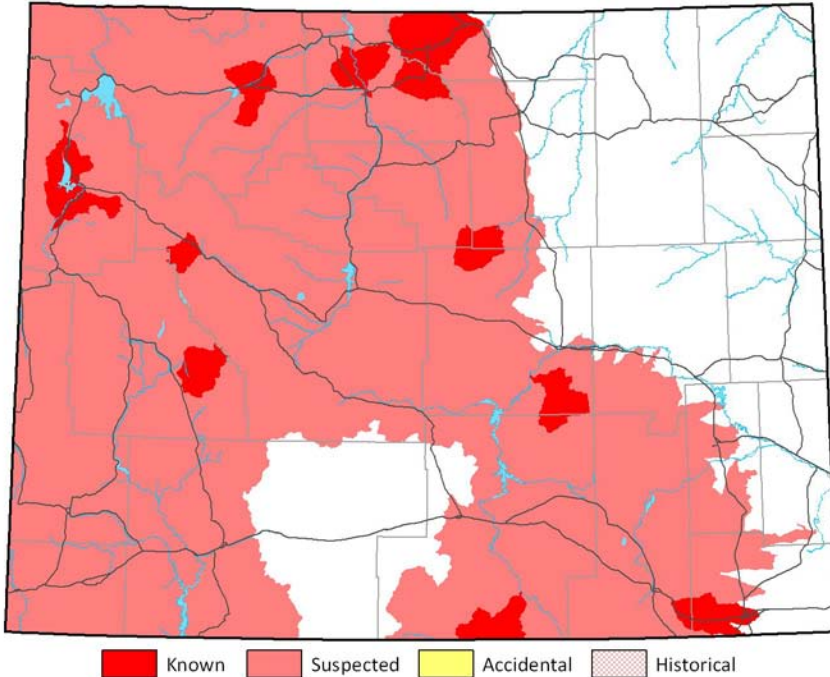


Water Shrew (*Sorex palustris*) Range Map and Distribution Model Summary

August 20, 2010

This report presents range and distribution of Water Shrew (AMABA01150) in Wyoming (see Keinath et al. 2010b). Similar reports were developed by the Wyoming Natural Diversity Database for terrestrial vertebrate species of conservation need in Wyoming's State Wildlife Action Plan. This effort was supported by the Wyoming Game and Fish Department and the U.S. Geological Survey.

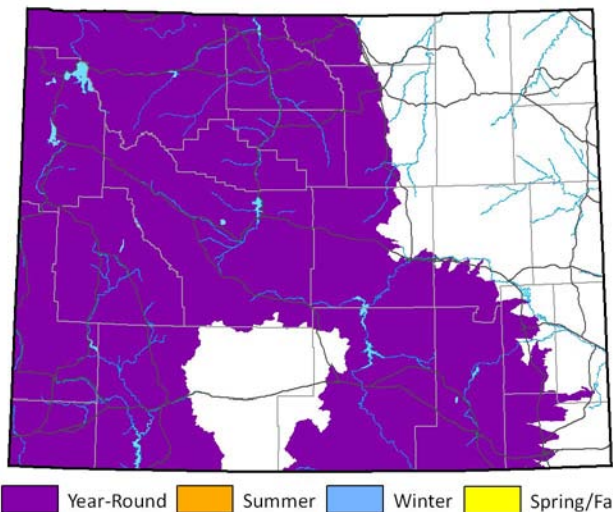
Range Map - Occupancy



Range Notes

- Version: 2010-01-19
- Proportion of range deemed known based on documented occurrences: 0.053
- Details of range map creation noted in Keinath et al. (2010a).

Range Map - Seasonality



Maps, models and report were created by and are available from the Wyoming Natural Diversity Database. (<http://uwadmnweb.uwyo.edu/wyndd/>).

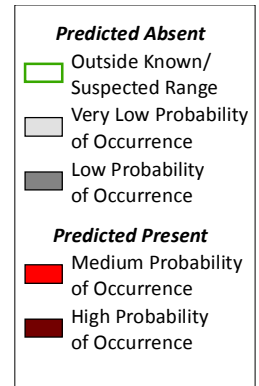
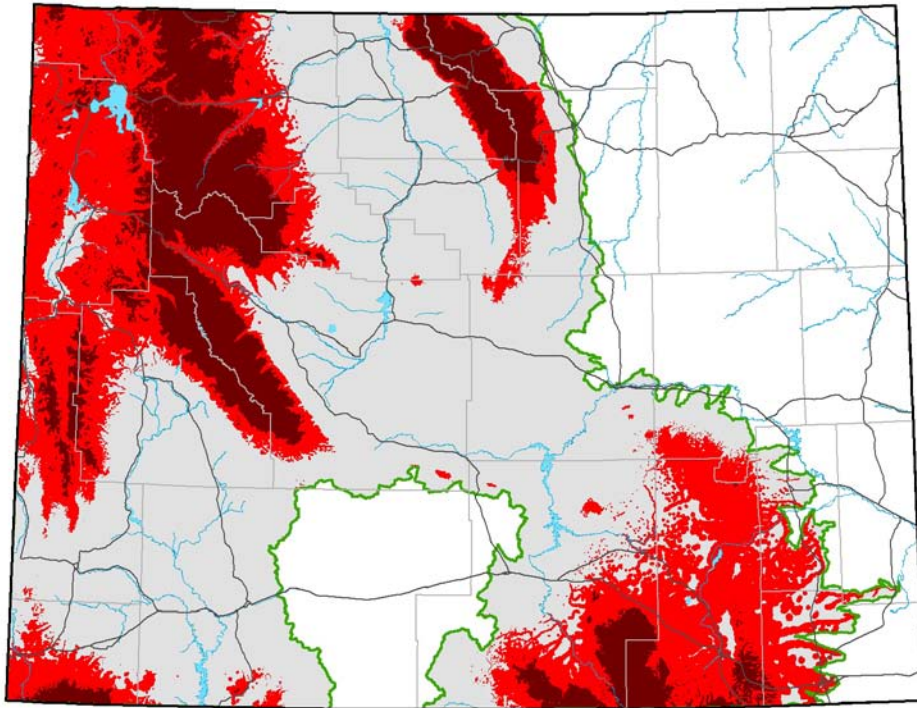
Doug Keinath, Senior Zoologist

Mark Andersen, GIS Specialist

© 2010, WYNDD

Distribution Model (Version: Tue Mar 16 20:29:46 MDT 2010)

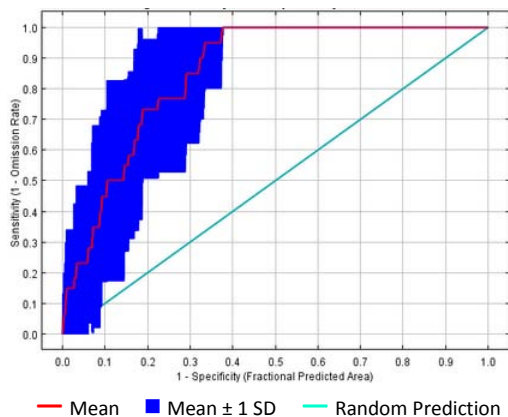
Details of distribution model creation are presented in Keinath et al. (2010b)



Model Parameters

- Season Modeled: Year-Round
- Algorithm: Maxent version 3.3.1
- Feature Types: Linear, Product
- Binary Threshold Rule: Maximum training sensitivity plus specificity
- Binary Threshold Value: 0.2465150
- High-Probability Threshold Value: 0.5222057
- Low-Probability Threshold Value: 0.2465150

Model Evaluation - ROC Plot



Model Quality Summary

Overall Assessment of Model Quality:

MEDIUM

- Expert Assessment: Medium
- Occurrence Sample Size: Medium
- Quality of Occurrences: Low
- Positive Success Rate: High
- Test AUC and Model Gain: Medium

Model Evaluation Statistics

Final Model Statistics

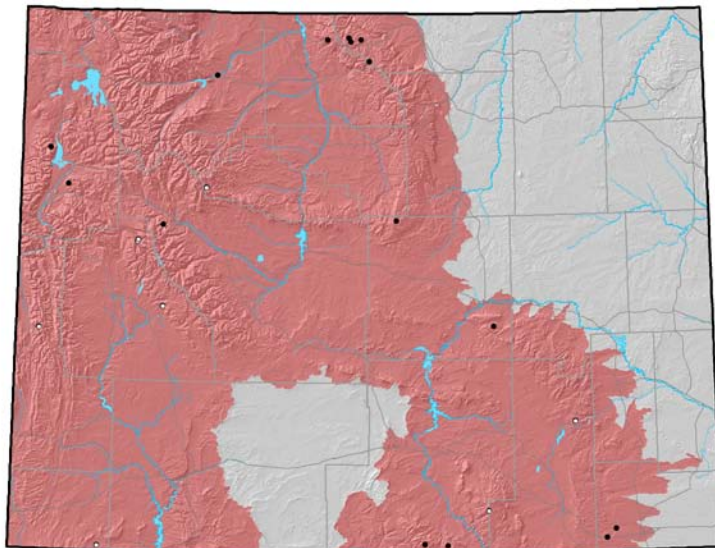
- Training AUC: 0.885
- Regularized Training Gain: 0.905

Cross-Validation Statistics

- Average Test AUC: 0.853 ± 0.073
- Upper Bound on Test AUC: 0.839
- Average Test Gain: 0.826 ± 0.580
- Omission Error (fraction of test points omitted during 10-fold cross validation): 0.18 ± 0.24

Occurrence Data for Distribution Model

Occurrence Map



Points Used in Modeling, by Year of Observation

- Pre-1985
- 1985 or Later

Known and Suspected Range

Occurrence Summary Statistics

- Number of Occurrences in AWVED master dataset: 30
- Number of Occurrences used to create distribution model: 23
- Average Point Quality Index (highest quality is 12.00): 5.22 ± 1.31
- Most recent occurrence used: 2000
- Oldest occurrence used: 1937
- Occurrence File:
LOCAL_SAMPLE_POINTS_W_PD OG_2.
csv

Comments

This species uses aspects of wetlands (e.g., dense emergent vegetation) for which statewide data are not available or reliable. This often results in low model quality because key habitat features are not mappable across the state. Great improvements in our ability to model this species distribution could be obtained by improving wetland maps. Qualitative expert review of this model suggests that the binary version may over-predict the distribution of this species in Wyoming.

References

- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010a. Range maps for Wyoming's species of greatest conservation need. Report prepared for the Wyoming Game and Fish Department by the Wyoming Natural Diversity Database, Laramie, Wyoming. January 19, 2010.
- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010b. Range and modeled distribution of Wyoming's species of greatest conservation need. Report prepared by the Wyoming Natural Diversity Database, Laramie Wyoming for the Wyoming Game and Fish Department, Cheyenne, Wyoming and the U.S. Geological Survey, Fort Collins, Colorado. August 20, 2010.

Predictor Variables used in the Distribution Model

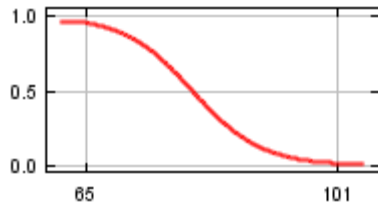
Percent Contribution (PC) to final model

<i>Environmental Variable</i>	<i>PC</i>
Standard deviation of monthly temperature	57
Hottest month mean maximum temperature	33
Conifer Index	4
Isothermality (T2/T5)	3
Variation of monthly precipitation	2
Distance to Permanent Water	2

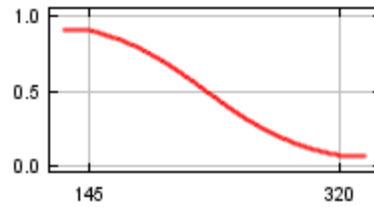
Response Curves

Each curve shows dependence of predicted suitability on input values of a single predictor variable considering correlations with others. Suitability is on the vertical axis (units: probability). Variable values are on the horizontal axis (units based on inputs; see Keinath et al 2010b for details).

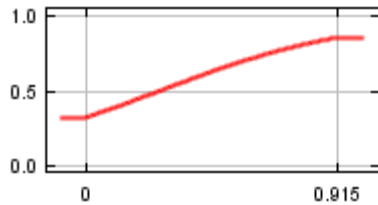
Standard deviation of monthly temperature



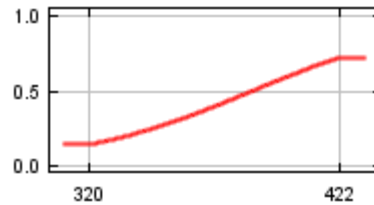
Hottest month mean maximum temperature



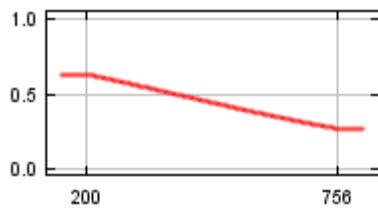
Conifer Index



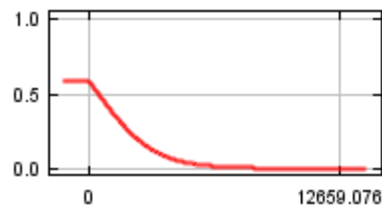
Isothermality (T2/T5)



Variation of monthly precipitation



Distance to Permanent Water

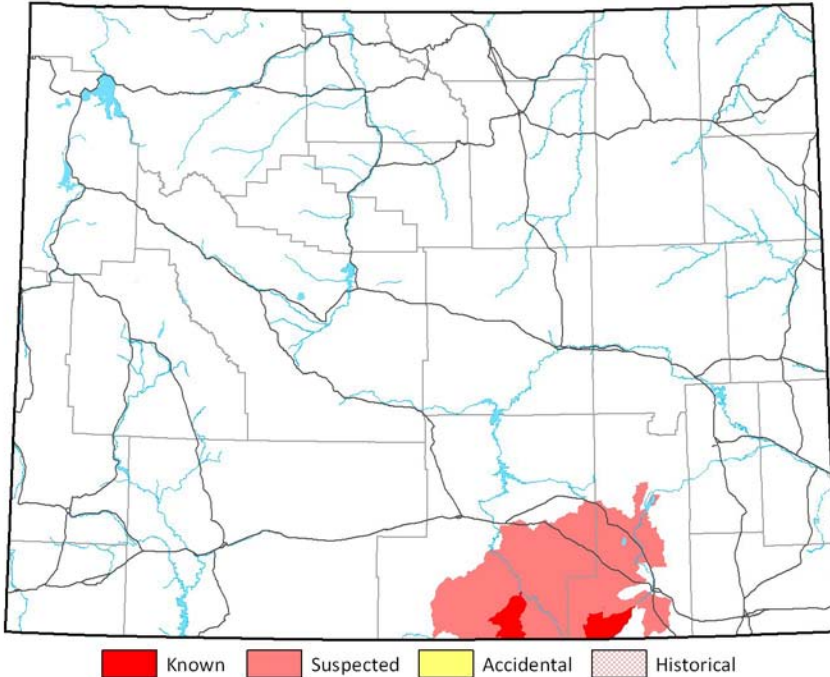


Pygmy Shrew (*Sorex hoyi*) Range Map and Distribution Model Summary

August 20, 2010

This report presents range and distribution of Pygmy Shrew (AMABA01250) in Wyoming (see Keinath et al. 2010b). Similar reports were developed by the Wyoming Natural Diversity Database for terrestrial vertebrate species of conservation need in Wyoming's State Wildlife Action Plan. This effort was supported by the Wyoming Game and Fish Department and the U.S. Geological Survey.

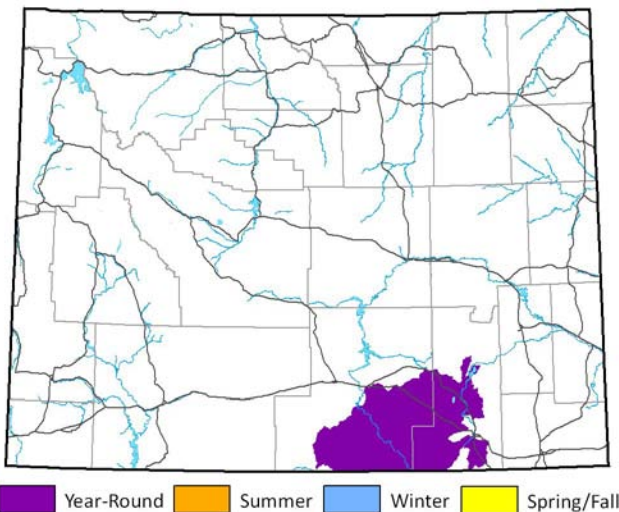
Range Map - Occupancy



Range Notes

- Version: 2010-01-19
- Proportion of range deemed known based on documented occurrences: 0.105
- Details of range map creation noted in Keinath et al. (2010a).

Range Map - Seasonality



Maps, models and report were created by and are available from the Wyoming Natural Diversity Database. (<http://uwadmnweb.uwyo.edu/wyndd/>).

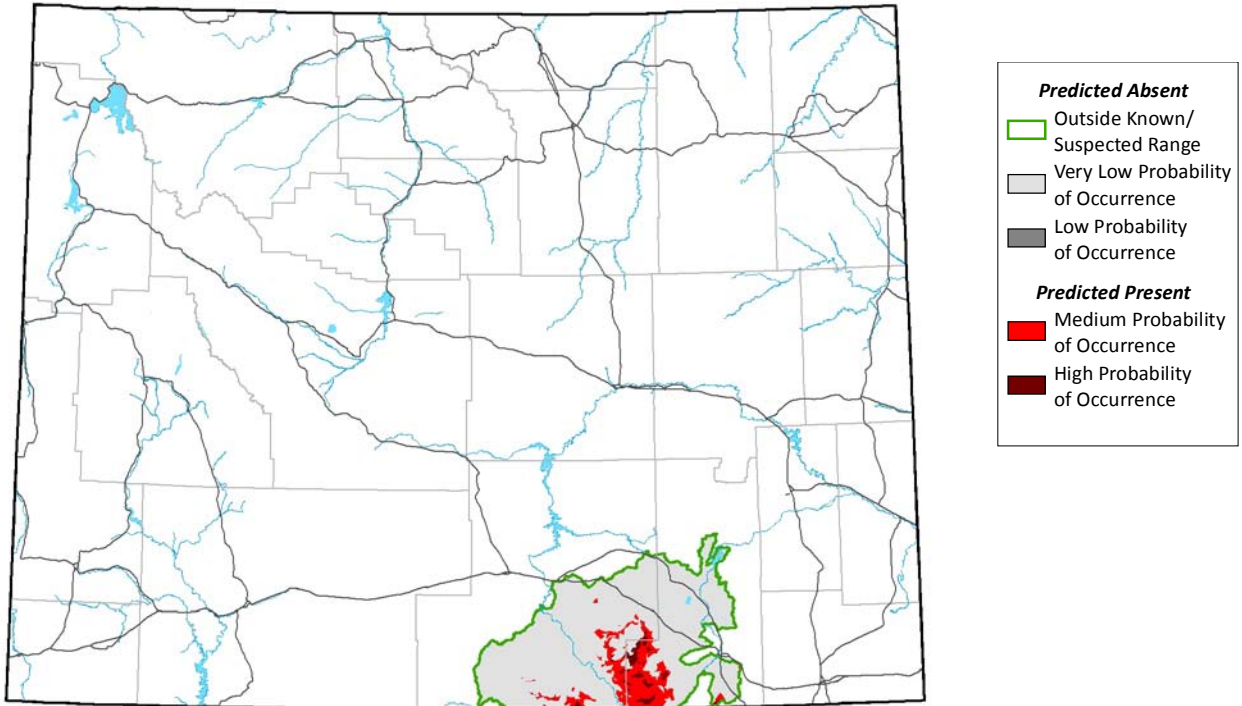
Doug Keinath, Senior Zoologist

Mark Andersen, GIS Specialist

© 2010, WYNDD

Distribution Model (Version: Wed Apr 21 10:05:47 MDT 2010)

Details of distribution model creation are presented in Keinath et al. (2010b)



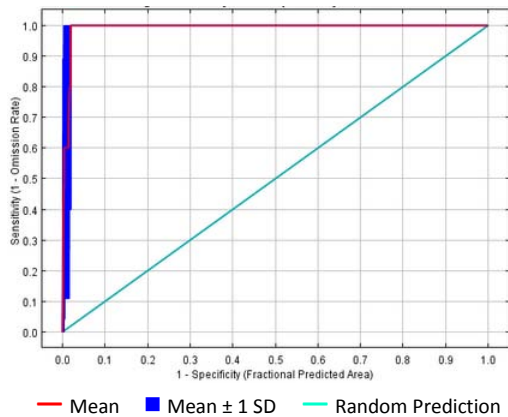
Model Parameters

- Season Modeled: Year-Round
- Algorithm: Maxent version 3.3.1
- Feature Types: Linear
- Binary Threshold Rule: Maximum training sensitivity plus specificity
- Binary Threshold Value: 0.4532210
- High-Probability Threshold Value: 0.7120659
- Low-Probability Threshold Value: 0.4531816

Model Quality Summary

Overall Assessment of Model Quality: LOW
 Expert Assessment: Low
 Occurrence Sample Size: Very Low
 Quality of Occurrences: Low
 Positive Success Rate: High
 Test AUC and Model Gain: Low

Model Evaluation - ROC Plot



Model Evaluation Statistics

Final Model Statistics

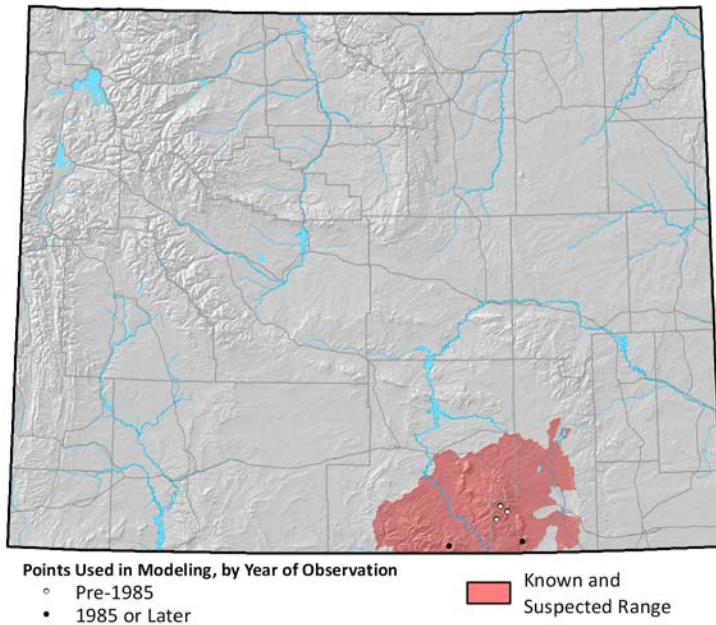
Training AUC: 0.993
 Regularized Training Gain: 3.121

Cross-Validation Statistics

- Average Test AUC: 0.496 ± 0.523
- Upper Bound on Test AUC: 0.982
- Average Test Gain: 1.837 ± 1.988
- Omission Error (fraction of test points omitted during 5-fold cross validation): 0.20 ± 0.45

Occurrence Data for Distribution Model

Occurrence Map



Occurrence Summary Statistics

- Number of Occurrences in AWVED master dataset: 14
- Number of Occurrences used to create distribution model: 5
- Average Point Quality Index (highest quality is 12.00): 5.80 ± 1.64
- Most recent occurrence used: 1990
- Oldest occurrence used: 1963
- Occurrence File:
LOCAL_SAMPLE_POINTS.csv

Comments

The model for this species is based on a small sample size of occurrence locations, which often results in low model quality. Collection of additional, high-quality occurrence locations could greatly improve the modeled distribution for this species.

References

- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010a. Range maps for Wyoming's species of greatest conservation need. Report prepared for the Wyoming Game and Fish Department by the Wyoming Natural Diversity Database, Laramie, Wyoming. January 19, 2010.
- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010b. Range and modeled distribution of Wyoming's species of greatest conservation need. Report prepared by the Wyoming Natural Diversity Database, Laramie Wyoming for the Wyoming Game and Fish Department, Cheyenne, Wyoming and the U.S. Geological Survey, Fort Collins, Colorado. August 20, 2010.

Predictor Variables used in the Distribution Model

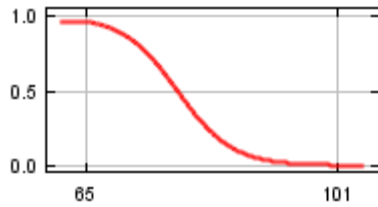
Percent Contribution (PC) to final model

<i>Environmental Variable</i>	<i>PC</i>
Standard deviation of monthly temperature	52
Depth to Shallowest Restrictive Layer	21
Soil texture	19
Variation in monthly radiation	5
Conifer Index	3

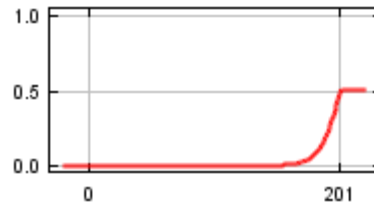
Response Curves

Each curve shows dependence of predicted suitability on input values of a single predictor variable considering correlations with others. Suitability is on the vertical axis (units: probability). Variable values are on the horizontal axis (units based on inputs; see Keinath et al 2010b for details).

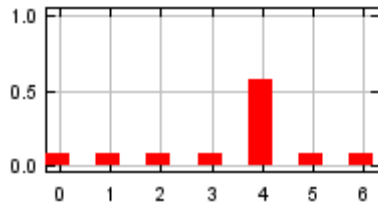
Standard deviation of monthly temperature



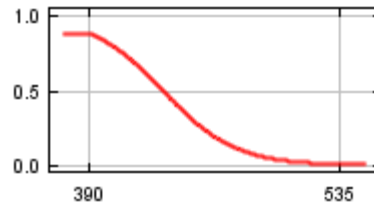
Depth to Shallowest Restrictive Layer



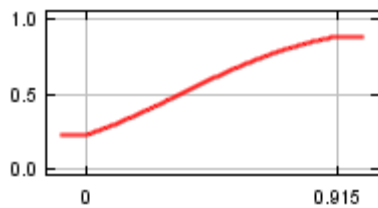
Soil texture



Variation in monthly radiation



Conifer Index

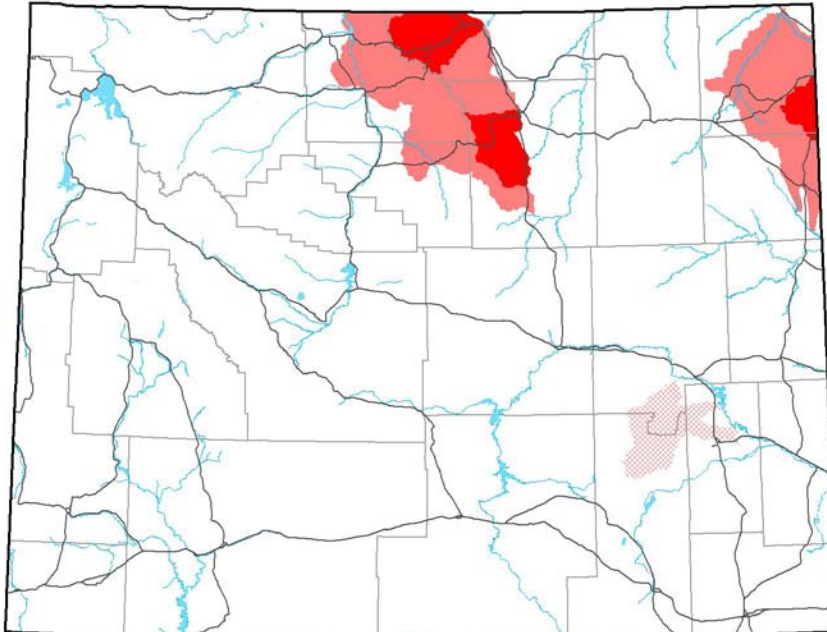


Hayden's Shrew (*Sorex haydeni*) Range Map and Distribution Model Summary

August 20, 2010

This report presents range and distribution of Hayden's Shrew (AMABA01280) in Wyoming (see Keinath et al. 2010b). Similar reports were developed by the Wyoming Natural Diversity Database for terrestrial vertebrate species of conservation need in Wyoming's State Wildlife Action Plan. This effort was supported by the Wyoming Game and Fish Department and the U.S. Geological Survey.

Range Map - Occupancy

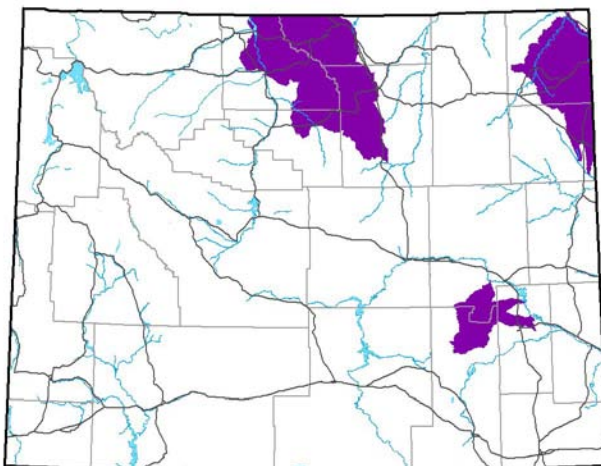


■ Known ■ Suspected ■ Accidental ■ Historical

Range Notes

- Version: 2010-01-19
- Proportion of range deemed known based on documented occurrences: 0.179
- Details of range map creation noted in Keinath et al. (2010a).

Range Map - Seasonality



■ Year-Round ■ Summer ■ Winter ■ Spring/Fall

Maps, models and report were created by and are available from the Wyoming Natural Diversity Database. (<http://uwadmnweb.uwyo.edu/wyndd/>).

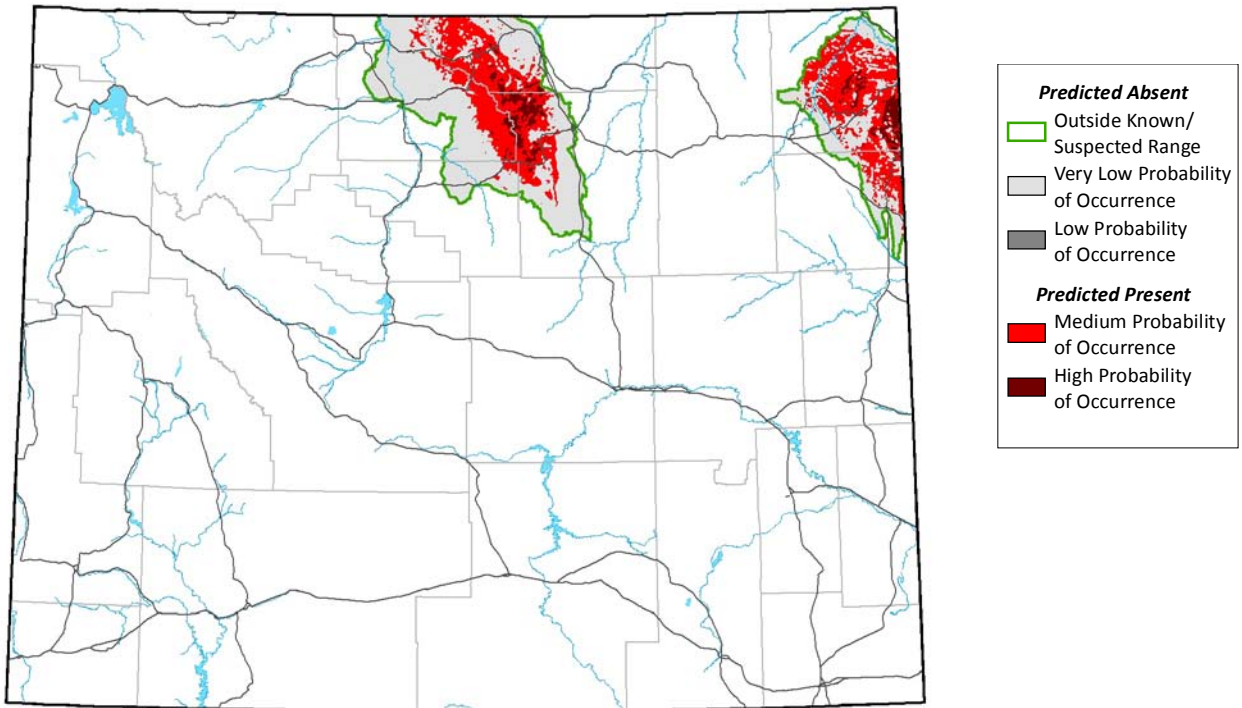
Doug Keinath, Senior Zoologist

Mark Andersen, GIS Specialist

© 2010, WYNDD

Distribution Model (Version: Wed Dec 09 09:07:07 MST 2009)

Details of distribution model creation are presented in Keinath et al. (2010b)



Model Parameters

- Season Modeled: Year-Round
- Algorithm: Maxent version 3.3.1
- Feature Types: Linear, Quadratic
- Binary Threshold Rule: Maximum training sensitivity plus specificity
- Binary Threshold Value: 0.0896060
- High-Probability Threshold Value: 0.6789909
- Low-Probability Threshold Value: 0.0896060

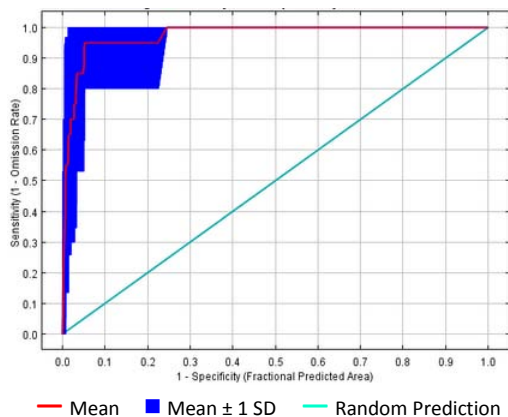
Model Quality Summary

Overall Assessment of Model Quality:

MEDIUM

- Expert Assessment: Medium
- Occurrence Sample Size: Low
- Quality of Occurrences: Medium
- Positive Success Rate: Very High
- Test AUC and Model Gain: High

Model Evaluation - ROC Plot



Model Evaluation Statistics

Final Model Statistics

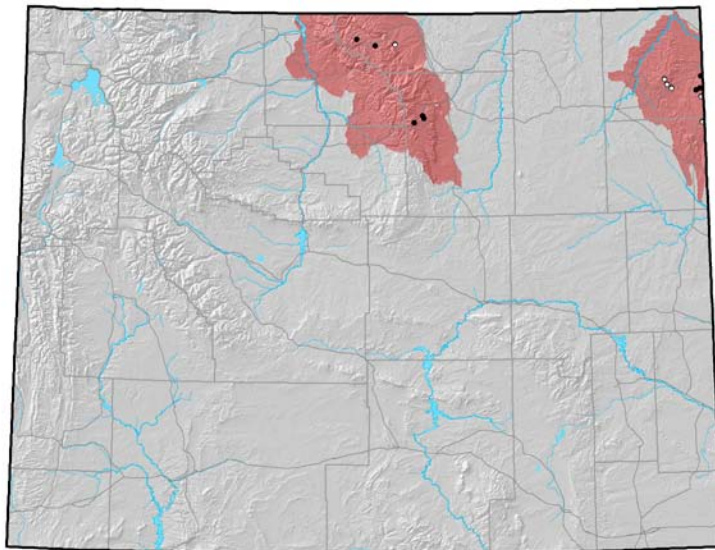
- Training AUC: 0.988
- Regularized Training Gain: 3.043

Cross-Validation Statistics

- Average Test AUC: 0.974 ± 0.036
- Upper Bound on Test AUC: 0.972
- Average Test Gain: 2.820 ± 1.393
- Omission Error (fraction of test points omitted during 10-fold cross validation): 0.05 ± 0.16

Occurrence Data for Distribution Model

Occurrence Map



Points Used in Modeling, by Year of Observation

- Pre-1985
- 1985 or Later

Known and Suspected Range

Occurrence Summary Statistics

- Number of Occurrences in AWVED master dataset: 28
- Number of Occurrences used to create distribution model: 14
- Average Point Quality Index (highest quality is 12.00): 6.21 ± 2.26
- Most recent occurrence used: 1994
- Oldest occurrence used: 1912
- Occurrence File:
LOCAL_SAMPLE_POINTS.csv

Comments

There are no additional comments specific to this species range map or distribution model.

References

- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010a. Range maps for Wyoming's species of greatest conservation need. Report prepared for the Wyoming Game and Fish Department by the Wyoming Natural Diversity Database, Laramie, Wyoming. January 19, 2010.
- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010b. Range and modeled distribution of Wyoming's species of greatest conservation need. Report prepared by the Wyoming Natural Diversity Database, Laramie Wyoming for the Wyoming Game and Fish Department, Cheyenne, Wyoming and the U.S. Geological Survey, Fort Collins, Colorado. August 20, 2010.

Predictor Variables used in the Distribution Model

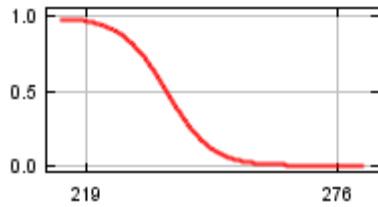
Percent Contribution (PC) to final model

<i>Environmental Variable</i>	<i>PC</i>
Radiation of the lightest month	38
Annual Relative Humidity Range	26
Forest Cover Index	19
Sagebrush Index	11
Cottonwood Index	6
Deciduous Forest Index	1

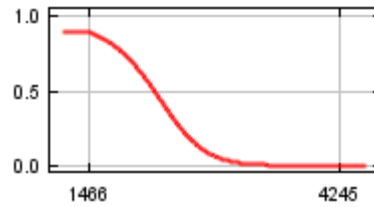
Response Curves

Each curve shows dependence of predicted suitability on input values of a single predictor variable considering correlations with others. Suitability is on the vertical axis (units: probability). Variable values are on the horizontal axis (units based on inputs; see Keinath et al 2010b for details).

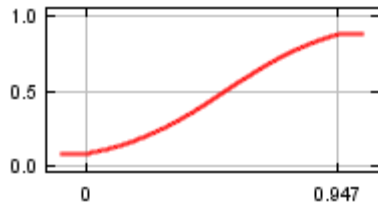
Radiation of the lightest month



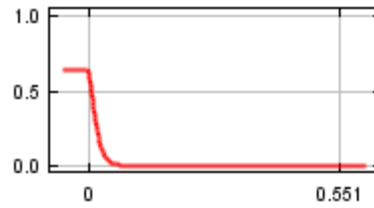
Annual Relative Humidity Range



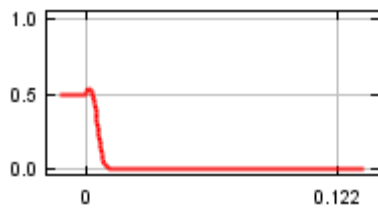
Forest Cover Index



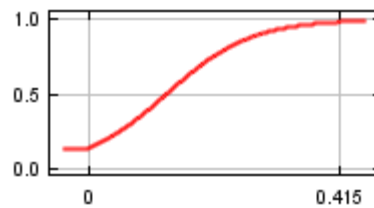
Sagebrush Index



Cottonwood Index



Deciduous Forest Index

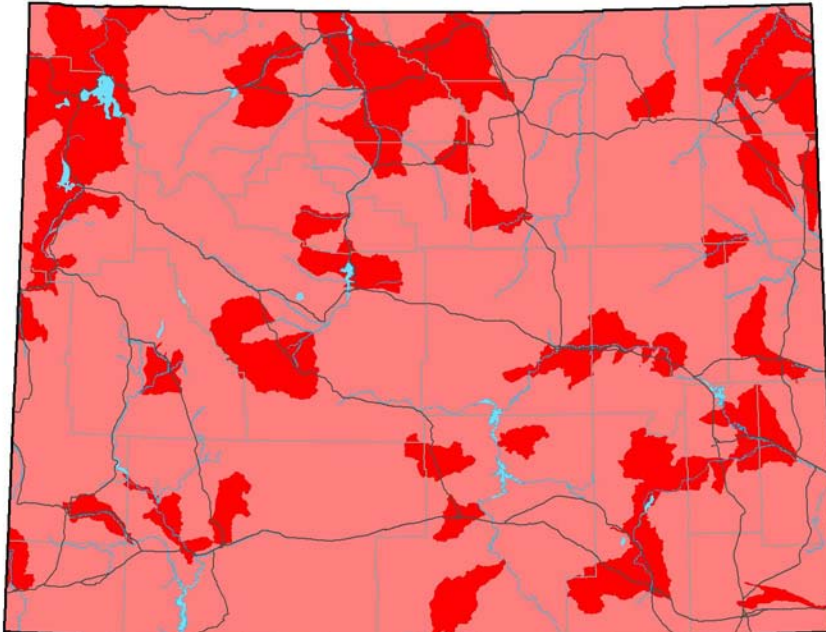


Little Brown Myotis (*Myotis lucifugus*) Range Map and Distribution Model Summary

August 20, 2010

This report presents range and distribution of Little Brown Myotis (AMACC01010) in Wyoming (see Keinath et al. 2010b). Similar reports were developed by the Wyoming Natural Diversity Database for terrestrial vertebrate species of conservation need in Wyoming's State Wildlife Action Plan. This effort was supported by the Wyoming Game and Fish Department and the U.S. Geological Survey.

Range Map - Occupancy

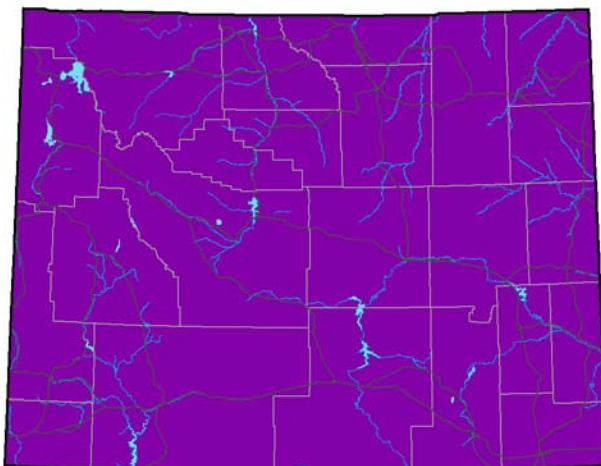


■ Known ■ Suspected ■ Accidental ■ Historical

Range Notes

- Version: 2010-01-19
- Proportion of range deemed known based on documented occurrences: 0.165
- Details of range map creation noted in Keinath et al. (2010a).

Range Map - Seasonality



■ Year-Round ■ Summer ■ Winter ■ Spring/Fall

Maps, models and report were created by and are available from the Wyoming Natural Diversity Database. (<http://uwadmnweb.uwyo.edu/wyndd/>).

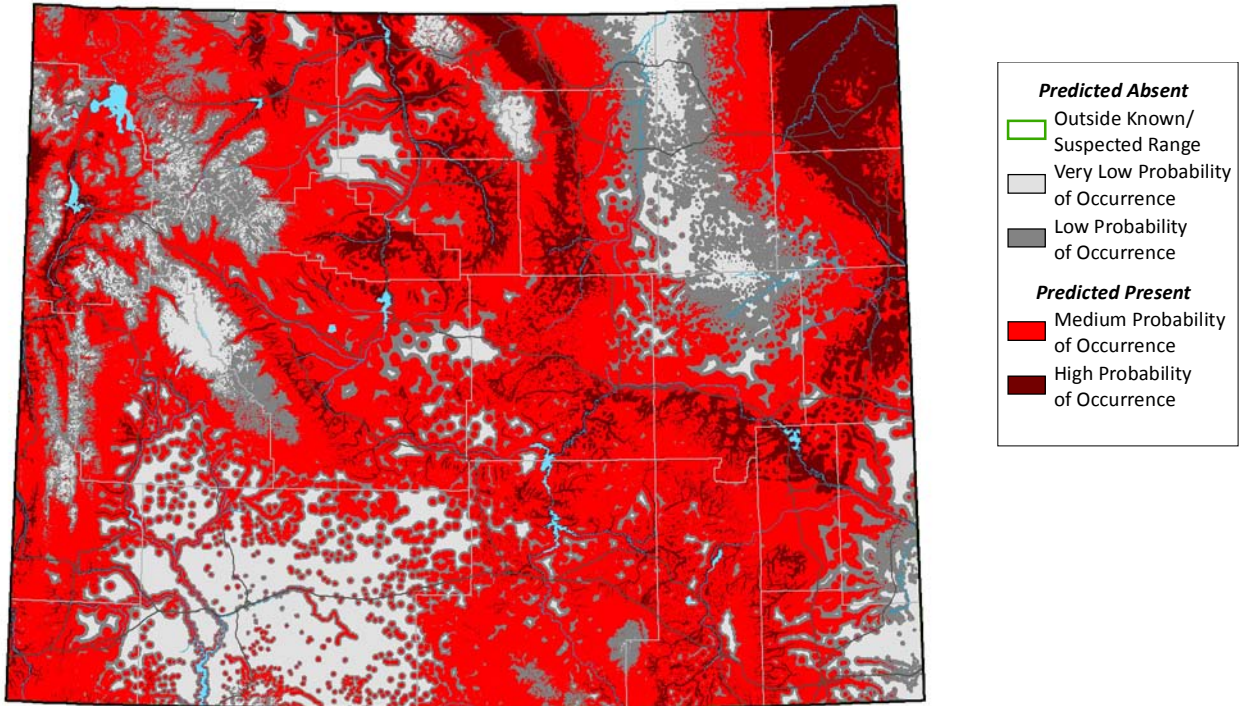
Doug Keinath, Senior Zoologist

Mark Andersen, GIS Specialist

© 2010, WYNDD

Distribution Model (Version: Fri Apr 09 11:36:35 MDT 2010)

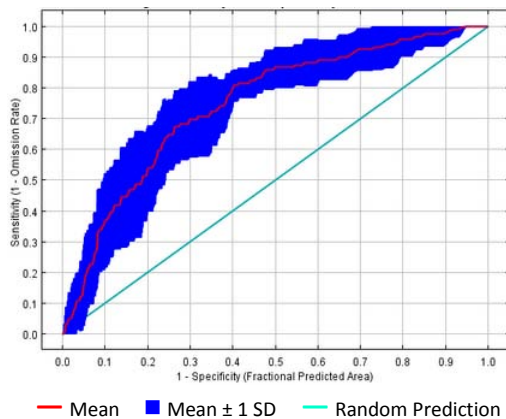
Details of distribution model creation are presented in Keinath et al. (2010b)



Model Parameters

- Season Modeled: Breeding (1-May- 25-Aug)
- Algorithm: Maxent version 3.3.1
- Feature Types: Linear, Product
- Binary Threshold Rule: 5 percentile training presence
- Binary Threshold Value: 0.1640000
- High-Probability Threshold Value: 0.5450856
- Low-Probability Threshold Value: 0.0511057

Model Evaluation - ROC Plot



Model Quality Summary

Overall Assessment of Model Quality:

MEDIUM

- Expert Assessment: Medium
- Occurrence Sample Size: High
- Quality of Occurrences: Medium
- Positive Success Rate: Medium
- Test AUC and Model Gain: Low

Model Evaluation Statistics

Final Model Statistics

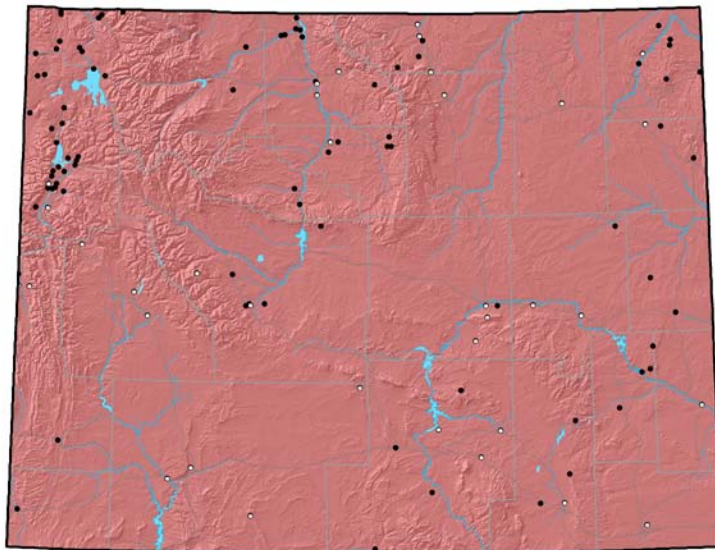
- Training AUC: 0.773
- Regularized Training Gain: 0.467

Cross-Validation Statistics

- Average Test AUC: 0.748 ± 0.047
- Upper Bound on Test AUC: 0.763
- Average Test Gain: 0.354 ± 0.191
- Omission Error (fraction of test points omitted during 10-fold cross validation): 0.29 ± 0.14

Occurrence Data for Distribution Model

Occurrence Map



Points Used in Modeling, by Year of Observation

- Pre-1985
- 1985 or Later

Known and Suspected Range

Occurrence Summary Statistics

- Number of Occurrences in AWVED master dataset: 440
- Number of Occurrences used to create distribution model: 119
- Average Point Quality Index (highest quality is 12.00): 7.18 ± 3.54
- Most recent occurrence used: 2007
- Oldest occurrence used: 1981
- Occurrence File:
DRAFT_3_SAGE_WATER_RERUNS.csv

Comments

Bat distributions are more difficult to model than those of other species, because bats require unique features (e.g., roost sites and hibernacula) for which complete statewide maps are not available.

Therefore, bat distribution models should be viewed as hypothetical predictions of where the species could occur if such features are present.

References

- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010a. Range maps for Wyoming's species of greatest conservation need. Report prepared for the Wyoming Game and Fish Department by the Wyoming Natural Diversity Database, Laramie, Wyoming. January 19, 2010.
- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010b. Range and modeled distribution of Wyoming's species of greatest conservation need. Report prepared by the Wyoming Natural Diversity Database, Laramie Wyoming for the Wyoming Game and Fish Department, Cheyenne, Wyoming and the U.S. Geological Survey, Fort Collins, Colorado. August 20, 2010.

Predictor Variables used in the Distribution Model

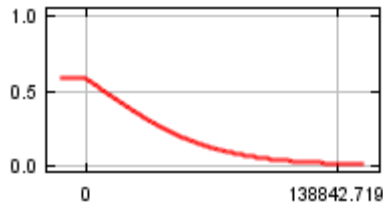
Percent Contribution (PC) to final model

<i>Environmental Variable</i>	<i>PC</i>
Distance to Cave-forming Formations	49
Interannual variation in annual frost days	26
Distance to Permanent Water	13
Elevation	12
Percent Forest Cover	1

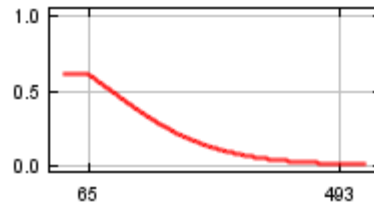
Response Curves

Each curve shows dependence of predicted suitability on input values of a single predictor variable considering correlations with others. Suitability is on the vertical axis (units: probability). Variable values are on the horizontal axis (units based on inputs; see Keinath et al 2010b for details).

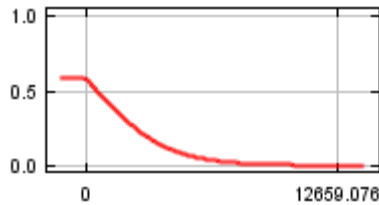
Distance to Cave-forming Formations



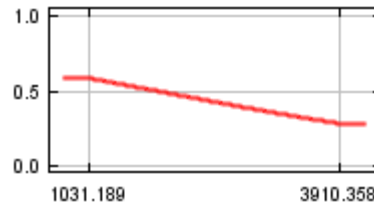
Interannual variation in annual frost days



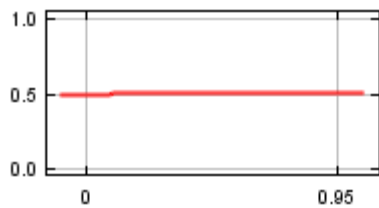
Distance to Permanent Water



Elevation



Percent Forest Cover

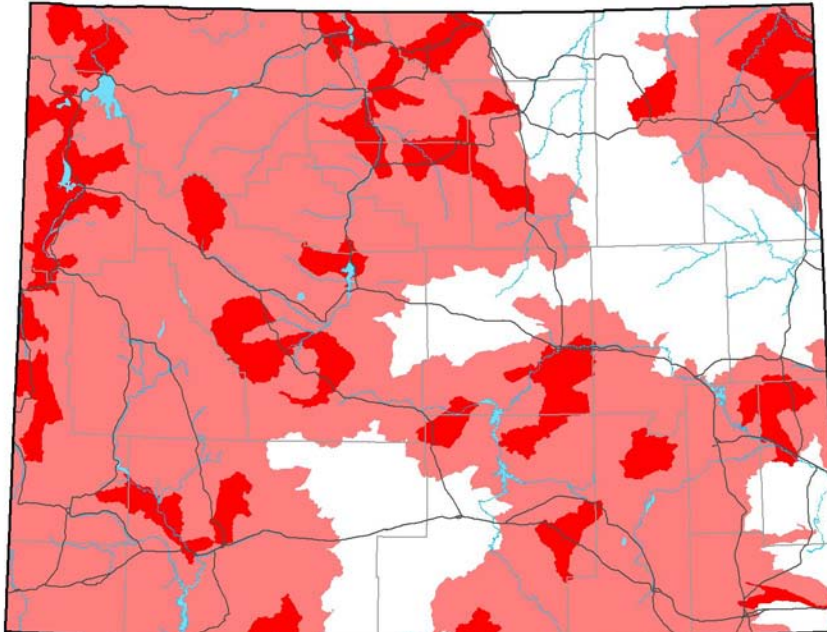


Long-eared Myotis (*Myotis evotis*) Range Map and Distribution Model Summary

August 20, 2010

This report presents range and distribution of Long-eared Myotis (AMACC01070) in Wyoming (see Keinath et al. 2010b). Similar reports were developed by the Wyoming Natural Diversity Database for terrestrial vertebrate species of conservation need in Wyoming's State Wildlife Action Plan. This effort was supported by the Wyoming Game and Fish Department and the U.S. Geological Survey.

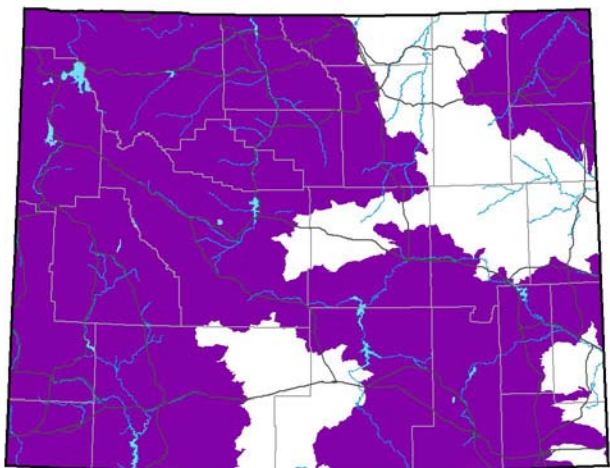
Range Map - Occupancy



Range Notes

- Version: 2010-01-19
- Proportion of range deemed known based on documented occurrences: 0.138
- Details of range map creation noted in Keinath et al. (2010a).

Range Map - Seasonality



Maps, models and report were created by and are available from the Wyoming Natural Diversity Database.
(<http://uwadmnweb.uwyo.edu/wyndd/>).

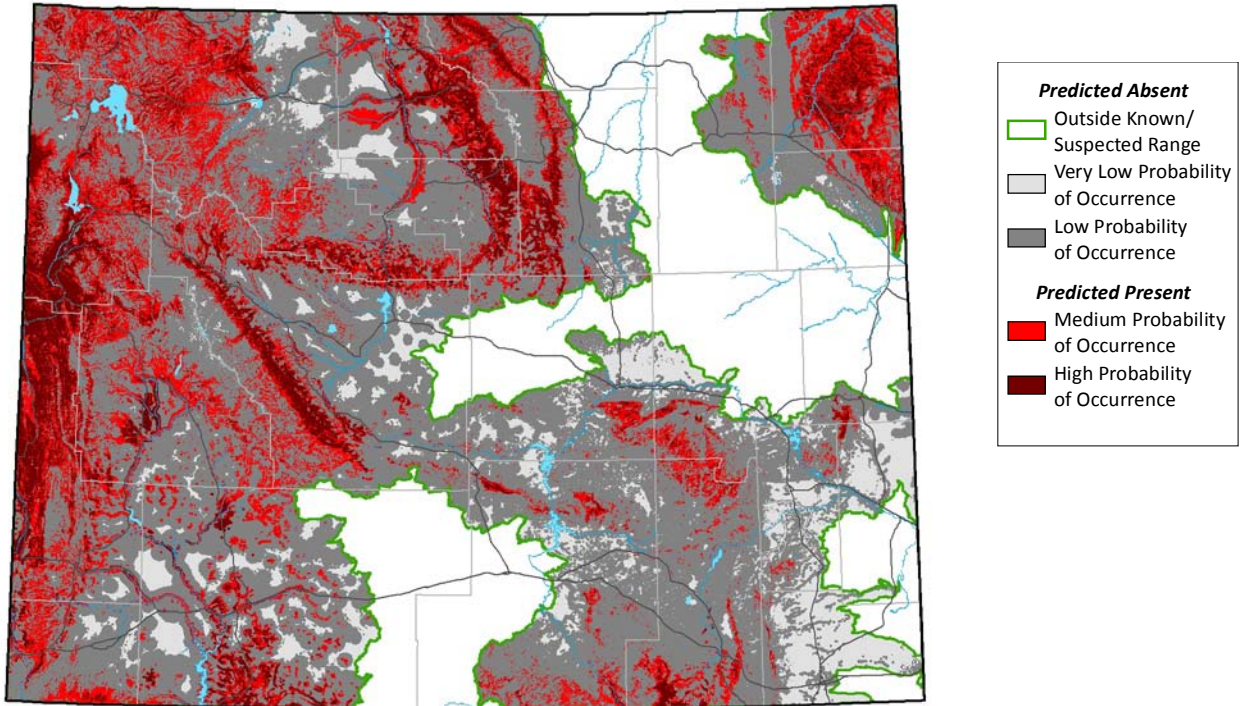
Doug Keinath, Senior Zoologist

Mark Andersen, GIS Specialist

© 2010, WYNDD

Distribution Model (Version: Tue Mar 16 21:24:17 MDT 2010)

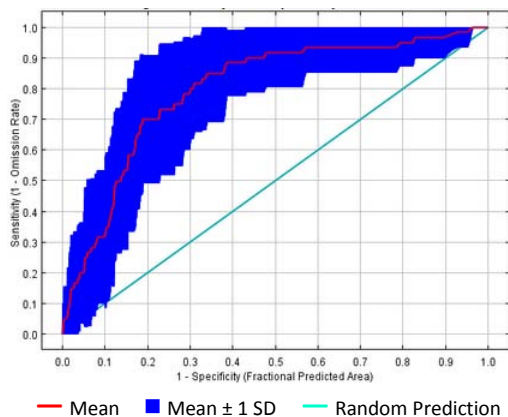
Details of distribution model creation are presented in Keinath et al. (2010b)



Model Parameters

- Season Modeled: Breeding (1-May- 25-Aug)
- Algorithm: Maxent version 3.3.1
- Feature Types: Linear, Quadratic, Hinge
- Binary Threshold Rule: Maximum training sensitivity plus specificity
- Binary Threshold Value: 0.3549790
- High-Probability Threshold Value: 0.5607981
- Low-Probability Threshold Value: 0.0257920

Model Evaluation - ROC Plot



Model Quality Summary

Overall Assessment of Model Quality:
MEDIUM

- Expert Assessment: Medium
- Occurrence Sample Size: Medium-High
- Quality of Occurrences: Medium
- Positive Success Rate: Medium
- Test AUC and Model Gain: Medium

Model Evaluation Statistics

Final Model Statistics

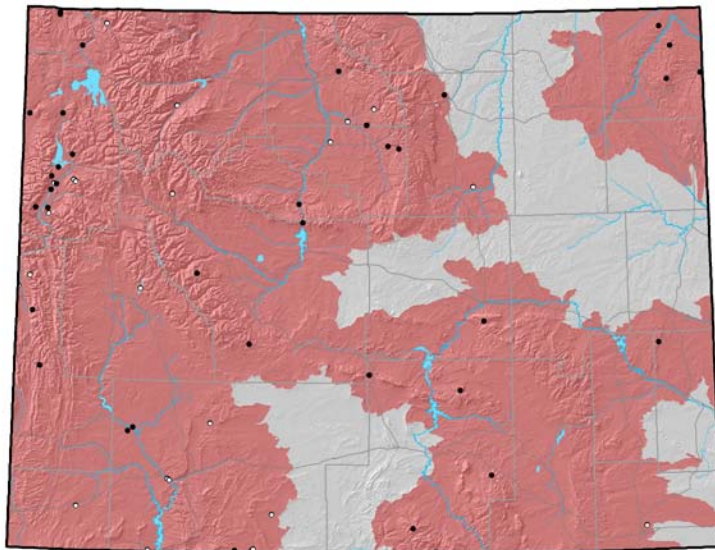
- Training AUC: 0.864
- Regularized Training Gain: 0.783

Cross-Validation Statistics

- Average Test AUC: 0.797 ± 0.101
- Upper Bound on Test AUC: 0.817
- Average Test Gain: 0.520 ± 0.643
- Omission Error (fraction of test points omitted during 10-fold cross validation): 0.28 ± 0.24

Occurrence Data for Distribution Model

Occurrence Map



Points Used in Modeling, by Year of Observation

- Pre-1985
- 1985 or Later

Known and Suspected Range

Occurrence Summary Statistics

- Number of Occurrences in AWVED master dataset: 143
- Number of Occurrences used to create distribution model: 60
- Average Point Quality Index (highest quality is 12.00): 7.55 ± 3.15
- Most recent occurrence used: 2007
- Oldest occurrence used: 1908
- Occurrence File:
LOCAL_SAMPLE_POINTS_W_PD OG_2.CSV

Comments

Bat distributions are more difficult to model than those of other species, because bats require unique features (e.g., roost sites and hibernacula) for which complete statewide maps are not available.

Therefore, bat distribution models should be viewed as hypothetical predictions of where the species could occur if such features are present. Conclusive identification of this species is difficult unless the observer is experienced with the species. We suspect numerous occurrences could be in error, thus resulting in lower than expected model quality. The lack of supporting data provided with many occurrences (notably those from the Wildlife Observation System) makes it impossible to assess the accuracy of such observations. Supplementation/replacement of the existing data set with high-quality occurrence locations could greatly improve the modeled distribution for this species.

References

- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010a. Range maps for Wyoming's species of greatest conservation need. Report prepared for the Wyoming Game and Fish Department by the Wyoming Natural Diversity Database, Laramie, Wyoming. January 19, 2010.
- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010b. Range and modeled distribution of Wyoming's species of greatest conservation need. Report prepared by the Wyoming Natural Diversity Database, Laramie Wyoming for the Wyoming Game and Fish Department, Cheyenne, Wyoming and the U.S. Geological Survey, Fort Collins, Colorado. August 20, 2010.

Predictor Variables used in the Distribution Model

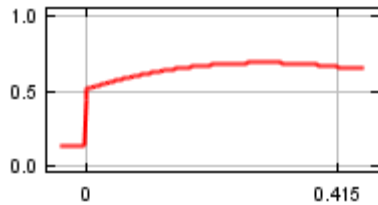
Percent Contribution (PC) to final model

<i>Environmental Variable</i>	<i>PC</i>
Deciduous Forest Index	23
Interannual variation in annual frost days	20
Distance to Cave-forming Formations	20
Vector Ruggedness Measure	20
Coldest month mean minimum temperature	12
Distance to Permanent Water	4

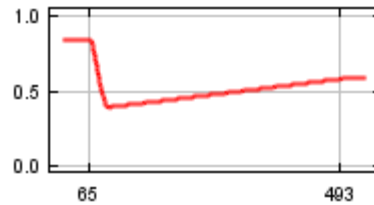
Response Curves

Each curve shows dependence of predicted suitability on input values of a single predictor variable considering correlations with others. Suitability is on the vertical axis (units: probability). Variable values are on the horizontal axis (units based on inputs; see Keinath et al 2010b for details).

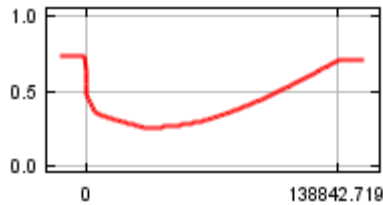
Deciduous Forest Index



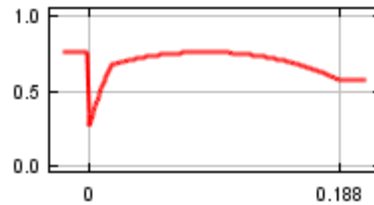
Interannual variation in annual frost days



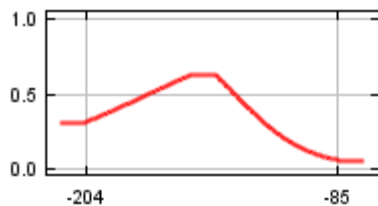
Distance to Cave-forming Formations



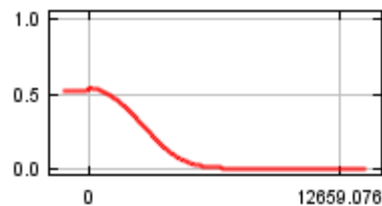
Vector Ruggedness Measure



Coldest month mean minimum temperature



Distance to Permanent Water

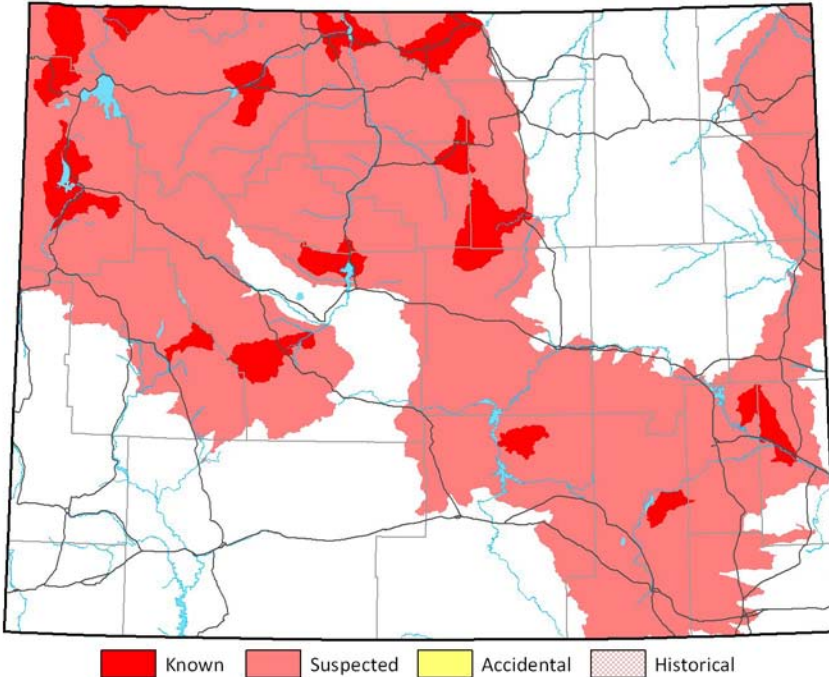


Fringed Myotis (*Myotis thysanodes*) Range Map and Distribution Model Summary

August 20, 2010

This report presents range and distribution of Fringed Myotis (AMACC01090Q) in Wyoming (see Keinath et al. 2010b). Similar reports were developed by the Wyoming Natural Diversity Database for terrestrial vertebrate species of conservation need in Wyoming's State Wildlife Action Plan. This effort was supported by the Wyoming Game and Fish Department and the U.S. Geological Survey.

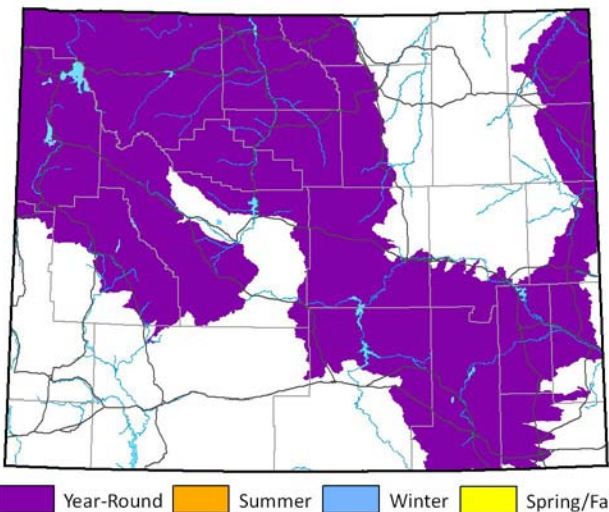
Range Map - Occupancy



Range Notes

- Version: 2010-01-19
- Proportion of range deemed known based on documented occurrences: 0.083
- Details of range map creation noted in Keinath et al. (2010a).

Range Map - Seasonality



Maps, models and report were created by and are available from the Wyoming Natural Diversity Database. (<http://uwadmnweb.uwyo.edu/wyndd/>).

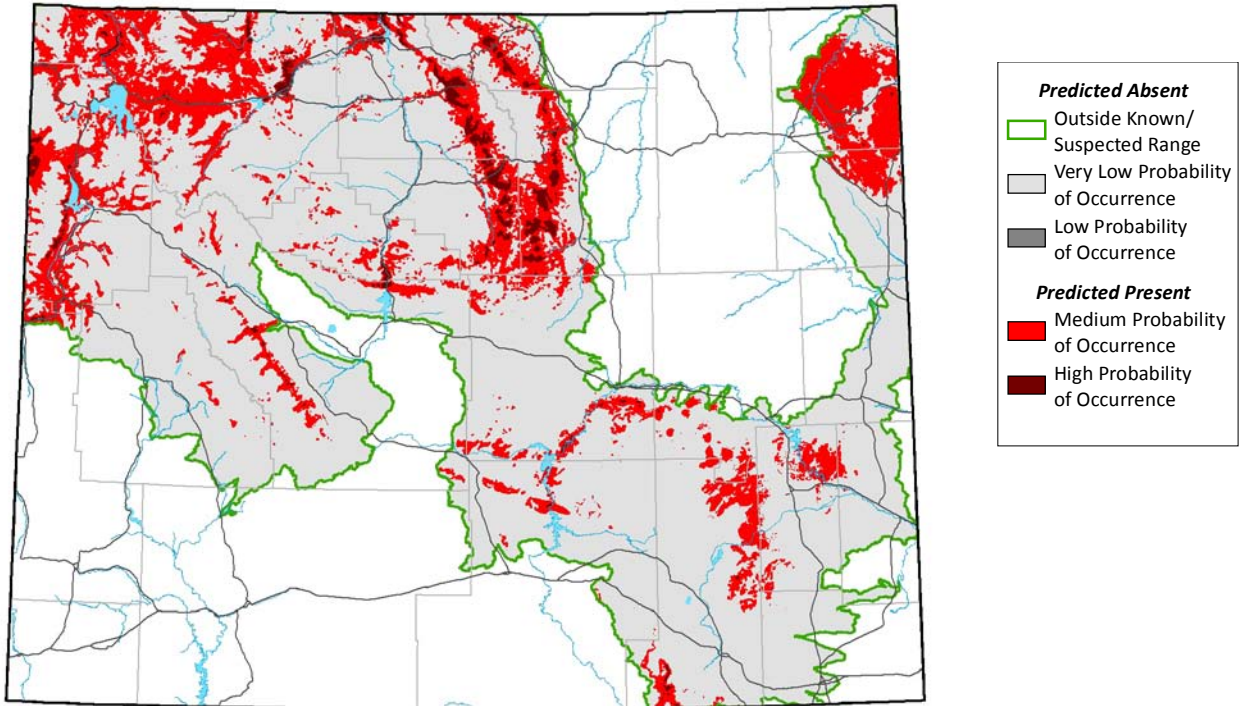
Doug Keinath, Senior Zoologist

Mark Andersen, GIS Specialist

© 2010, WYNDD

Distribution Model (Version: Wed Dec 09 11:14:50 MST 2009)

Details of distribution model creation are presented in Keinath et al. (2010b)



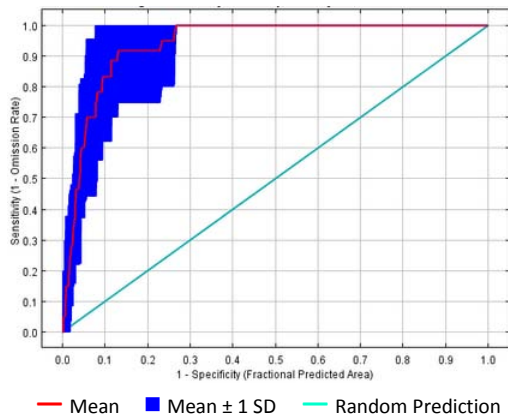
Model Parameters

- Season Modeled: Breeding (1-May- 15-Aug)
- Algorithm: Maxent version 3.3.1
- Feature Types: Linear, Quadratic, Hinge
- Binary Threshold Rule: Maximum training sensitivity plus specificity
- Binary Threshold Value: 0.1675400
- High-Probability Threshold Value: 0.6548637
- Low-Probability Threshold Value: 0.1675400

Model Quality Summary

Overall Assessment of Model Quality: HIGH
 Expert Assessment: Medium
 Occurrence Sample Size: Medium
 Quality of Occurrences: High
 Positive Success Rate: High
 Test AUC and Model Gain: High

Model Evaluation - ROC Plot



Model Evaluation Statistics

Final Model Statistics

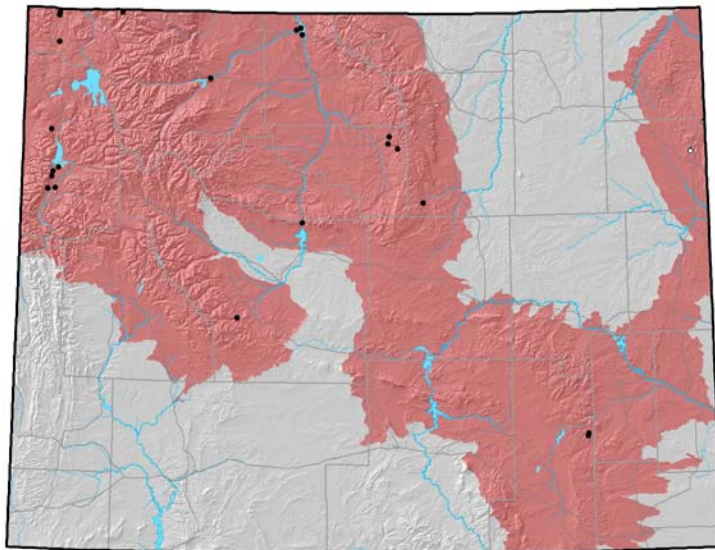
Training AUC: 0.966
 Regularized Training Gain: 1.848

Cross-Validation Statistics

- Average Test AUC: 0.939 ± 0.033
- Upper Bound on Test AUC: 0.932
- Average Test Gain: 1.659 ± 0.343
- Omission Error (fraction of test points omitted during 10-fold cross validation): 0.12 ± 0.19

Occurrence Data for Distribution Model

Occurrence Map



Points Used in Modeling, by Year of Observation

- Pre-1985
- 1985 or Later

Known and Suspected Range

Occurrence Summary Statistics

- Number of Occurrences in AWVED master dataset: 53
- Number of Occurrences used to create distribution model: 24
- Average Point Quality Index (highest quality is 12.00): 10.25 ± 2.36
- Most recent occurrence used: 2004
- Oldest occurrence used: 1951
- Occurrence File:
LOCAL_SAMPLE_POINTS.csv

Comments

Devil's tower is a known occurrence location for Fringed Myotis, but no documented records existed until after this model was created. These new records could change the model somewhat by introducing data from the relatively under-sampled northwest corner of the state. Bat distributions are more difficult to model than those of other species, because bats require unique features (e.g., roost sites and hibernacula) for which complete statewide maps are not available. Therefore, bat distribution models should be viewed as hypothetical predictions of where the species could occur if such features are present. Conclusive identification of this species is difficult unless the observer is experienced with the species. We suspect numerous occurrences could be in error, thus resulting in lower than expected model quality. The lack of supporting data provided with many occurrences (notably those from the Wildlife Observation System) makes it impossible to assess the accuracy of such observations. Supplementation/replacement of the existing data set with high-quality occurrence locations could greatly improve the modeled distribution for this species.

References

- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010a. Range maps for Wyoming's species of greatest conservation need. Report prepared for the Wyoming Game and Fish Department by the Wyoming Natural Diversity Database, Laramie, Wyoming. January 19, 2010.
- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010b. Range and modeled distribution of Wyoming's species of greatest conservation need. Report prepared by the Wyoming Natural Diversity Database, Laramie Wyoming for the Wyoming Game and Fish Department, Cheyenne, Wyoming and the U.S. Geological Survey, Fort Collins, Colorado. August 20, 2010.

Predictor Variables used in the Distribution Model

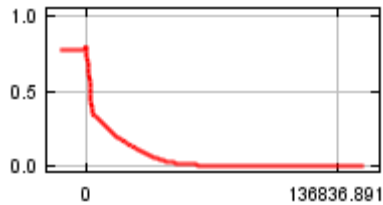
Percent Contribution (PC) to final model

<i>Environmental Variable</i>	<i>PC</i>
Distance to Cliffs	31
Conifer Index	25
Pinon-Juniper Index	16
Radiation of the lightest month	14
Interannual variation in annual frost days	10
Annual Relative Humidity Range	5

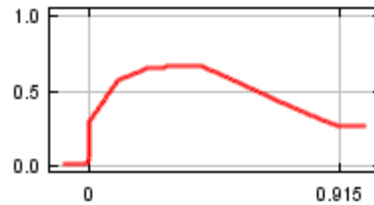
Response Curves

Each curve shows dependence of predicted suitability on input values of a single predictor variable considering correlations with others. Suitability is on the vertical axis (units: probability). Variable values are on the horizontal axis (units based on inputs; see Keinath et al 2010b for details).

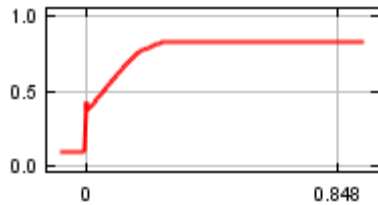
Distance to Cliffs



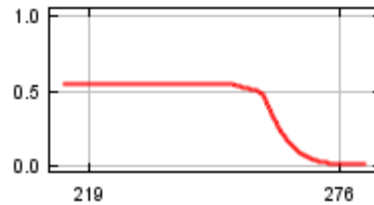
Conifer Index



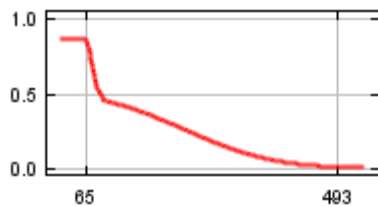
Pinon-Juniper Index



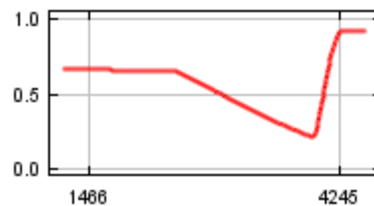
Radiation of the lightest month



Interannual variation in annual frost days



Annual Relative Humidity Range

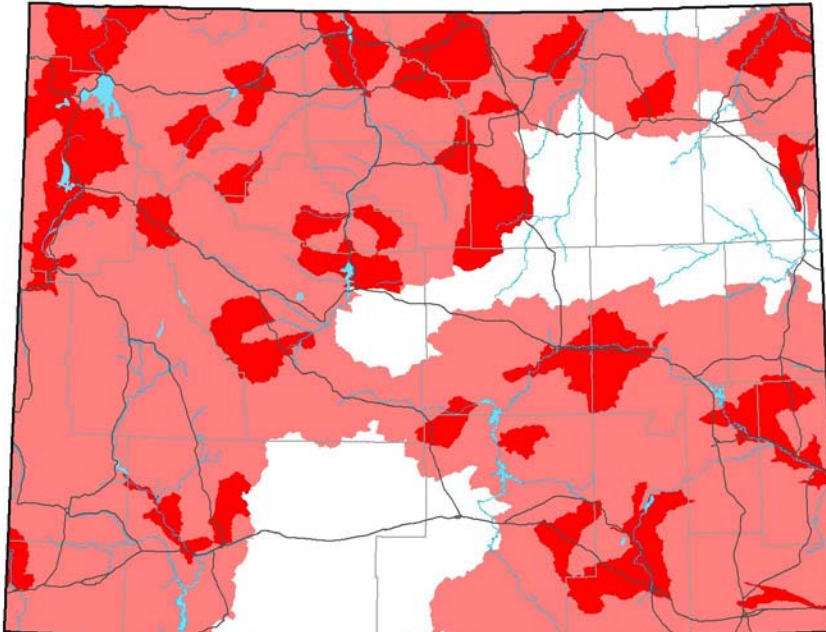


Long-legged Myotis (*Myotis volans*) Range Map and Distribution Model Summary

August 20, 2010

This report presents range and distribution of Long-legged Myotis (AMACC01110) in Wyoming (see Keinath et al. 2010b). Similar reports were developed by the Wyoming Natural Diversity Database for terrestrial vertebrate species of conservation need in Wyoming's State Wildlife Action Plan. This effort was supported by the Wyoming Game and Fish Department and the U.S. Geological Survey.

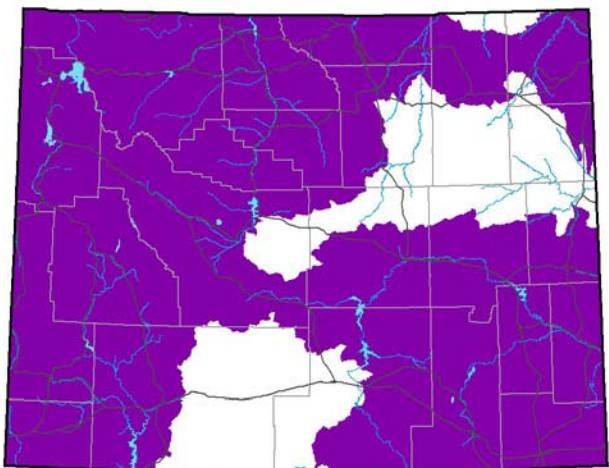
Range Map - Occupancy



Range Notes

- Version: 2010-01-19
- Proportion of range deemed known based on documented occurrences: 0.167
- Details of range map creation noted in Keinath et al. (2010a).

Range Map - Seasonality



Maps, models and report were created by and are available from the Wyoming Natural Diversity Database. (<http://uwadmnweb.uwyo.edu/wyndd/>).

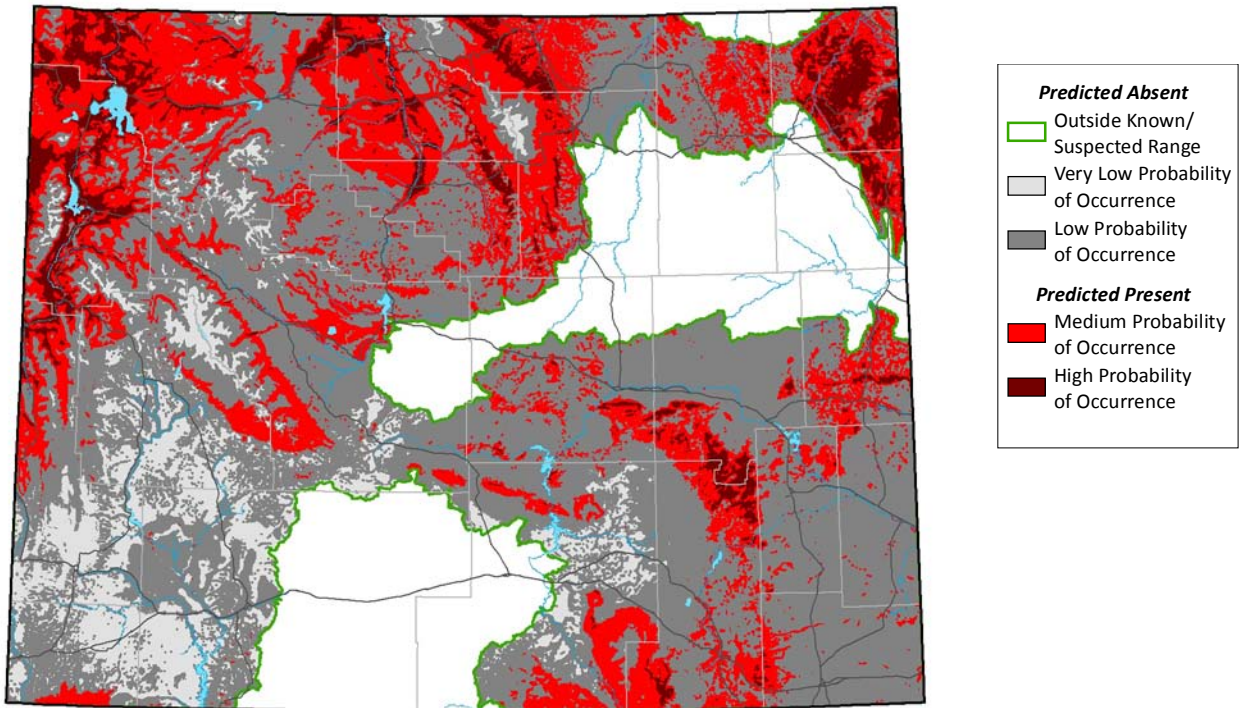
Doug Keinath, Senior Zoologist

Mark Andersen, GIS Specialist

© 2010, WYNDD

Distribution Model (Version: Wed Apr 21 13:47:08 MDT 2010)

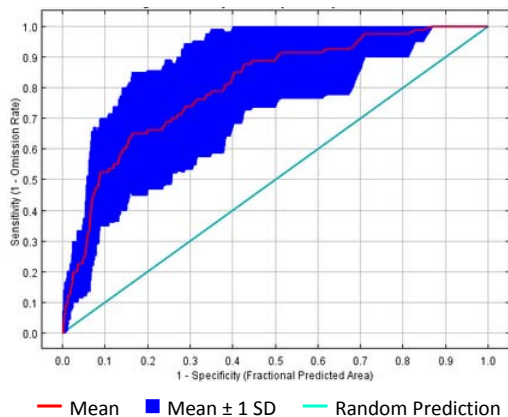
Details of distribution model creation are presented in Keinath et al. (2010b)



Model Parameters

- Season Modeled: Breeding (1-May- 25-Aug)
- Algorithm: Maxent version 3.3.1
- Feature Types: Linear, Product, Quadratic, Hinge, Threshold
- Binary Threshold Rule: Maximum training sensitivity plus specificity
- Binary Threshold Value: 0.2968910
- High-Probability Threshold Value: 0.6356897
- Low-Probability Threshold Value: 0.0513723

Model Evaluation - ROC Plot



Model Quality Summary

Overall Assessment of Model Quality:
MEDIUM

- Expert Assessment: Medium
- Occurrence Sample Size: Medium-High
- Quality of Occurrences: High
- Positive Success Rate: Low
- Test AUC and Model Gain: Medium

Model Evaluation Statistics

Final Model Statistics

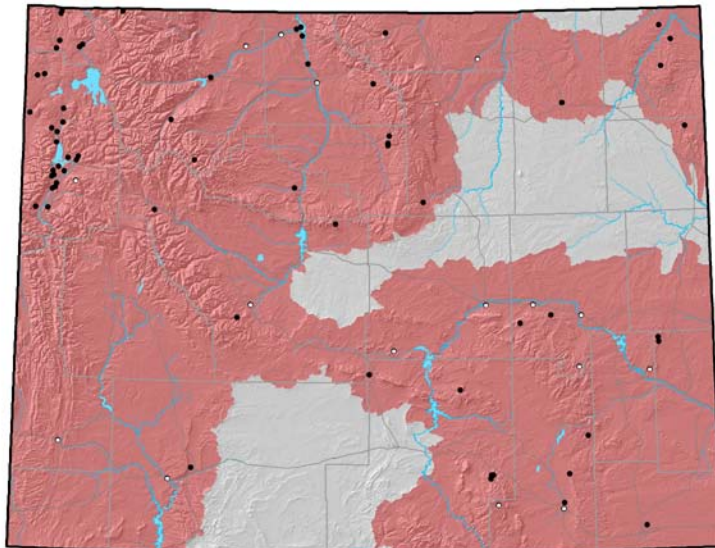
- Training AUC: 0.854
- Regularized Training Gain: 0.795

Cross-Validation Statistics

- Average Test AUC: 0.804 ± 0.114
- Upper Bound on Test AUC: 0.822
- Average Test Gain: 0.653 ± 0.627
- Omission Error (fraction of test points omitted during 10-fold cross validation): 0.35 ± 0.23

Occurrence Data for Distribution Model

Occurrence Map



Points Used in Modeling, by Year of Observation

- Pre-1985
- 1985 or Later

Known and Suspected Range

Occurrence Summary Statistics

- Number of Occurrences in AWVED master dataset: 221
- Number of Occurrences used to create distribution model: 80
- Average Point Quality Index (highest quality is 12.00): 8.51 ± 3.26
- Most recent occurrence used: 2007
- Oldest occurrence used: 1947
- Occurrence File:
LOCAL_SAMPLE_POINTS.csv

Comments

Bat distributions are more difficult to model than those of other species, because bats require unique features (e.g., roost sites and hibernacula) for which complete statewide maps are not available. Therefore, bat distribution models should be viewed as hypothetical predictions of where the species could occur if such features are present.

References

- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010a. Range maps for Wyoming's species of greatest conservation need. Report prepared for the Wyoming Game and Fish Department by the Wyoming Natural Diversity Database, Laramie, Wyoming. January 19, 2010.
- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010b. Range and modeled distribution of Wyoming's species of greatest conservation need. Report prepared by the Wyoming Natural Diversity Database, Laramie Wyoming for the Wyoming Game and Fish Department, Cheyenne, Wyoming and the U.S. Geological Survey, Fort Collins, Colorado. August 20, 2010.

Predictor Variables used in the Distribution Model

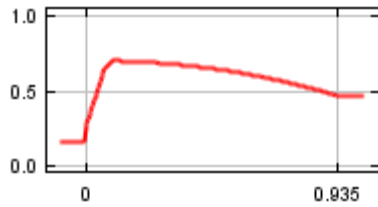
Percent Contribution (PC) to final model

<i>Environmental Variable</i>	<i>PC</i>
Conifer Index	32
Radiation of the lightest month	26
Interannual variation in annual frost days	13
Variation in monthly radiation	11
Deciduous Forest Index	11
Relative Humidity of least humid month	7

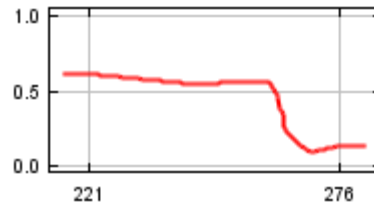
Response Curves

Each curve shows dependence of predicted suitability on input values of a single predictor variable considering correlations with others. Suitability is on the vertical axis (units: probability). Variable values are on the horizontal axis (units based on inputs; see Keinath et al 2010b for details).

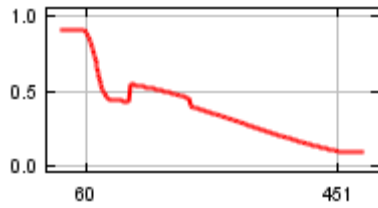
Conifer Index



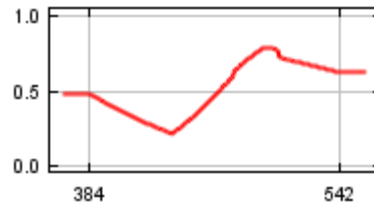
Radiation of the lightest month



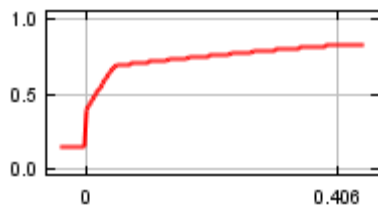
Interannual variation in annual frost days



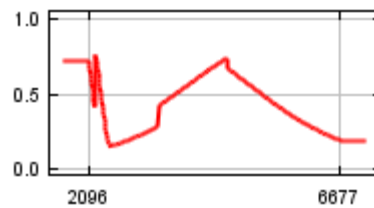
Variation in monthly radiation



Deciduous Forest Index



Relative Humidity of least humid month

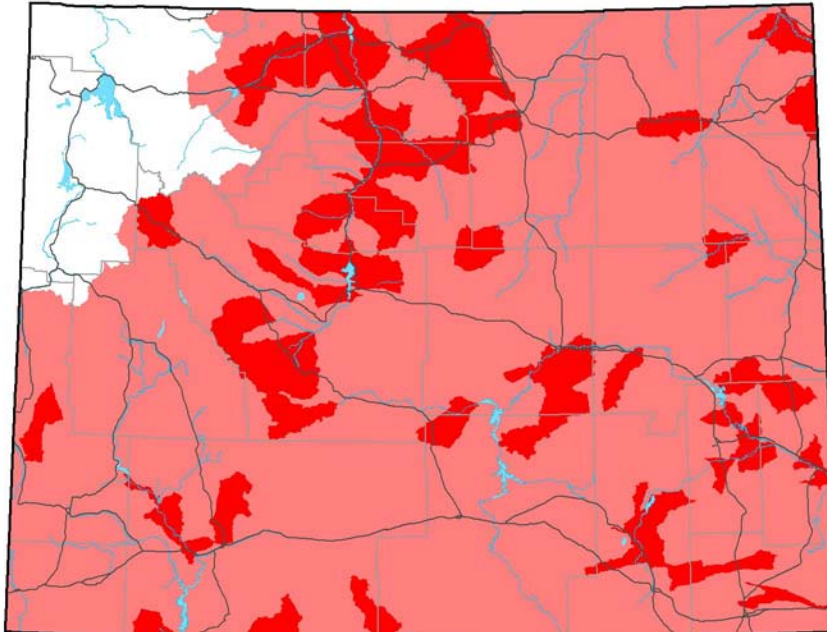


Western Small-footed Myotis (*Myotis ciliolabrum*) Range Map and Distribution Model Summary

August 20, 2010

This report presents range and distribution of Western Small-footed Myotis (AMACC01140) in Wyoming (see Keinath et al. 2010b). Similar reports were developed by the Wyoming Natural Diversity Database for terrestrial vertebrate species of conservation need in Wyoming's State Wildlife Action Plan. This effort was supported by the Wyoming Game and Fish Department and the U.S. Geological Survey.

Range Map - Occupancy

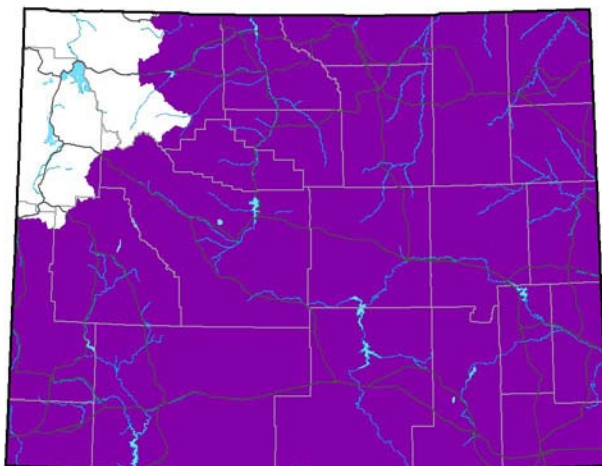


Known Suspected Accidental Historical

Range Notes

- Version: 2010-01-19
- Proportion of range deemed known based on documented occurrences: 0.138
- Details of range map creation noted in Keinath et al. (2010a).

Range Map - Seasonality



Year-Round Summer Winter Spring/Fall

Maps, models and report were created by and are available from the Wyoming Natural Diversity Database. (<http://uwadmweb.uwyo.edu/wyndd/>).

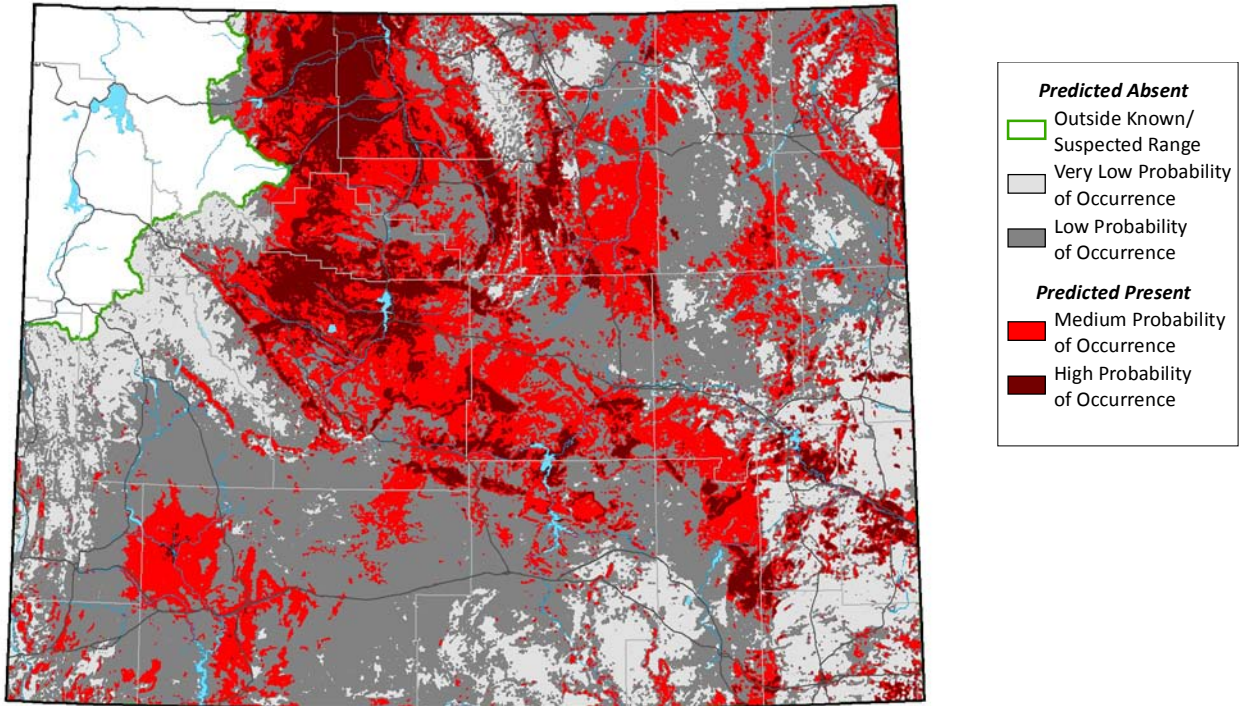
Doug Keinath, Senior Zoologist

Mark Andersen, GIS Specialist

© 2010, WYNDD

Distribution Model (Version: Wed Apr 21 21:59:47 MDT 2010)

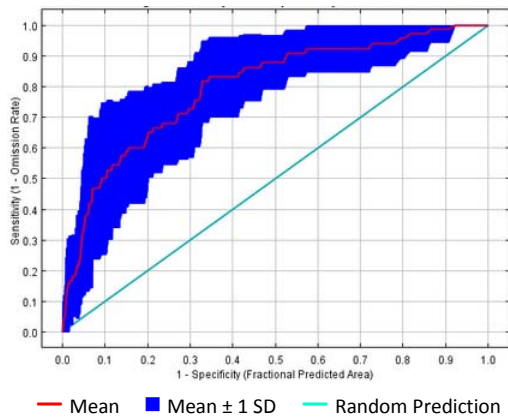
Details of distribution model creation are presented in Keinath et al. (2010b)



Model Parameters

- Season Modeled: Breeding (1-May- 25-Aug)
- Algorithm: Maxent version 3.3.1
- Feature Types: Linear, Quadratic, Hinge
- Binary Threshold Rule: Maximum training sensitivity plus specificity
- Binary Threshold Value: 0.2817920
- High-Probability Threshold Value: 0.5752826
- Low-Probability Threshold Value: 0.0782366

Model Evaluation - ROC Plot



Model Quality Summary

Overall Assessment of Model Quality:
MEDIUM

- Expert Assessment: Medium
- Occurrence Sample Size: Medium-High
- Quality of Occurrences: Medium
- Positive Success Rate: Low
- Test AUC and Model Gain: Medium

Model Evaluation Statistics

Final Model Statistics

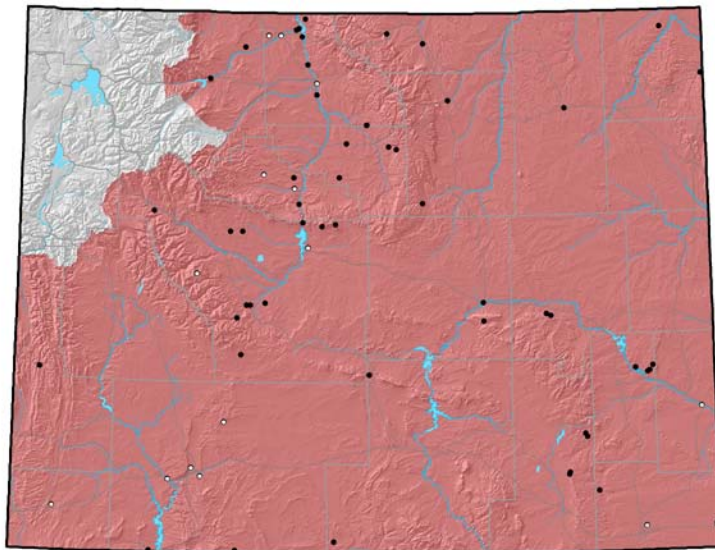
- Training AUC: 0.841
- Regularized Training Gain: 0.796

Cross-Validation Statistics

- Average Test AUC: 0.798 ± 0.076
- Upper Bound on Test AUC: 0.812
- Average Test Gain: 0.654 ± 0.506
- Omission Error (fraction of test points omitted during 10-fold cross validation): 0.32 ± 0.18

Occurrence Data for Distribution Model

Occurrence Map



Points Used in Modeling, by Year of Observation

- Pre-1985
- 1985 or Later

Known and Suspected Range

Occurrence Summary Statistics

- Number of Occurrences in AWVED master dataset: 281
- Number of Occurrences used to create distribution model: 66
- Average Point Quality Index (highest quality is 12.00): 7.39 ± 2.58
- Most recent occurrence used: 2007
- Oldest occurrence used: 1937
- Occurrence File:
LOCAL_SAMPLE_POINTS.csv

Comments

Bat distributions are more difficult to model than those of other species, because bats require unique features (e.g., roost sites and hibernacula) for which complete statewide maps are not available.

Therefore, bat distribution models should be viewed as hypothetical predictions of where the species could occur if such features are present.

References

- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010a. Range maps for Wyoming's species of greatest conservation need. Report prepared for the Wyoming Game and Fish Department by the Wyoming Natural Diversity Database, Laramie, Wyoming. January 19, 2010.
- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010b. Range and modeled distribution of Wyoming's species of greatest conservation need. Report prepared by the Wyoming Natural Diversity Database, Laramie Wyoming for the Wyoming Game and Fish Department, Cheyenne, Wyoming and the U.S. Geological Survey, Fort Collins, Colorado. August 20, 2010.

Predictor Variables used in the Distribution Model

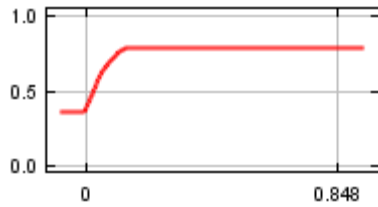
Percent Contribution (PC) to final model

<i>Environmental Variable</i>	<i>PC</i>
Pinon-Juniper Index	39
Variation of monthly precipitation	31
Relative Humidity of least humid month	13
Herbaceous Cover Index	10
Shrub Cover Index	5
Wettest quarter mean temperature	1

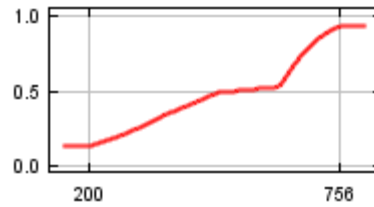
Response Curves

Each curve shows dependence of predicted suitability on input values of a single predictor variable considering correlations with others. Suitability is on the vertical axis (units: probability). Variable values are on the horizontal axis (units based on inputs; see Keinath et al 2010b for details).

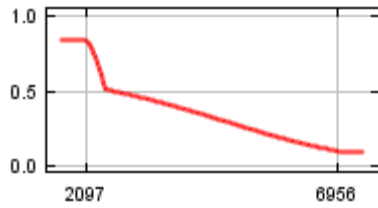
Pinon-Juniper Index



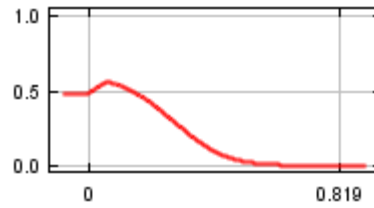
Variation of monthly precipitation



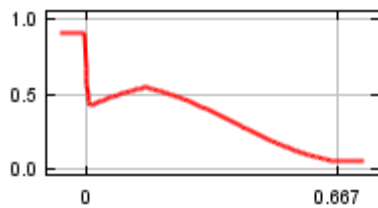
Relative Humidity of least humid month



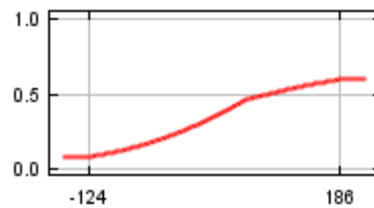
Herbaceous Cover Index



Shrub Cover Index



Wettest quarter mean temperature

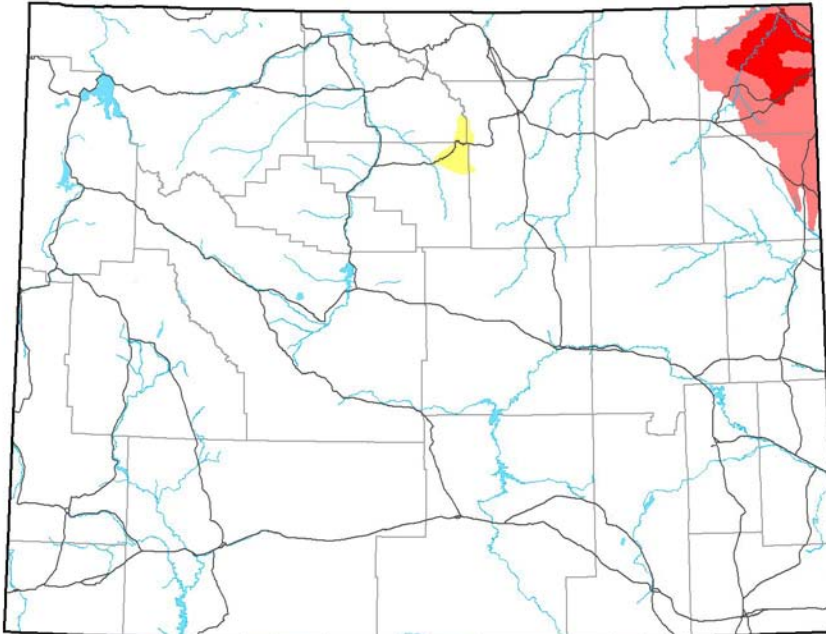


Northern Myotis (*Myotis septentrionalis*) Range Map and Distribution Model Summary

August 20, 2010

This report presents range and distribution of Northern Myotis (AMACC01150) in Wyoming (see Keinath et al. 2010b). Similar reports were developed by the Wyoming Natural Diversity Database for terrestrial vertebrate species of conservation need in Wyoming's State Wildlife Action Plan. This effort was supported by the Wyoming Game and Fish Department and the U.S. Geological Survey.

Range Map - Occupancy

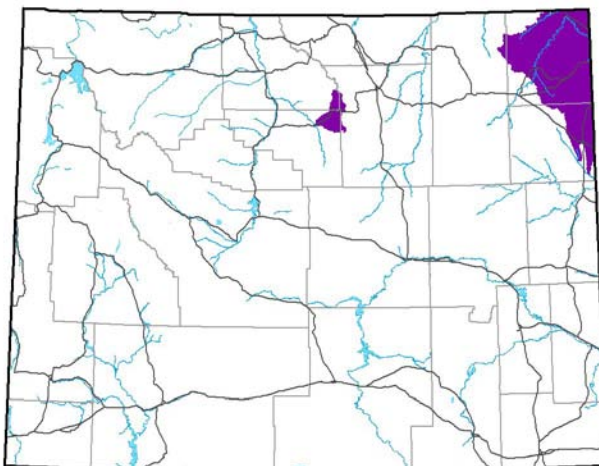


Known Suspected Accidental Historical

Range Notes

- Version: 2010-01-19
- Proportion of range deemed known based on documented occurrences: 0.200
- Details of range map creation noted in Keinath et al. (2010a).

Range Map - Seasonality



Year-Round Summer Winter Spring/Fall

Maps, models and report were created by and are available from the Wyoming Natural Diversity Database. (<http://uwadmnweb.uwyo.edu/wyndd/>).

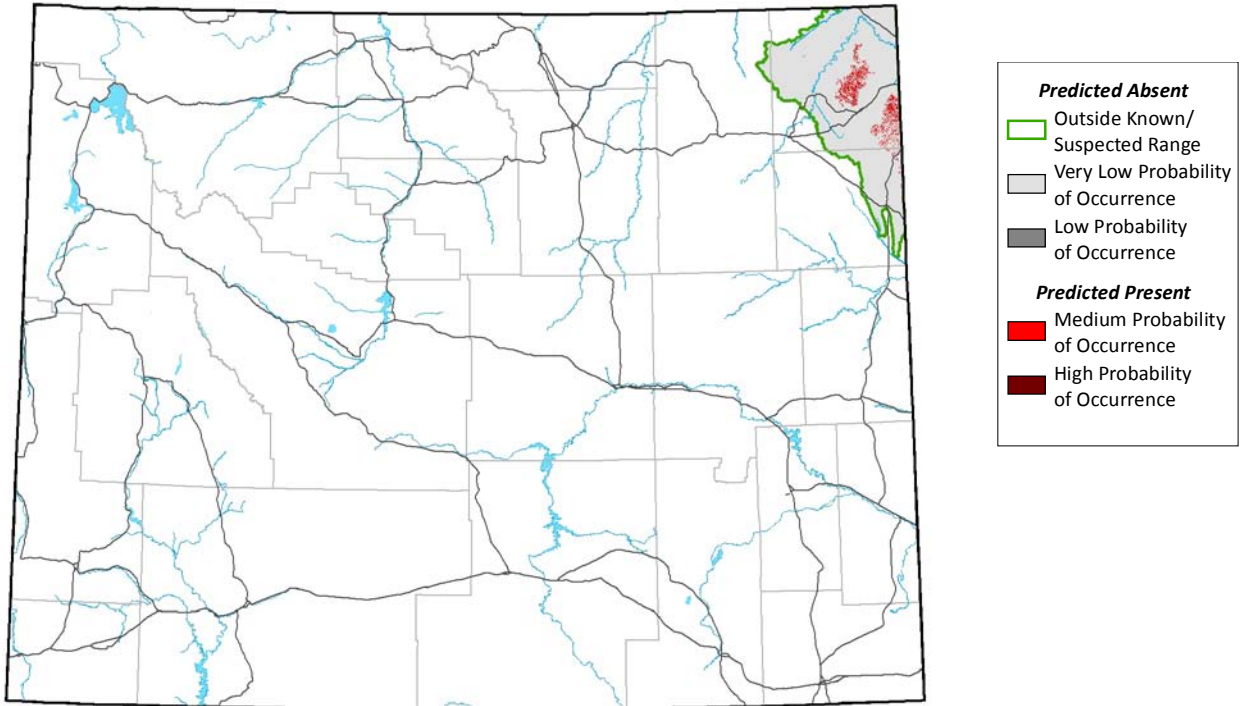
Doug Keinath, Senior Zoologist

Mark Andersen, GIS Specialist

© 2010, WYNDD

Distribution Model (Version: Fri Dec 04 10:10:00 MST 2009)

Details of distribution model creation are presented in Keinath et al. (2010b)



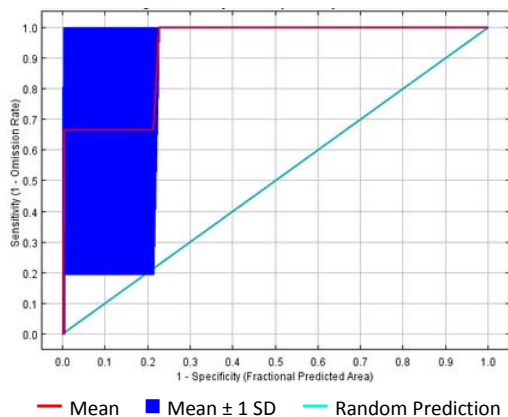
Model Parameters

- Season Modeled: Breeding (1-May- 25-Aug)
- Algorithm: Maxent version 3.3.1
- Feature Types: Linear
- Binary Threshold Rule: Maximum training sensitivity plus specificity
- Binary Threshold Value: 0.4700590
- High-Probability Threshold Value: 0.7445595
- Low-Probability Threshold Value: 0.4700590

Model Quality Summary

Overall Assessment of Model Quality: LOW
 Expert Assessment: Low
 Occurrence Sample Size: Very Low
 Quality of Occurrences: High
 Positive Success Rate: Very High
 Test AUC and Model Gain: Low

Model Evaluation - ROC Plot



Model Evaluation Statistics

Final Model Statistics

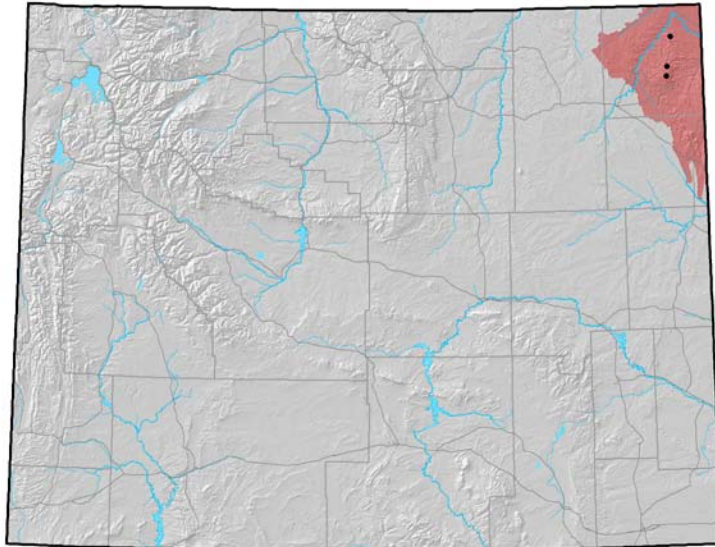
Training AUC: 0.998
 Regularized Training Gain: 4.320

Cross-Validation Statistics

- Average Test AUC: 0.277 ± 0.450
- Upper Bound on Test AUC: 0.989
- Average Test Gain: 0.062 ± 3.708
- Omission Error (fraction of test points omitted during 3-fold cross validation): 0.00± 0.00

Occurrence Data for Distribution Model

Occurrence Map



Points Used in Modeling, by Year of Observation

- Pre-1985
- 1985 or Later

■ Known and Suspected Range

Occurrence Summary Statistics

- Number of Occurrences in AWVED master dataset: 5
- Number of Occurrences used to create distribution model: 3
- Average Point Quality Index (highest quality is 12.00): 8.67 ± 2.89
- Most recent occurrence used: 2007
- Oldest occurrence used: 1994
- Occurrence File:
LOCAL_SAMPLE_POINTS.csv

Comments

Bat distributions are more difficult to model than those of other species, because bats require unique features (e.g., roost sites and hibernacula) for which complete statewide maps are not available. Therefore, bat distribution models should be viewed as hypothetical predictions of where the species could occur if such features are present. The model for this species is based on a small sample size of occurrence locations, which often results in low model quality. Collection of additional, high-quality occurrence locations could greatly improve the modeled distribution for this species.

References

- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010a. Range maps for Wyoming's species of greatest conservation need. Report prepared for the Wyoming Game and Fish Department by the Wyoming Natural Diversity Database, Laramie, Wyoming. January 19, 2010.
- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010b. Range and modeled distribution of Wyoming's species of greatest conservation need. Report prepared by the Wyoming Natural Diversity Database, Laramie Wyoming for the Wyoming Game and Fish Department, Cheyenne, Wyoming and the U.S. Geological Survey, Fort Collins, Colorado. August 20, 2010.

Predictor Variables used in the Distribution Model

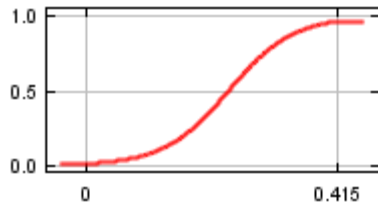
Percent Contribution (PC) to final model

<i>Environmental Variable</i>	<i>PC</i>
Deciduous Forest Index	58
Isothermality (T2/T5)	12
Precipitation of the warmest quarter	11
Depth to Shallowest Restrictive Layer	10
Percent Forest Cover	7
Sagebrush Index	3

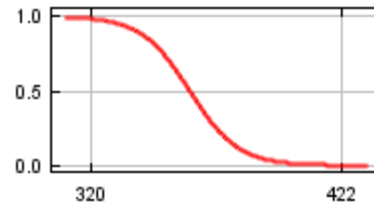
Response Curves

Each curve shows dependence of predicted suitability on input values of a single predictor variable considering correlations with others. Suitability is on the vertical axis (units: probability). Variable values are on the horizontal axis (units based on inputs; see Keinath et al 2010b for details).

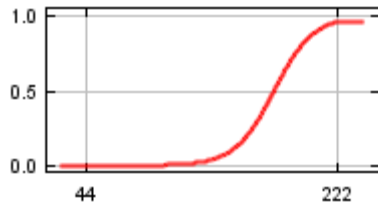
Deciduous Forest Index



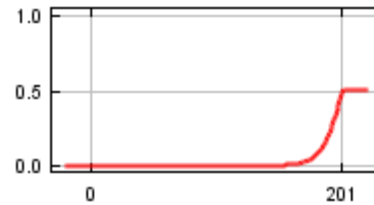
Isothermality (T2/T5)



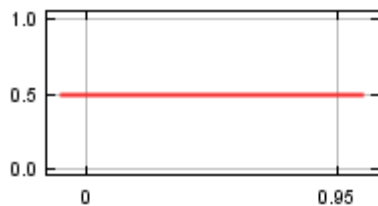
Precipitation of the warmest quarter



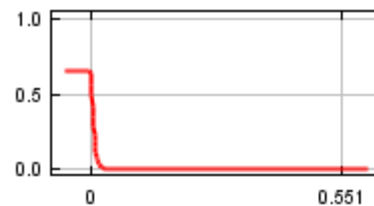
Depth to Shallowest Restrictive Layer



Percent Forest Cover



Sagebrush Index

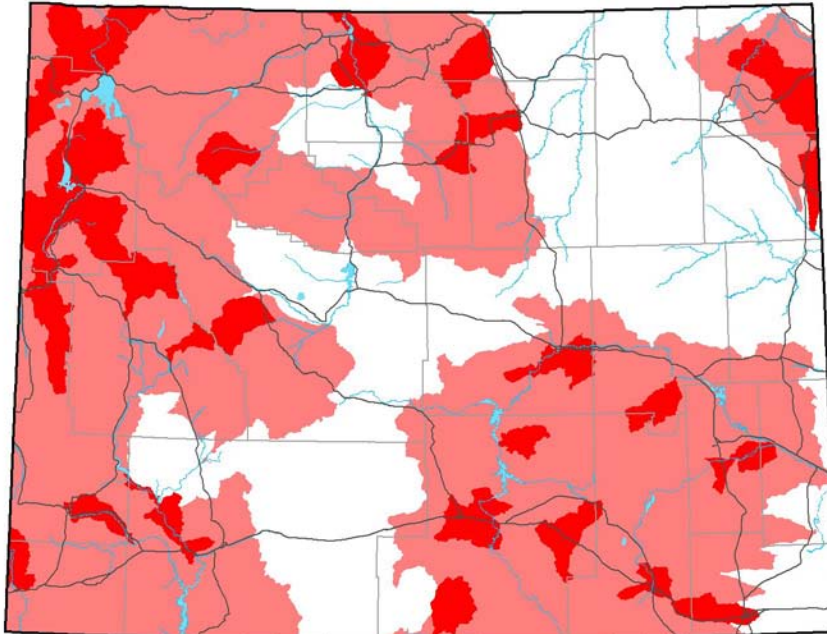


Silver-haired Bat (*Lasionycteris noctivagans*) Range Map and Distribution Model Summary

August 20, 2010

This report presents range and distribution of Silver-haired Bat (AMACC02010) in Wyoming (see Keinath et al. 2010b). Similar reports were developed by the Wyoming Natural Diversity Database for terrestrial vertebrate species of conservation need in Wyoming's State Wildlife Action Plan. This effort was supported by the Wyoming Game and Fish Department and the U.S. Geological Survey.

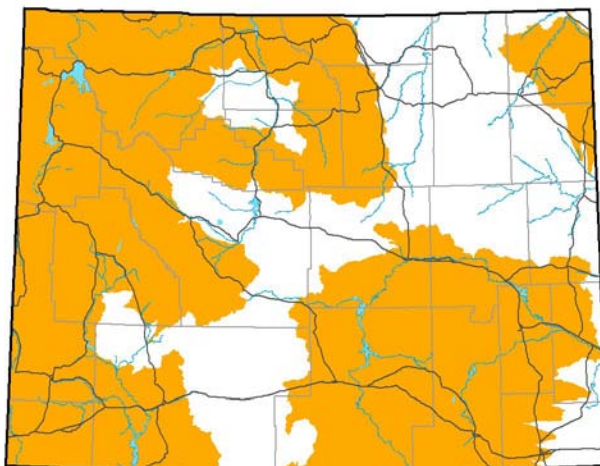
Range Map - Occupancy



Range Notes

- Version: 2010-01-19
- Proportion of range deemed known based on documented occurrences: 0.154
- Details of range map creation noted in Keinath et al. (2010a).

Range Map - Seasonality



Maps, models and report were created by and are available from the Wyoming Natural Diversity Database. (<http://uwadmnweb.uwyo.edu/wyndd/>).

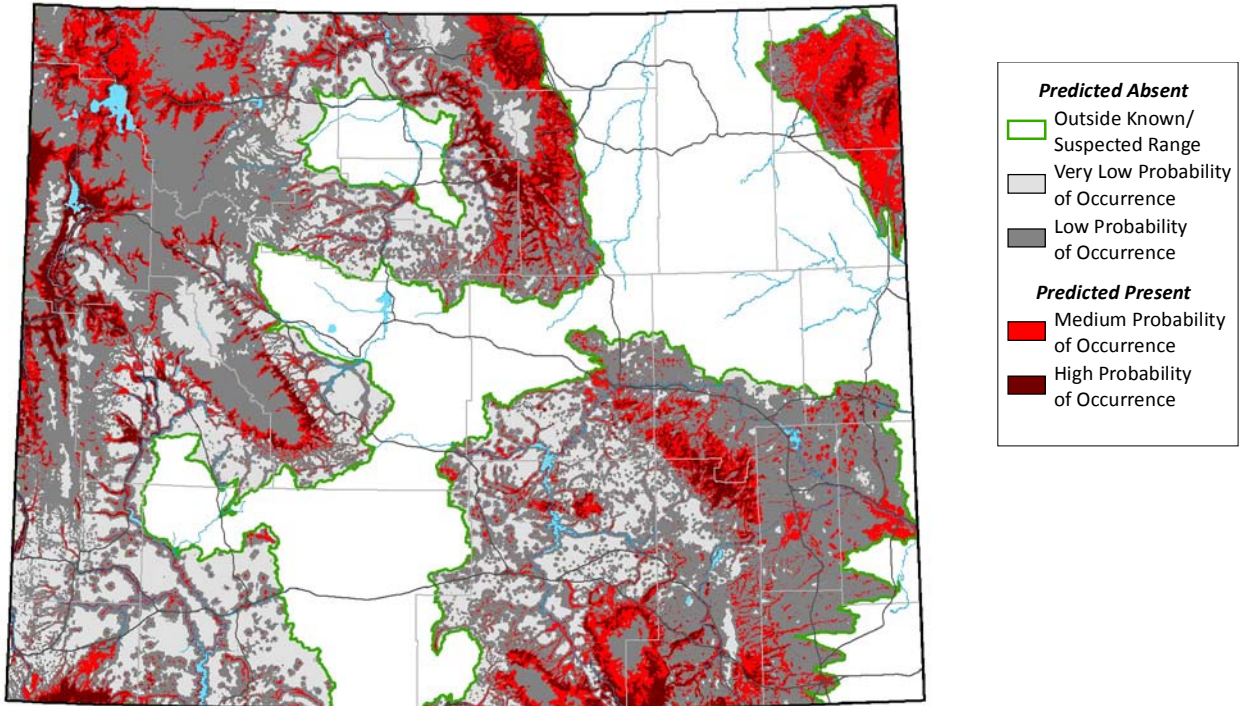
Doug Keinath, Senior Zoologist

Mark Andersen, GIS Specialist

© 2010, WYNDD

Distribution Model (Version: Thu Apr 08 15:36:19 MDT 2010)

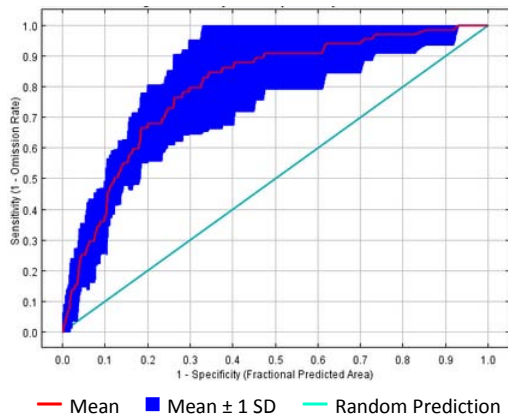
Details of distribution model creation are presented in Keinath et al. (2010b)



Model Parameters

- Season Modeled: Breeding (1-May- 25-Aug)
- Algorithm: Maxent version 3.3.1
- Feature Types: Linear, Product
- Binary Threshold Rule: Maximum training sensitivity plus specificity
- Binary Threshold Value: 0.3651160
- High-Probability Threshold Value: 0.5502134
- Low-Probability Threshold Value: 0.0344098

Model Evaluation - ROC Plot



Model Quality Summary

Overall Assessment of Model Quality:

MEDIUM

- Expert Assessment: Medium
- Occurrence Sample Size: Medium-High
- Quality of Occurrences: High
- Positive Success Rate: Medium
- Test AUC and Model Gain: Medium

Model Evaluation Statistics

Final Model Statistics

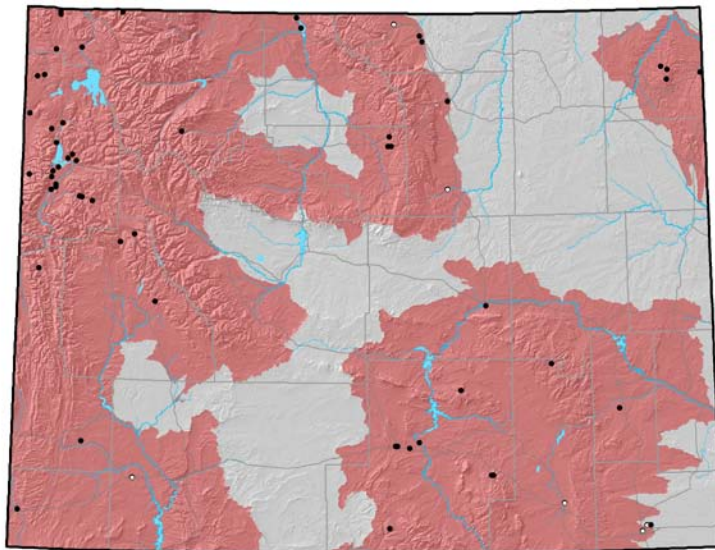
- Training AUC: 0.825
- Regularized Training Gain: 0.637

Cross-Validation Statistics

- Average Test AUC: 0.801 ± 0.078
- Upper Bound on Test AUC: 0.796
- Average Test Gain: 0.479 ± 0.492
- Omission Error (fraction of test points omitted during 10-fold cross validation): 0.27 ± 0.17

Occurrence Data for Distribution Model

Occurrence Map



Points Used in Modeling, by Year of Observation

- Pre-1985
- 1985 or Later

Known and Suspected Range

Occurrence Summary Statistics

- Number of Occurrences in AWVED master dataset: 260
- Number of Occurrences used to create distribution model: 63
- Average Point Quality Index (highest quality is 12.00): 7.92 ± 3.57
- Most recent occurrence used: 2007
- Oldest occurrence used: 1897
- Occurrence File:
DRAFT_3_SAGE_WATER_RERUNS.csv

Comments

Bat distributions are more difficult to model than those of other species, because bats require unique features (e.g., roost sites and hibernacula) for which complete statewide maps are not available.

Therefore, bat distribution models should be viewed as hypothetical predictions of where the species could occur if such features are present.

References

- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010a. Range maps for Wyoming's species of greatest conservation need. Report prepared for the Wyoming Game and Fish Department by the Wyoming Natural Diversity Database, Laramie, Wyoming. January 19, 2010.
- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010b. Range and modeled distribution of Wyoming's species of greatest conservation need. Report prepared by the Wyoming Natural Diversity Database, Laramie Wyoming for the Wyoming Game and Fish Department, Cheyenne, Wyoming and the U.S. Geological Survey, Fort Collins, Colorado. August 20, 2010.

Predictor Variables used in the Distribution Model

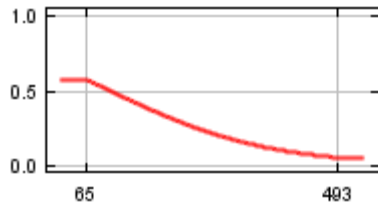
Percent Contribution (PC) to final model

<i>Environmental Variable</i>	<i>PC</i>
Interannual variation in annual frost days	33
Distance to Permanent Water	23
Shrub Cover Index	18
Conifer Index	12
Percent Cover of sagebrush	7
Contagion Index	7

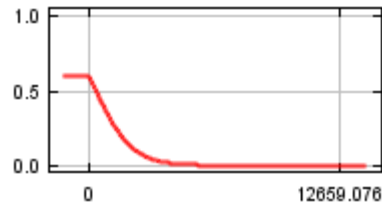
Response Curves

Each curve shows dependence of predicted suitability on input values of a single predictor variable considering correlations with others. Suitability is on the vertical axis (units: probability). Variable values are on the horizontal axis (units based on inputs; see Keinath et al 2010b for details).

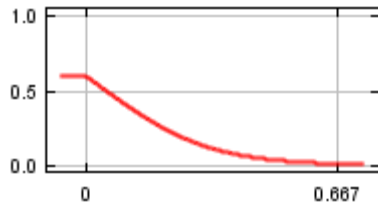
Interannual variation in annual frost days



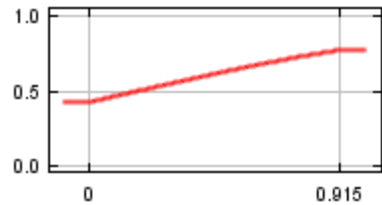
Distance to Permanent Water



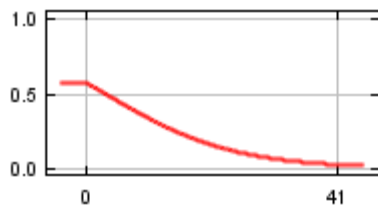
Shrub Cover Index



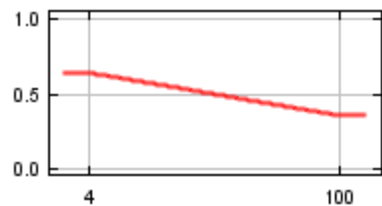
Conifer Index



Percent Cover of sagebrush



Contagion Index

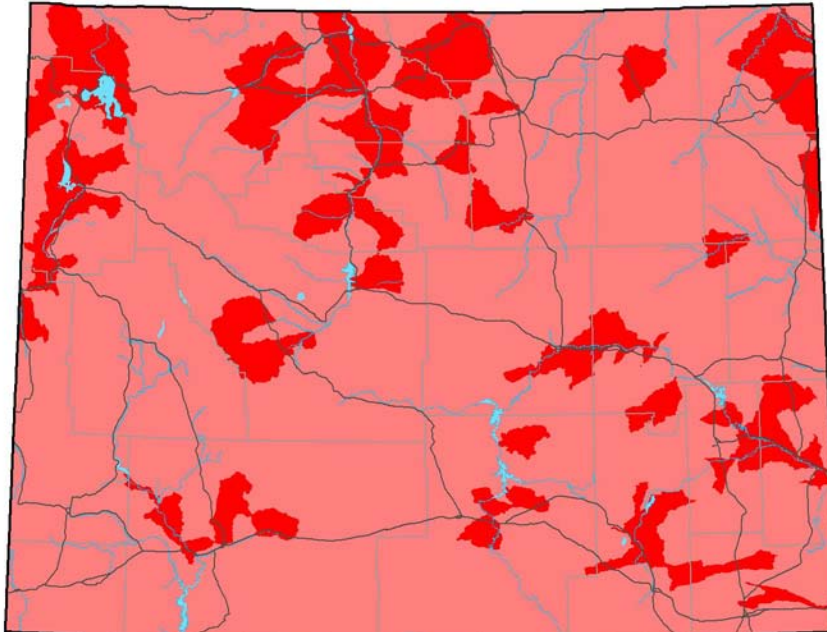


Big Brown Bat (*Eptesicus fuscus*) Range Map and Distribution Model Summary

August 20, 2010

This report presents range and distribution of Big Brown Bat (AMACC04010) in Wyoming (see Keinath et al. 2010b). Similar reports were developed by the Wyoming Natural Diversity Database for terrestrial vertebrate species of conservation need in Wyoming's State Wildlife Action Plan. This effort was supported by the Wyoming Game and Fish Department and the U.S. Geological Survey.

Range Map - Occupancy

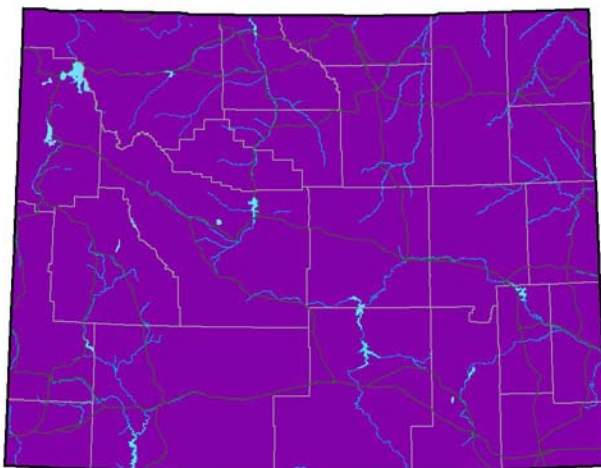


■ Known ■ Suspected ■ Accidental ■ Historical

Range Notes

- Version: 2010-01-19
- Proportion of range deemed known based on documented occurrences: 0.137
- Details of range map creation noted in Keinath et al. (2010a).

Range Map - Seasonality



■ Year-Round ■ Summer ■ Winter ■ Spring/Fall

Maps, models and report were created by and are available from the Wyoming Natural Diversity Database. (<http://uwadmnweb.uwyo.edu/wyndd/>).

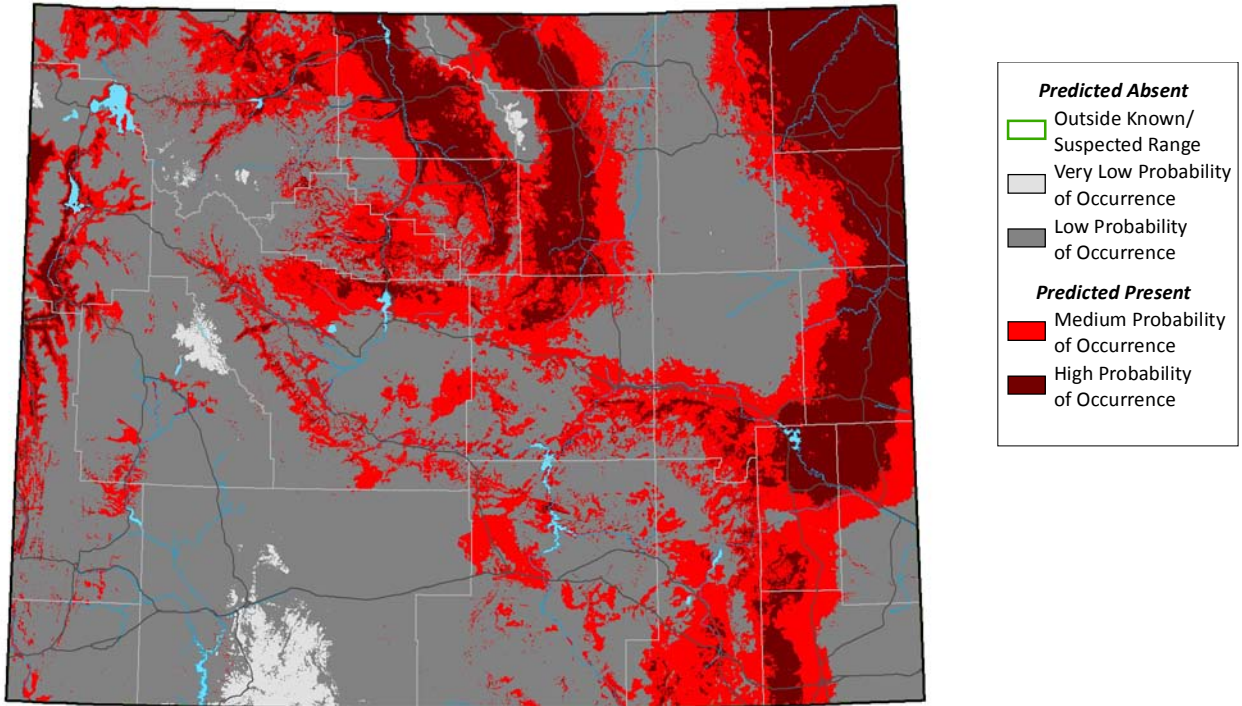
Doug Keinath, Senior Zoologist

Mark Andersen, GIS Specialist

© 2010, WYNDD

Distribution Model (Version: Wed Mar 17 07:06:11 MDT 2010)

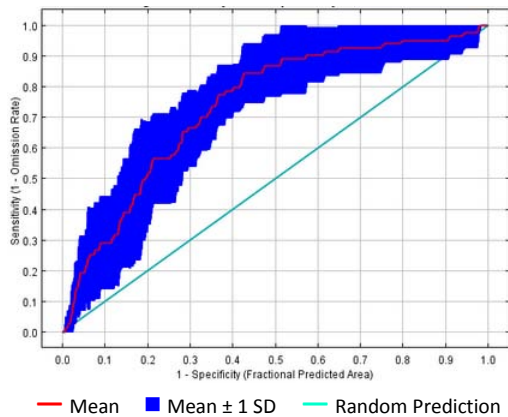
Details of distribution model creation are presented in Keinath et al. (2010b)



Model Parameters

- Season Modeled: Breeding (1-May- 30-Sep)
- Algorithm: Maxent version 3.3.1
- Feature Types: Linear, Product
- Binary Threshold Rule: Maximum training sensitivity plus specificity
- Binary Threshold Value: 0.3751490
- High-Probability Threshold Value: 0.5442343
- Low-Probability Threshold Value: 0.0295718

Model Evaluation - ROC Plot



Model Quality Summary

Overall Assessment of Model Quality:

MEDIUM

- Expert Assessment: Medium
- Occurrence Sample Size: Medium-High
- Quality of Occurrences: Medium
- Positive Success Rate: Medium
- Test AUC and Model Gain: Low

Model Evaluation Statistics

Final Model Statistics

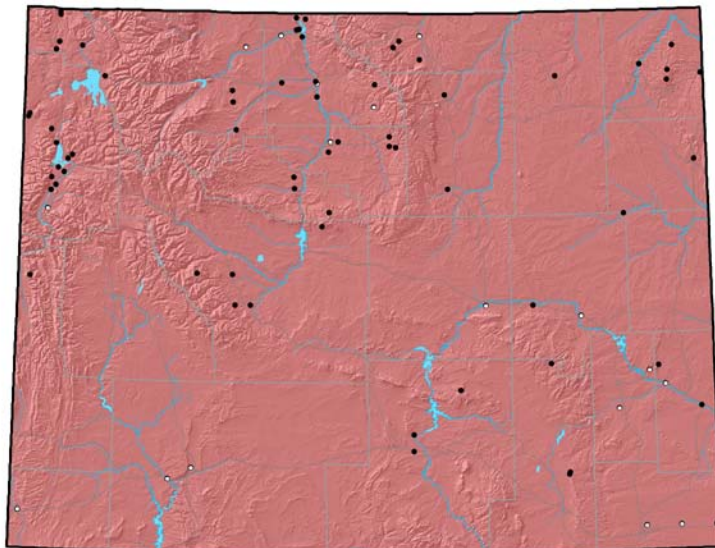
- Training AUC: 0.772
- Regularized Training Gain: 0.409

Cross-Validation Statistics

- Average Test AUC: 0.738 ± 0.069
- Upper Bound on Test AUC: 0.743
- Average Test Gain: 0.280 ± 0.323
- Omission Error (fraction of test points omitted during 10-fold cross validation): 0.26 ± 0.15

Occurrence Data for Distribution Model

Occurrence Map



Points Used in Modeling, by Year of Observation

- Pre-1985
- 1985 or Later

Known and Suspected Range

Occurrence Summary Statistics

- Number of Occurrences in AWVED master dataset: 343
- Number of Occurrences used to create distribution model: 83
- Average Point Quality Index (highest quality is 12.00): 6.94 ± 3.37
- Most recent occurrence used: 2007
- Oldest occurrence used: 1973
- Occurrence File:
LOCAL_SAMPLE_POINTS_W_PD OG_2.
csv

Comments

Bat distributions are more difficult to model than those of other species, because bats require unique features (e.g., roost sites and hibernacula) for which complete statewide maps are not available.

Therefore, bat distribution models should be viewed as hypothetical predictions of where the species could occur if such features are present.

References

- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010a. Range maps for Wyoming's species of greatest conservation need. Report prepared for the Wyoming Game and Fish Department by the Wyoming Natural Diversity Database, Laramie, Wyoming. January 19, 2010.
- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010b. Range and modeled distribution of Wyoming's species of greatest conservation need. Report prepared by the Wyoming Natural Diversity Database, Laramie Wyoming for the Wyoming Game and Fish Department, Cheyenne, Wyoming and the U.S. Geological Survey, Fort Collins, Colorado. August 20, 2010.

Predictor Variables used in the Distribution Model

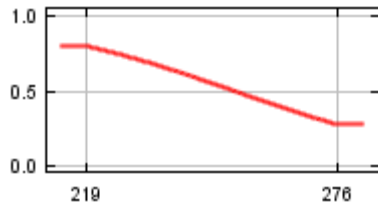
Percent Contribution (PC) to final model

<i>Environmental Variable</i>	<i>PC</i>
Radiation of the lightest month	43
Distance to Cave-forming Formations	26
Interannual variation in annual frost days	13
Shrub Cover Index	7
Relative Humidity of least humid month	7
Vector Ruggedness Measure	3

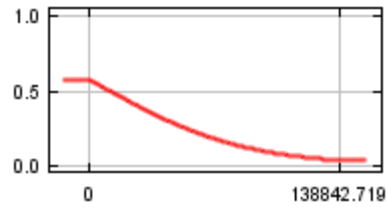
Response Curves

Each curve shows dependence of predicted suitability on input values of a single predictor variable considering correlations with others. Suitability is on the vertical axis (units: probability). Variable values are on the horizontal axis (units based on inputs; see Keinath et al 2010b for details).

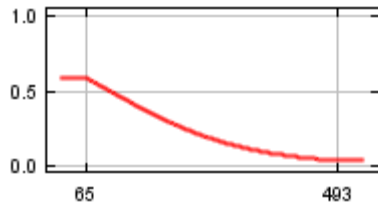
Radiation of the lightest month



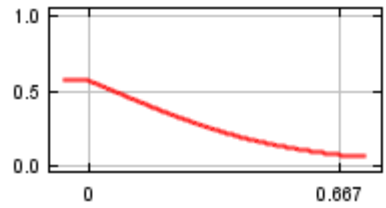
Distance to Cave-forming Formations



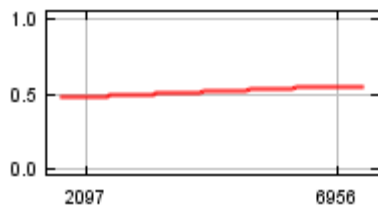
Interannual variation in annual frost days



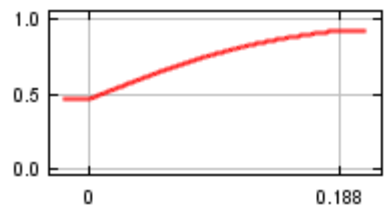
Shrub Cover Index



Relative Humidity of least humid month



Vector Ruggedness Measure

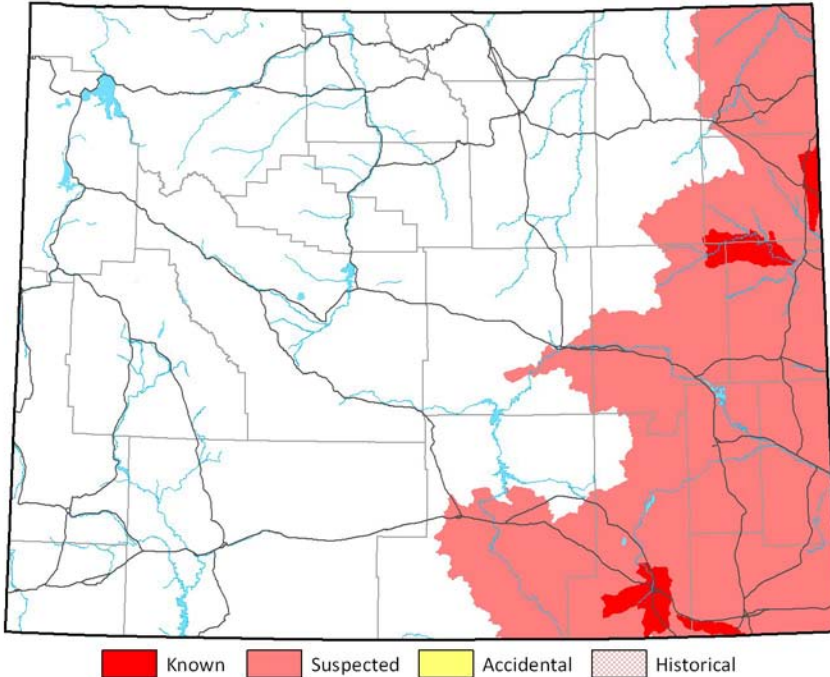


Eastern Red Bat (*Lasiurus borealis*) Range Map and Distribution Model Summary

August 20, 2010

This report presents range and distribution of Eastern Red Bat (AMACC05010) in Wyoming (see Keinath et al. 2010b). Similar reports were developed by the Wyoming Natural Diversity Database for terrestrial vertebrate species of conservation need in Wyoming's State Wildlife Action Plan. This effort was supported by the Wyoming Game and Fish Department and the U.S. Geological Survey.

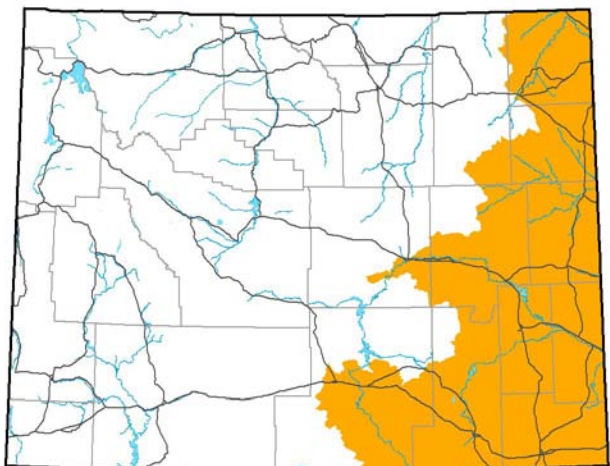
Range Map - Occupancy



Range Notes

- Version: 2010-01-19
- Proportion of range deemed known based on documented occurrences: 0.049
- Details of range map creation noted in Keinath et al. (2010a).

Range Map - Seasonality



Maps, models and report were created by and are available from the Wyoming Natural Diversity Database. (<http://uwadmnweb.uwyo.edu/wyndd/>).

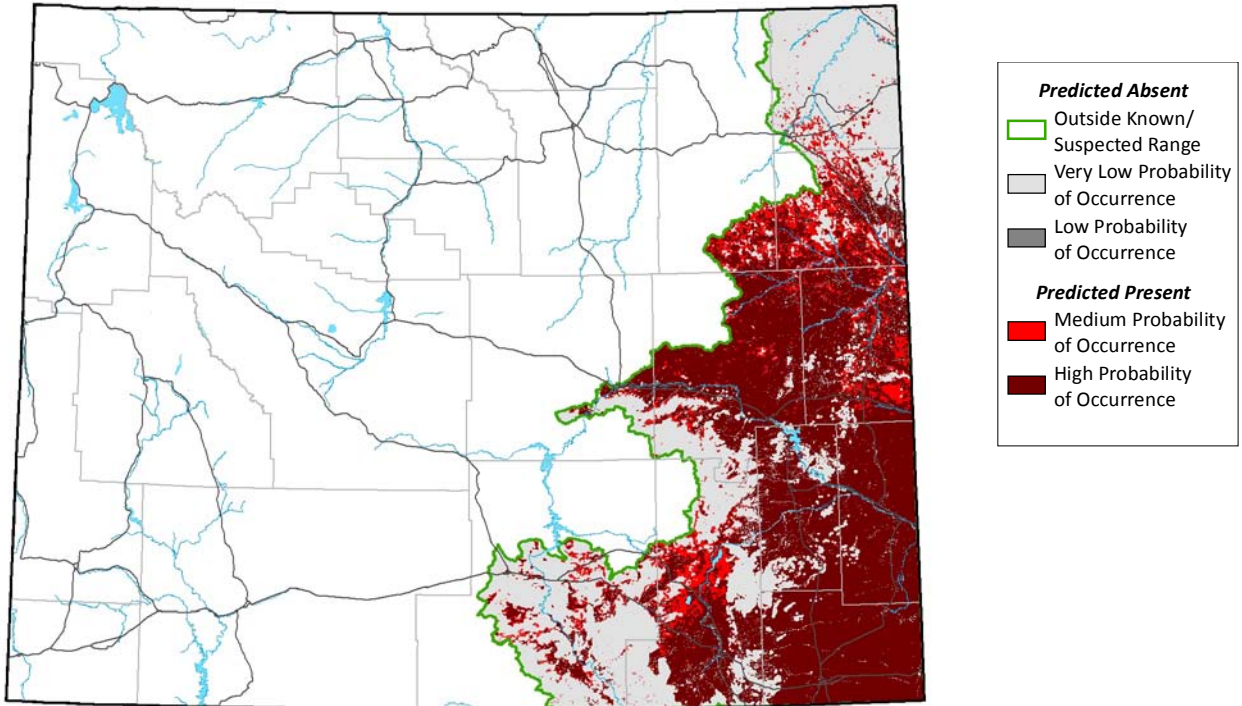
Doug Keinath, Senior Zoologist

Mark Andersen, GIS Specialist

© 2010, WYNDD

Distribution Model (Version: Thu Apr 22 13:55:55 MDT 2010)

Details of distribution model creation are presented in Keinath et al. (2010b)



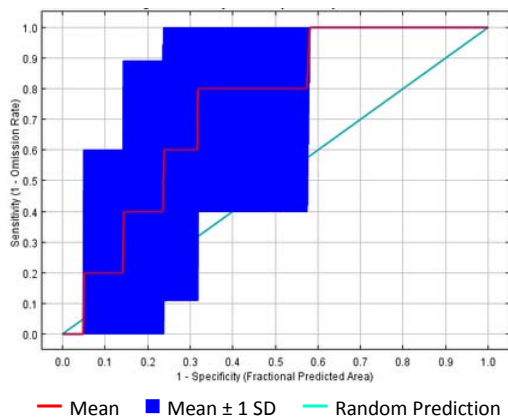
Model Parameters

- Season Modeled: Breeding (1-May- 25-Aug)
- Algorithm: Maxent version 3.3.1
- Feature Types: Linear
- Binary Threshold Rule: Maximum training sensitivity plus specificity
- Binary Threshold Value: 0.4691120
- High-Probability Threshold Value: 0.5053660
- Low-Probability Threshold Value: 0.4691120

Model Quality Summary

Overall Assessment of Model Quality: LOW
 Expert Assessment: Low
 Occurrence Sample Size: Very Low
 Quality of Occurrences: Low
 Positive Success Rate: Very High
 Test AUC and Model Gain: Low

Model Evaluation - ROC Plot



Model Evaluation Statistics

Final Model Statistics

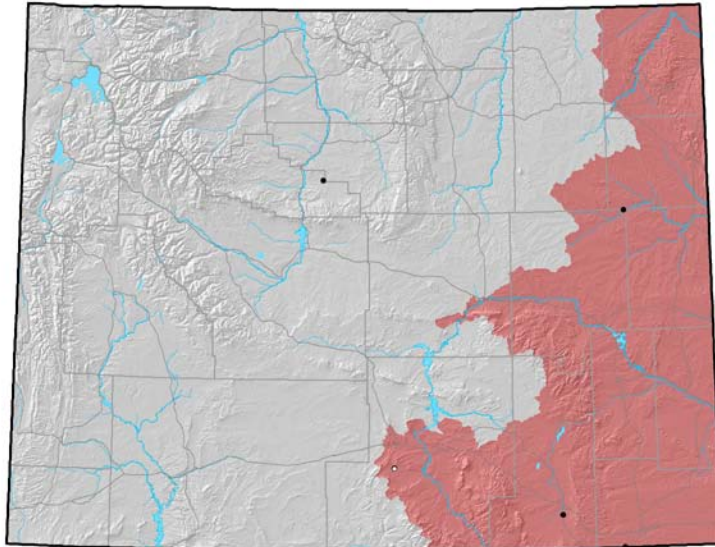
Training AUC: 0.871
 Regularized Training Gain: 0.502

Cross-Validation Statistics

- Average Test AUC: 0.367 ± 0.410
- Upper Bound on Test AUC: 0.757
- Average Test Gain: -1.550 ± 5.622
- Omission Error (fraction of test points omitted during 5-fold cross validation): 0.00± 0.00

Occurrence Data for Distribution Model

Occurrence Map



Points Used in Modeling, by Year of Observation

- Pre-1985
- 1985 or Later

Known and Suspected Range

Occurrence Summary Statistics

- Number of Occurrences in AWVED master dataset: 14
- Number of Occurrences used to create distribution model: 5
- Average Point Quality Index (highest quality is 12.00): 5.40 ± 1.67
- Most recent occurrence used: 2005
- Oldest occurrence used: 1981
- Occurrence File:
LOCAL_SAMPLE_POINTS_W_PD OG_2.CSV

Comments

Bat distributions are more difficult to model than those of other species, because bats require unique features (e.g., roost sites and hibernacula) for which complete statewide maps are not available. Therefore, bat distribution models should be viewed as hypothetical predictions of where the species could occur if such features are present. The model for this species is based on a small sample size of occurrence locations, which often results in low model quality. Collection of additional, high-quality occurrence locations could greatly improve the modeled distribution for this species.

References

- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010a. Range maps for Wyoming's species of greatest conservation need. Report prepared for the Wyoming Game and Fish Department by the Wyoming Natural Diversity Database, Laramie, Wyoming. January 19, 2010.
- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010b. Range and modeled distribution of Wyoming's species of greatest conservation need. Report prepared by the Wyoming Natural Diversity Database, Laramie Wyoming for the Wyoming Game and Fish Department, Cheyenne, Wyoming and the U.S. Geological Survey, Fort Collins, Colorado. August 20, 2010.

Predictor Variables used in the Distribution Model

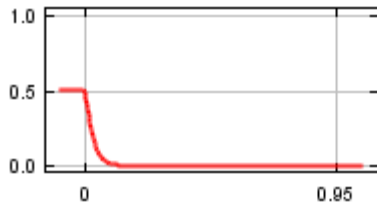
Percent Contribution (PC) to final model

<i>Environmental Variable</i>	<i>PC</i>
Percent Forest Cover	44
Pinon-Juniper Index	25
Coldest quarter mean temperature	14
Variation in monthly radiation	13
Contagion Index	3

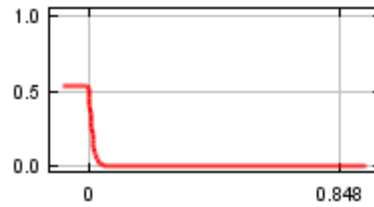
Response Curves

Each curve shows dependence of predicted suitability on input values of a single predictor variable considering correlations with others. Suitability is on the vertical axis (units: probability). Variable values are on the horizontal axis (units based on inputs; see Keinath et al 2010b for details).

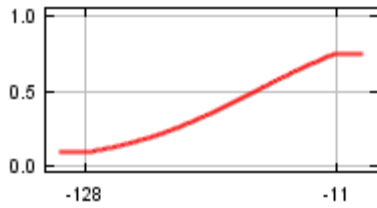
Percent Forest Cover



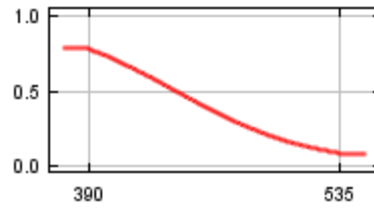
Pinon-Juniper Index



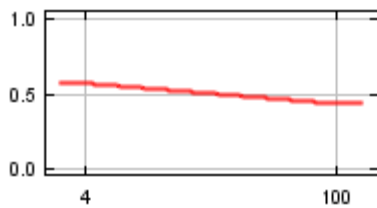
Coldest quarter mean temperature



Variation in monthly radiation



Contagion Index

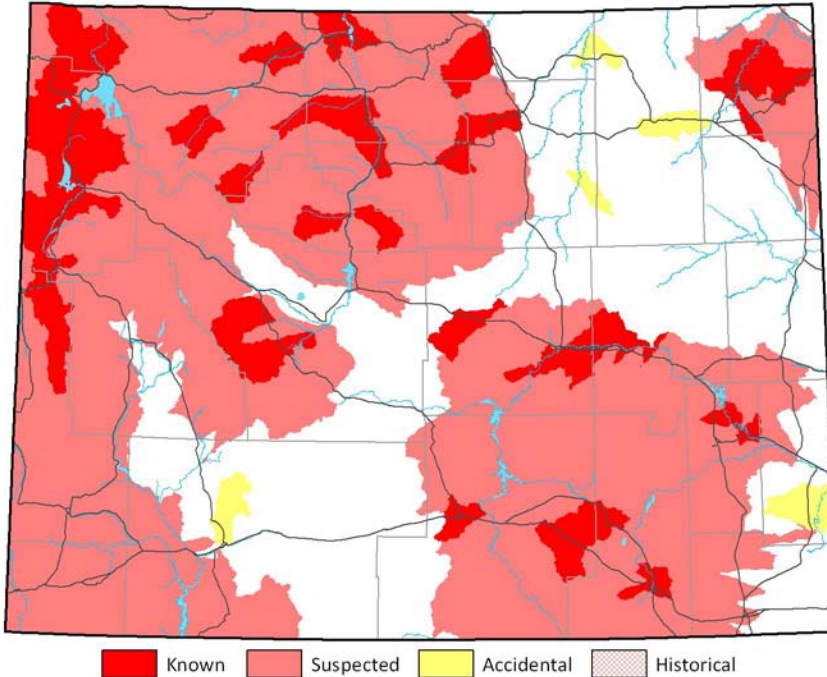


Hoary Bat (*Lasiurus cinereus*) Range Map and Distribution Model Summary

August 20, 2010

This report presents range and distribution of Hoary Bat (AMACC05030) in Wyoming (see Keinath et al. 2010b). Similar reports were developed by the Wyoming Natural Diversity Database for terrestrial vertebrate species of conservation need in Wyoming's State Wildlife Action Plan. This effort was supported by the Wyoming Game and Fish Department and the U.S. Geological Survey.

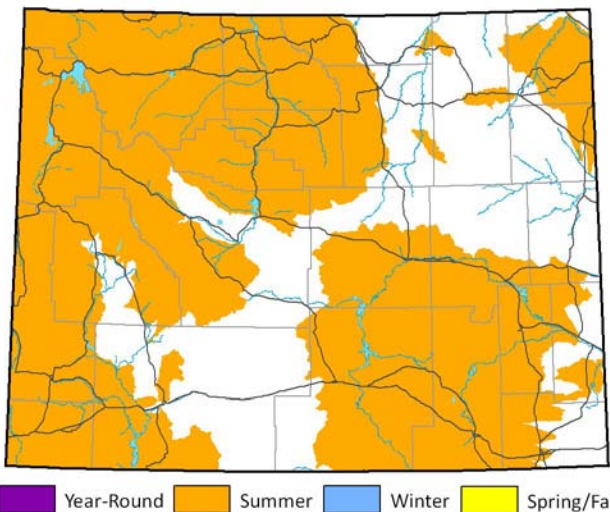
Range Map - Occupancy



Range Notes

- Version: 2010-01-19
- Proportion of range deemed known based on documented occurrences: 0.143
- Details of range map creation noted in Keinath et al. (2010a).

Range Map - Seasonality



Maps, models and report were created by and are available from the Wyoming Natural Diversity Database. (<http://uwadmnweb.uwyo.edu/wyndd/>).

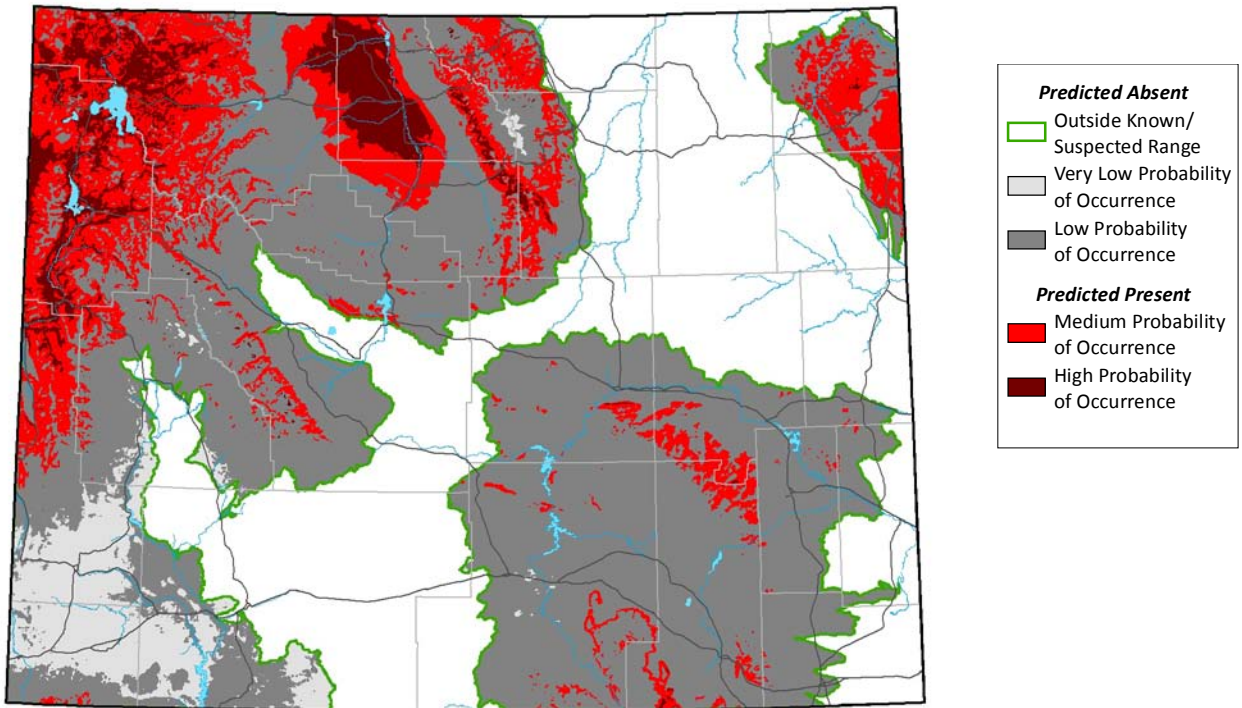
Doug Keinath, Senior Zoologist

Mark Andersen, GIS Specialist

© 2010, WYNDD

Distribution Model (Version: Wed Dec 09 14:25:44 MST 2009)

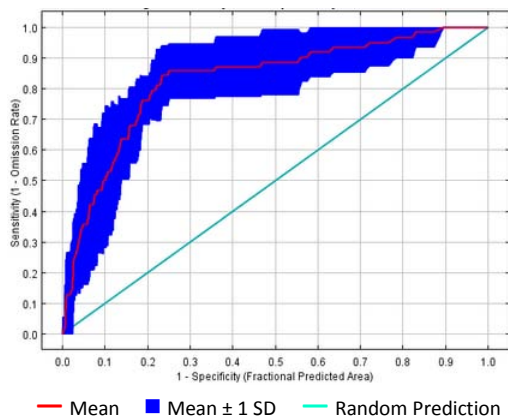
Details of distribution model creation are presented in Keinath et al. (2010b)



Model Parameters

- Season Modeled: Breeding (1-May- 25-Aug)
- Algorithm: Maxent version 3.3.1
- Feature Types: Linear, Quadratic, Hinge
- Binary Threshold Rule: Maximum training sensitivity plus specificity
- Binary Threshold Value: 0.3169890
- High-Probability Threshold Value: 0.6053731
- Low-Probability Threshold Value: 0.0273077

Model Evaluation - ROC Plot



Model Quality Summary

Overall Assessment of Model Quality:
MEDIUM

- Expert Assessment: Medium
- Occurrence Sample Size: Medium-High
- Quality of Occurrences: High
- Positive Success Rate: Medium
- Test AUC and Model Gain: Medium

Model Evaluation Statistics

Final Model Statistics

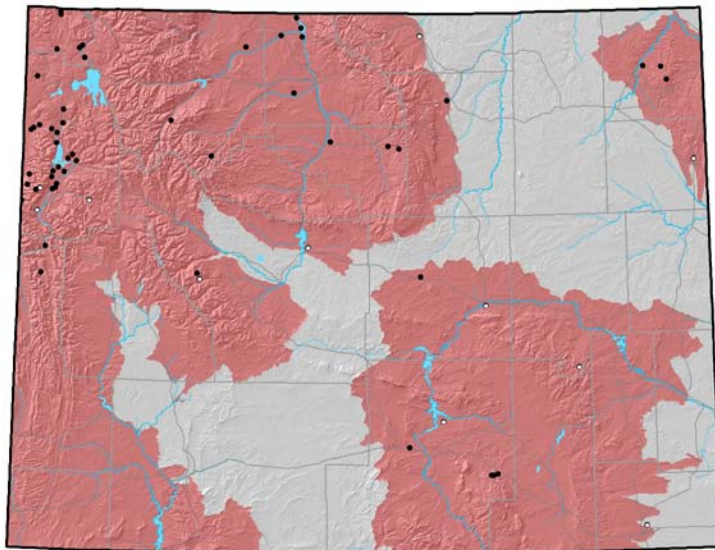
- Training AUC: 0.871
- Regularized Training Gain: 0.911

Cross-Validation Statistics

- Average Test AUC: 0.829 ± 0.063
- Upper Bound on Test AUC: 0.837
- Average Test Gain: 0.784 ± 0.414
- Omission Error (fraction of test points omitted during 10-fold cross validation): 0.24 ± 0.08

Occurrence Data for Distribution Model

Occurrence Map



Points Used in Modeling, by Year of Observation

- Pre-1985
- 1985 or Later

Known and Suspected Range

Occurrence Summary Statistics

- Number of Occurrences in AWVED master dataset: 138
- Number of Occurrences used to create distribution model: 63
- Average Point Quality Index (highest quality is 12.00): 8.81 ± 3.23
- Most recent occurrence used: 2007
- Oldest occurrence used: 1951
- Occurrence File:
LOCAL_SAMPLE_POINTS.csv

Comments

Hoary Bat is a wide-ranging and difficult to detect species, suggesting that it is under sampled in potentially suitable habitat and that the model might under predicts its actual distribution. Bat distributions are more difficult to model than those of other species, because bats require unique features (e.g., roost sites and hibernacula) for which complete statewide maps are not available. Therefore, bat distribution models should be viewed as hypothetical predictions of where the species could occur if such features are present.

References

- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010a. Range maps for Wyoming's species of greatest conservation need. Report prepared for the Wyoming Game and Fish Department by the Wyoming Natural Diversity Database, Laramie, Wyoming. January 19, 2010.
- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010b. Range and modeled distribution of Wyoming's species of greatest conservation need. Report prepared by the Wyoming Natural Diversity Database, Laramie Wyoming for the Wyoming Game and Fish Department, Cheyenne, Wyoming and the U.S. Geological Survey, Fort Collins, Colorado. August 20, 2010.

Predictor Variables used in the Distribution Model

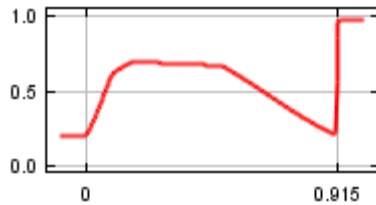
Percent Contribution (PC) to final model

<i>Environmental Variable</i>	<i>PC</i>
Conifer Index	48
Annual total radiation	24
Interannual variation in annual frost days	11
Wettest quarter mean temperature	8
Relative Humidity of least humid month	8
Radiation of the lightest month	2

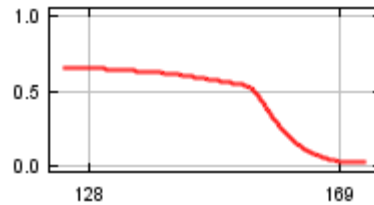
Response Curves

Each curve shows dependence of predicted suitability on input values of a single predictor variable considering correlations with others. Suitability is on the vertical axis (units: probability). Variable values are on the horizontal axis (units based on inputs; see Keinath et al 2010b for details).

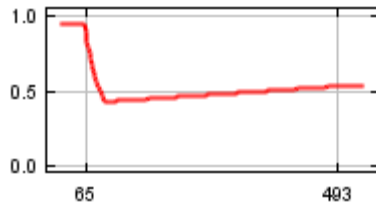
Conifer Index



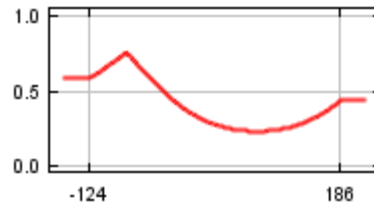
Annual total radiation



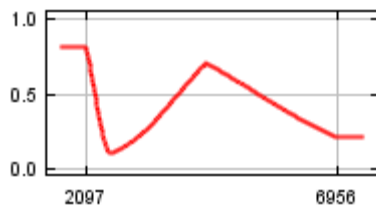
Interannual variation in annual frost days



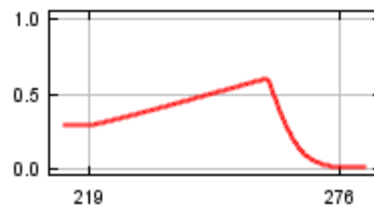
Wettest quarter mean temperature



Relative Humidity of least humid month



Radiation of the lightest month

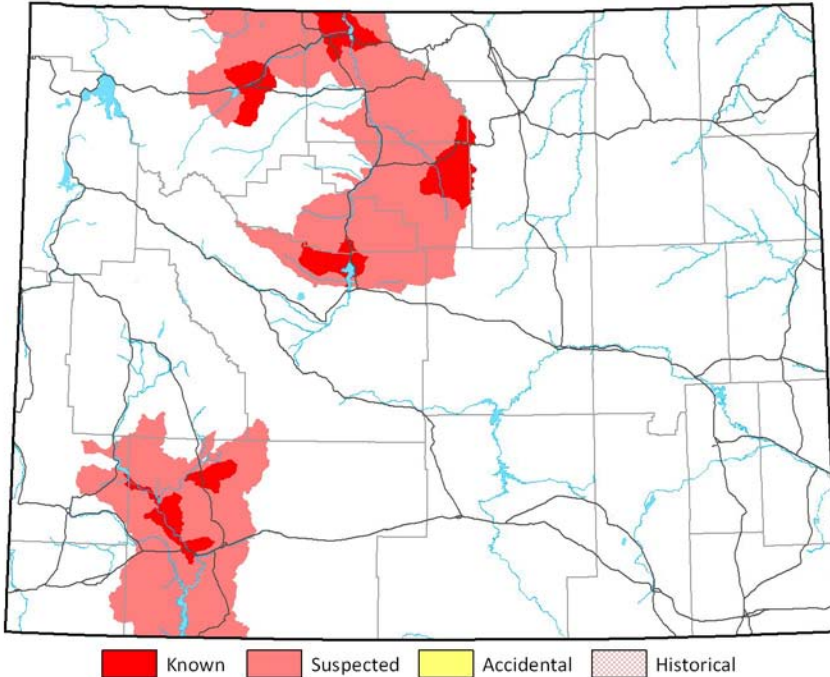


Spotted Bat (*Euderma maculatum*) Range Map and Distribution Model Summary

August 20, 2010

This report presents range and distribution of Spotted Bat (AMACC07010) in Wyoming (see Keinath et al. 2010b). Similar reports were developed by the Wyoming Natural Diversity Database for terrestrial vertebrate species of conservation need in Wyoming's State Wildlife Action Plan. This effort was supported by the Wyoming Game and Fish Department and the U.S. Geological Survey.

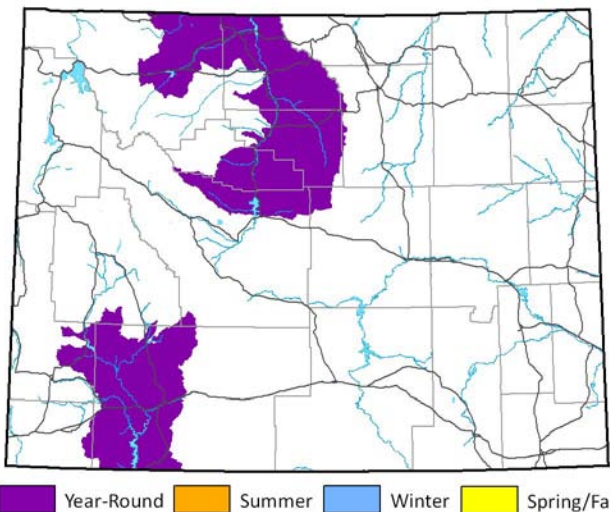
Range Map - Occupancy



Range Notes

- Version: 2010-01-19
- Proportion of range deemed known based on documented occurrences: 0.158
- Details of range map creation noted in Keinath et al. (2010a).

Range Map - Seasonality



Maps, models and report were created by and are available from the Wyoming Natural Diversity Database. (<http://uwadmnweb.uwyo.edu/wyndd/>).

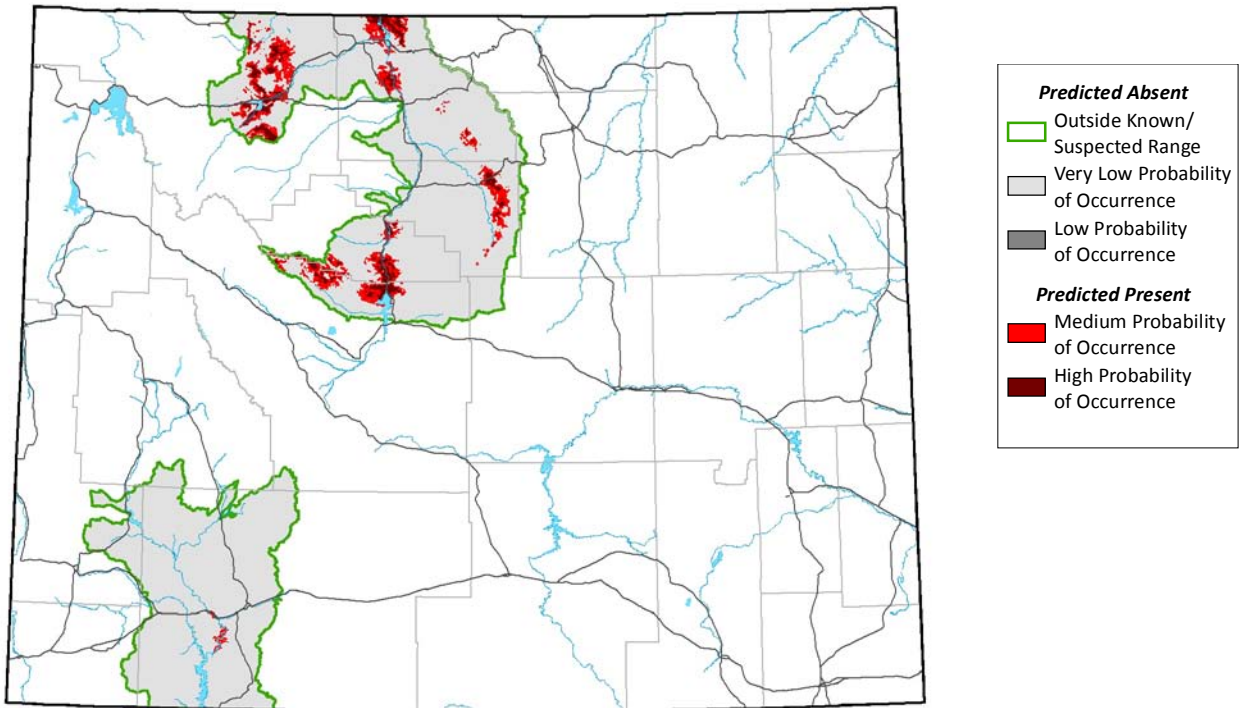
Doug Keinath, Senior Zoologist

Mark Andersen, GIS Specialist

© 2010, WYNDD

Distribution Model (Version: Tue Mar 16 16:53:45 MDT 2010)

Details of distribution model creation are presented in Keinath et al. (2010b)



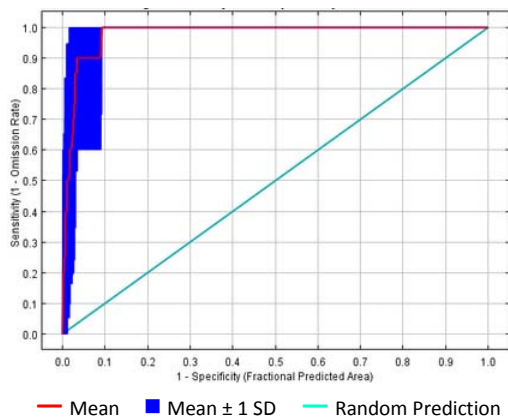
Model Parameters

- Season Modeled: Breeding (1-May- 31-Aug)
- Algorithm: Maxent version 3.3.1
- Feature Types: Linear, Quadratic
- Binary Threshold Rule: Maximum training sensitivity plus specificity
- Binary Threshold Value: 0.3395720
- High-Probability Threshold Value: 0.5718728
- Low-Probability Threshold Value: 0.3395720

Model Quality Summary

Overall Assessment of Model Quality: HIGH
 Expert Assessment: Medium
 Occurrence Sample Size: Low
 Quality of Occurrences: High
 Positive Success Rate: High
 Test AUC and Model Gain: High

Model Evaluation - ROC Plot



Model Evaluation Statistics

Final Model Statistics

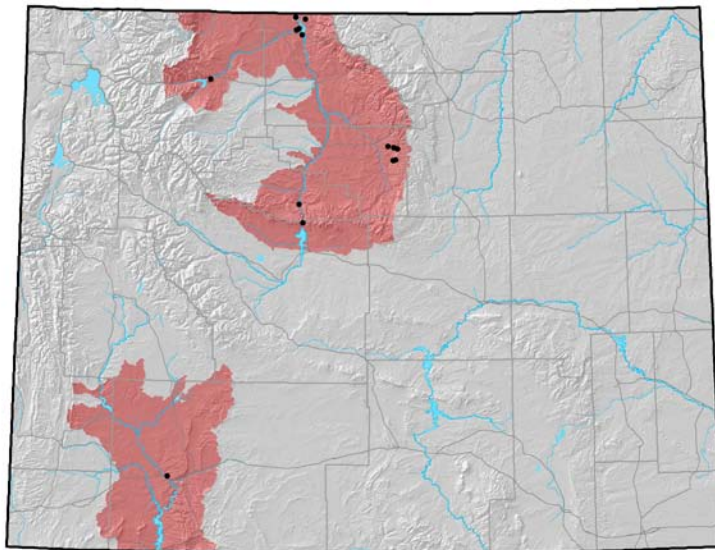
Training AUC: 0.988
 Regularized Training Gain: 2.670

Cross-Validation Statistics

- Average Test AUC: 0.978 ± 0.027
- Upper Bound on Test AUC: 0.970
- Average Test Gain: 2.786 ± 1.165
- Omission Error (fraction of test points omitted during 10-fold cross validation): 0.20 ± 0.42

Occurrence Data for Distribution Model

Occurrence Map



Points Used in Modeling, by Year of Observation

- Pre-1985
- 1985 or Later

Known and Suspected Range

Occurrence Summary Statistics

- Number of Occurrences in AWVED master dataset: 81
- Number of Occurrences used to create distribution model: 14
- Average Point Quality Index (highest quality is 12.00): 9.57 ± 2.14
- Most recent occurrence used: 2004
- Oldest occurrence used: 1990
- Occurrence File:
LOCAL_SAMPLE_POINTS_W_PD OG_2.csv

Comments

Bat distributions are more difficult to model than those of other species, because bats require unique features (e.g., roost sites and hibernacula) for which complete statewide maps are not available.

Therefore, bat distribution models should be viewed as hypothetical predictions of where the species could occur if such features are present.

References

- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010a. Range maps for Wyoming's species of greatest conservation need. Report prepared for the Wyoming Game and Fish Department by the Wyoming Natural Diversity Database, Laramie, Wyoming. January 19, 2010.
- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010b. Range and modeled distribution of Wyoming's species of greatest conservation need. Report prepared by the Wyoming Natural Diversity Database, Laramie Wyoming for the Wyoming Game and Fish Department, Cheyenne, Wyoming and the U.S. Geological Survey, Fort Collins, Colorado. August 20, 2010.

Predictor Variables used in the Distribution Model

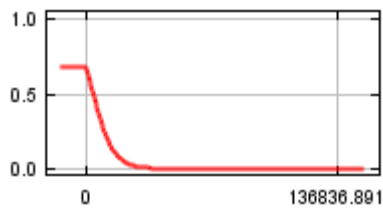
Percent Contribution (PC) to final model

<i>Environmental Variable</i>	<i>PC</i>
Distance to Cliffs	50
Variation of monthly precipitation	21
Precipitation of the driest quarter	15
Pinon-Juniper Index	8
Variation in monthly radiation	3
Contagion Index	3

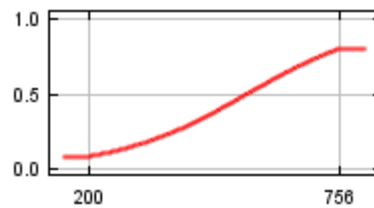
Response Curves

Each curve shows dependence of predicted suitability on input values of a single predictor variable considering correlations with others. Suitability is on the vertical axis (units: probability). Variable values are on the horizontal axis (units based on inputs; see Keinath et al 2010b for details).

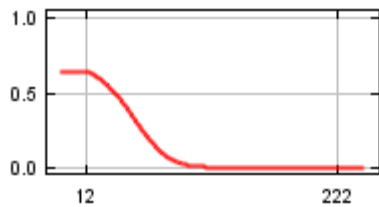
Distance to Cliffs



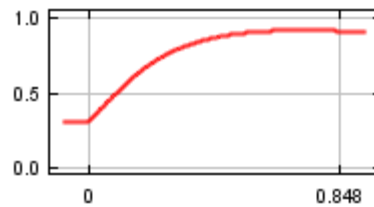
Variation of monthly precipitation



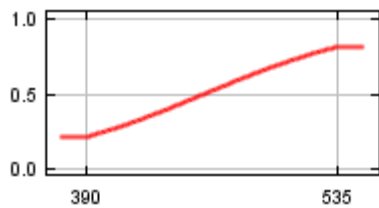
Precipitation of the driest quarter



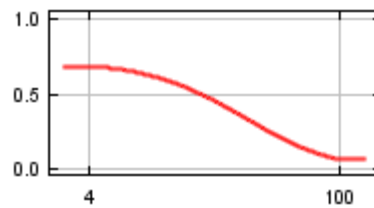
Pinon-Juniper Index



Variation in monthly radiation



Contagion Index

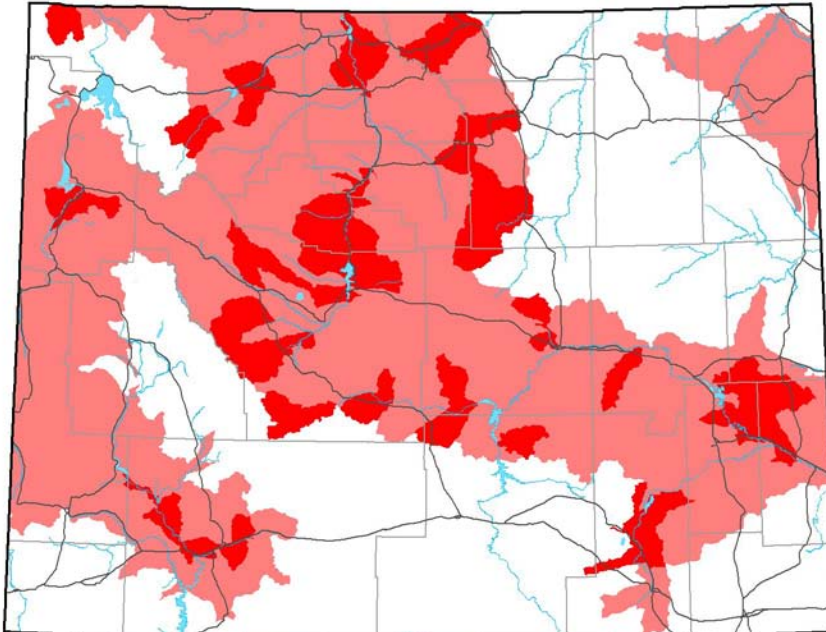


Townsend's Big-eared Bat (*Corynorhinus townsendii*) Range Map and Distribution Model Summary

August 20, 2010

This report presents range and distribution of Townsend's Big-eared Bat (AMACC08010Q) in Wyoming (see Keinath et al. 2010b). Similar reports were developed by the Wyoming Natural Diversity Database for terrestrial vertebrate species of conservation need in Wyoming's State Wildlife Action Plan. This effort was supported by the Wyoming Game and Fish Department and the U.S. Geological Survey.

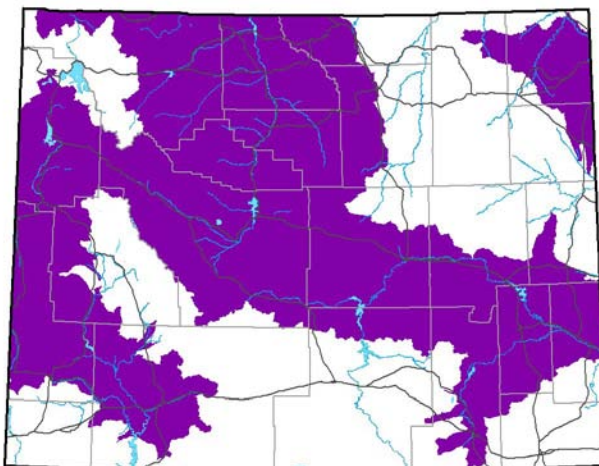
Range Map - Occupancy



Range Notes

- Version: 2010-01-19
- Proportion of range deemed known based on documented occurrences: 0.168
- Details of range map creation noted in Keinath et al. (2010a).

Range Map - Seasonality



Maps, models and report were created by and are available from the Wyoming Natural Diversity Database. (<http://uwadmnweb.uwyo.edu/wyndd/>).

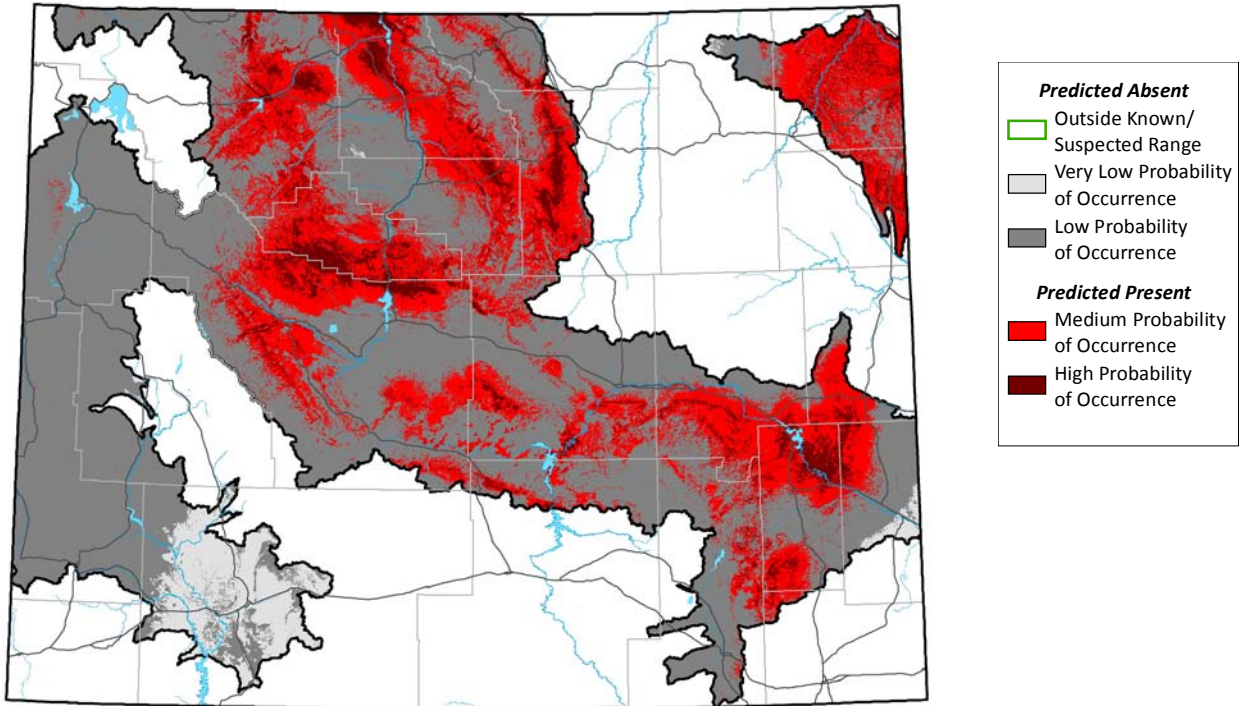
Doug Keinath, Senior Zoologist

Mark Andersen, GIS Specialist

© 2010, WYNDD

Distribution Model (Version: Wed Apr 21 21:53:21 MDT 2010)

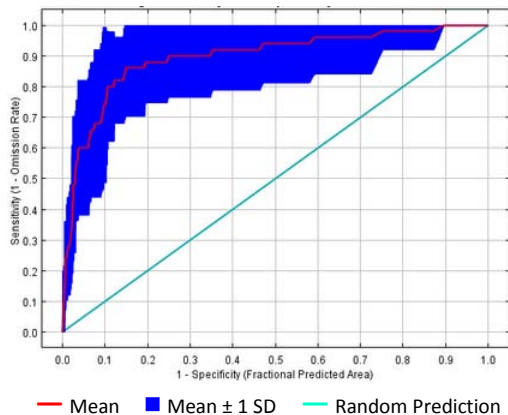
Details of distribution model creation are presented in Keinath et al. (2010b)



Model Parameters

- Season Modeled: Breeding (1-May- 15-Sep)
- Algorithm: Maxent version 3.3.1
- Feature Types: Linear, Product
- Binary Threshold Rule: Maximum training sensitivity plus specificity
- Binary Threshold Value: 0.2932530
- High-Probability Threshold Value: 0.5710616
- Low-Probability Threshold Value: 0.0172806

Model Evaluation - ROC Plot



Model Quality Summary

Overall Assessment of Model Quality:

MEDIUM

- Expert Assessment: Medium
- Occurrence Sample Size: Medium
- Quality of Occurrences: High
- Positive Success Rate: High
- Test AUC and Model Gain: Medium

Model Evaluation Statistics

Final Model Statistics

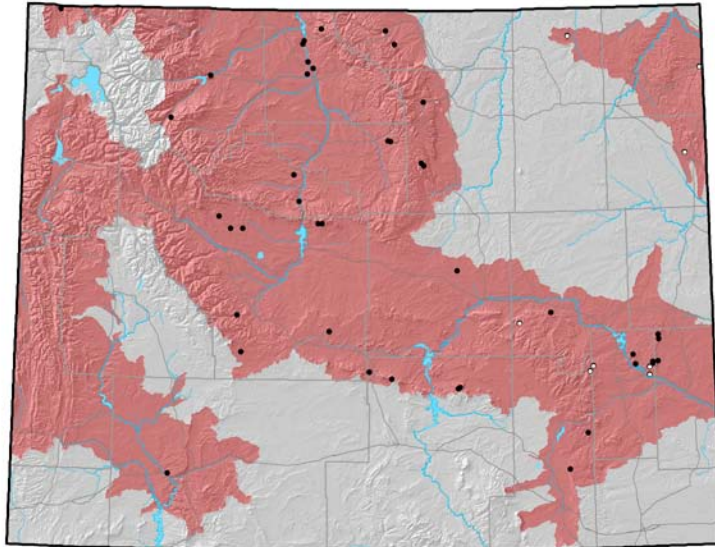
- Training AUC: 0.903
- Regularized Training Gain: 1.334

Cross-Validation Statistics

- Average Test AUC: 0.896 ± 0.102
- Upper Bound on Test AUC: 0.867
- Average Test Gain: 1.296 ± 1.037
- Omission Error (fraction of test points omitted during 10-fold cross validation): 0.16 ± 0.16

Occurrence Data for Distribution Model

Occurrence Map



Points Used in Modeling, by Year of Observation

- Pre-1985
- 1985 or Later

Known and Suspected Range

Occurrence Summary Statistics

- Number of Occurrences in AWVED master dataset: 255
- Number of Occurrences used to create distribution model: 50
- Average Point Quality Index (highest quality is 12.00): 7.92 ± 1.95
- Most recent occurrence used: 2004
- Oldest occurrence used: 1913
- Occurrence File:
LOCAL_SAMPLE_POINTS.csv

Comments

Bat distributions are more difficult to model than those of other species, because bats require unique features (e.g., roost sites and hibernacula) for which complete statewide maps are not available.

Therefore, bat distribution models should be viewed as hypothetical predictions of where the species could occur if such features are present. Qualitative expert review of this model suggests that the binary version may over-predict the distribution of this species in Wyoming.

References

- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010a. Range maps for Wyoming's species of greatest conservation need. Report prepared for the Wyoming Game and Fish Department by the Wyoming Natural Diversity Database, Laramie, Wyoming. January 19, 2010.
- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010b. Range and modeled distribution of Wyoming's species of greatest conservation need. Report prepared by the Wyoming Natural Diversity Database, Laramie Wyoming for the Wyoming Game and Fish Department, Cheyenne, Wyoming and the U.S. Geological Survey, Fort Collins, Colorado. August 20, 2010.

Predictor Variables used in the Distribution Model

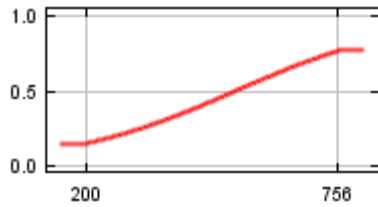
Percent Contribution (PC) to final model

<i>Environmental Variable</i>	<i>PC</i>
Variation of monthly precipitation	51
Degree Slope	25
Distance to Cave-forming Formations	15
Wettest quarter mean temperature	7
Pinon-Juniper Index	2
Sagebrush Index	0

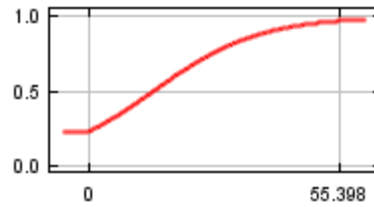
Response Curves

Each curve shows dependence of predicted suitability on input values of a single predictor variable considering correlations with others. Suitability is on the vertical axis (units: probability). Variable values are on the horizontal axis (units based on inputs; see Keinath et al 2010b for details).

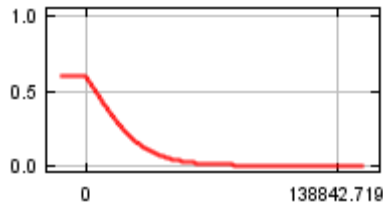
Variation of monthly precipitation



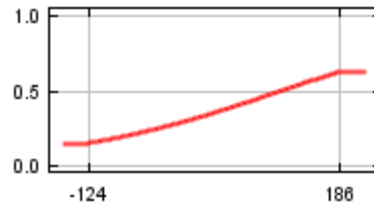
Degree Slope



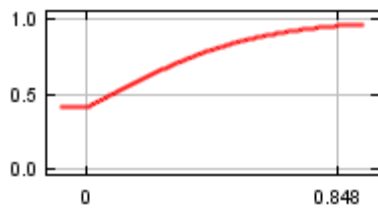
Distance to Cave-forming Formations



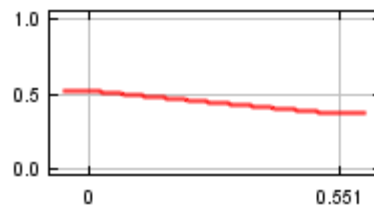
Wettest quarter mean temperature



Pinon-Juniper Index



Sagebrush Index

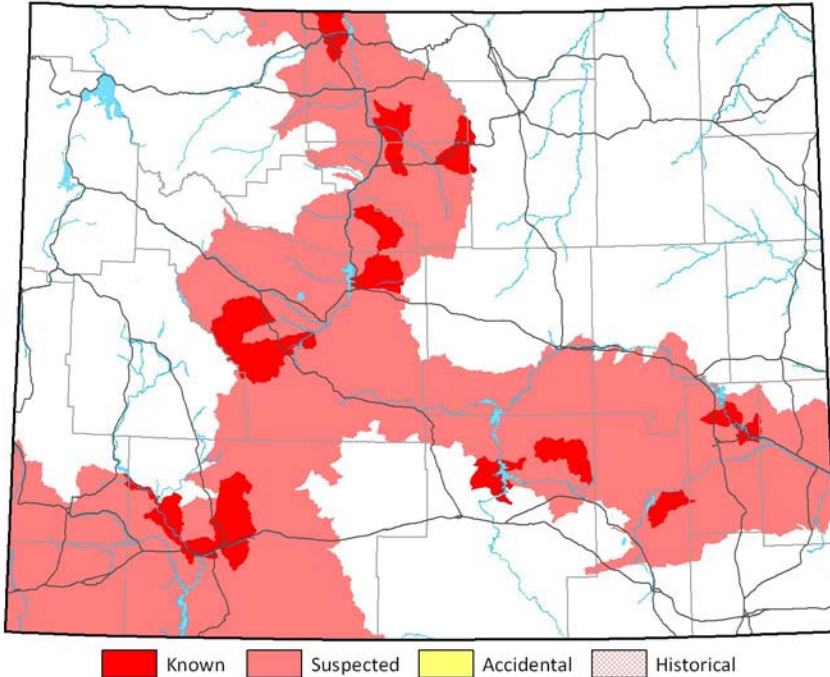


Pallid Bat (*Antrozous pallidus*) Range Map and Distribution Model Summary

August 20, 2010

This report presents range and distribution of Pallid Bat (AMACC10010) in Wyoming (see Keinath et al. 2010b). Similar reports were developed by the Wyoming Natural Diversity Database for terrestrial vertebrate species of conservation need in Wyoming's State Wildlife Action Plan. This effort was supported by the Wyoming Game and Fish Department and the U.S. Geological Survey.

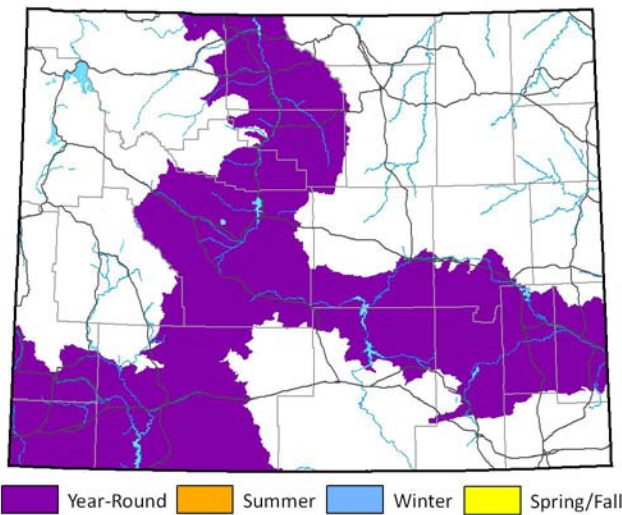
Range Map - Occupancy



Range Notes

- Version: 2010-01-19
- Proportion of range deemed known based on documented occurrences: 0.096
- Details of range map creation noted in Keinath et al. (2010a).

Range Map - Seasonality



Maps, models and report were created by and are available from the Wyoming Natural Diversity Database. (<http://uwadmnweb.uwyo.edu/wyndd/>).

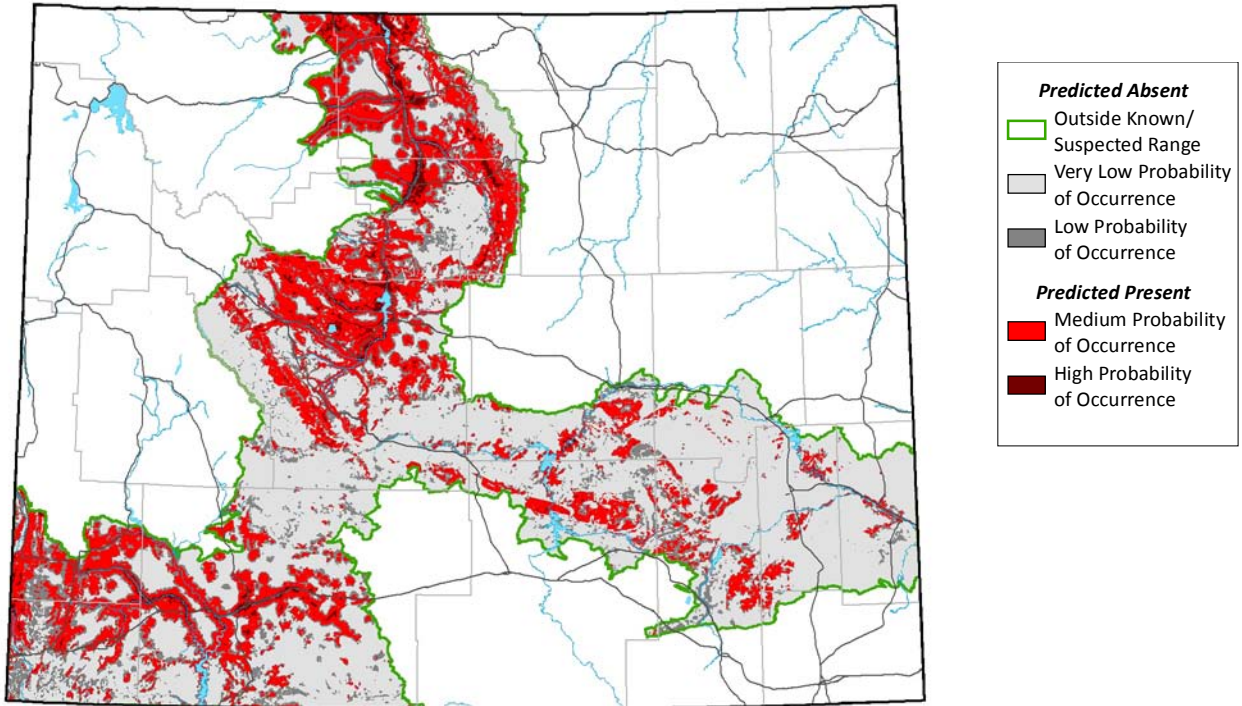
Doug Keinath, Senior Zoologist

Mark Andersen, GIS Specialist

© 2010, WYNDD

Distribution Model (Version: Wed Mar 17 02:09:47 MDT 2010)

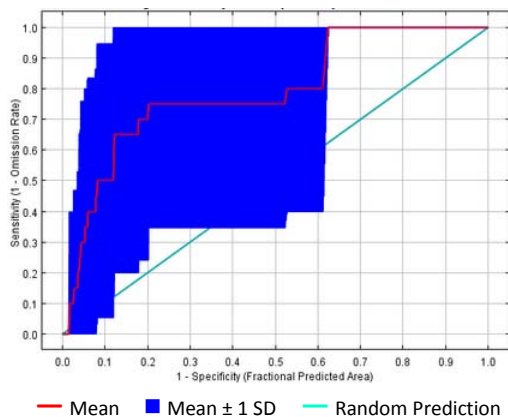
Details of distribution model creation are presented in Keinath et al. (2010b)



Model Parameters

- Season Modeled: Breeding (1-May- 25-Aug)
- Algorithm: Maxent version 3.3.1
- Feature Types: Linear, Quadratic, Hinge
- Binary Threshold Rule: Maximum training sensitivity plus specificity
- Binary Threshold Value: 0.2695310
- High-Probability Threshold Value: 0.7637730
- Low-Probability Threshold Value: 0.1519953

Model Evaluation - ROC Plot



Model Quality Summary

Overall Assessment of Model Quality:

MEDIUM

- Expert Assessment: Medium
- Occurrence Sample Size: Low
- Quality of Occurrences: Medium
- Positive Success Rate: Medium
- Test AUC and Model Gain: Medium

Model Evaluation Statistics

Final Model Statistics

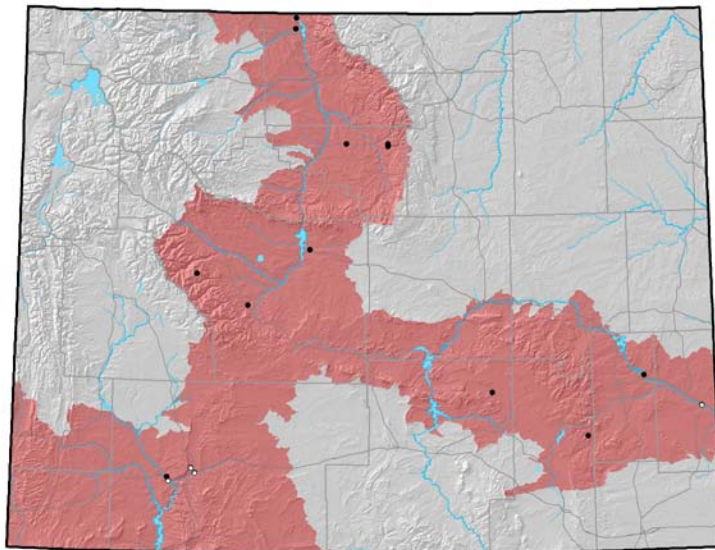
- Training AUC: 0.936
- Regularized Training Gain: 1.107

Cross-Validation Statistics

- Average Test AUC: 0.791 ± 0.236
- Upper Bound on Test AUC: 0.853
- Average Test Gain: 0.471 ± 1.233
- Omission Error (fraction of test points omitted during 10-fold cross validation): 0.30 ± 0.48

Occurrence Data for Distribution Model

Occurrence Map



Points Used in Modeling, by Year of Observation

- Pre-1985
- 1985 or Later

Known and Suspected Range

Occurrence Summary Statistics

- Number of Occurrences in AWVED master dataset: 36
- Number of Occurrences used to create distribution model: 16
- Average Point Quality Index (highest quality is 12.00): 7.38 ± 2.50
- Most recent occurrence used: 2004
- Oldest occurrence used: 1981
- Occurrence File:
LOCAL_SAMPLE_POINTS_W_PD OG_2.csv

Comments

Bat distributions are more difficult to model than those of other species, because bats require unique features (e.g., roost sites and hibernacula) for which complete statewide maps are not available.

Therefore, bat distribution models should be viewed as hypothetical predictions of where the species could occur if such features are present.

References

- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010a. Range maps for Wyoming's species of greatest conservation need. Report prepared for the Wyoming Game and Fish Department by the Wyoming Natural Diversity Database, Laramie, Wyoming. January 19, 2010.
- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010b. Range and modeled distribution of Wyoming's species of greatest conservation need. Report prepared by the Wyoming Natural Diversity Database, Laramie Wyoming for the Wyoming Game and Fish Department, Cheyenne, Wyoming and the U.S. Geological Survey, Fort Collins, Colorado. August 20, 2010.

Predictor Variables used in the Distribution Model

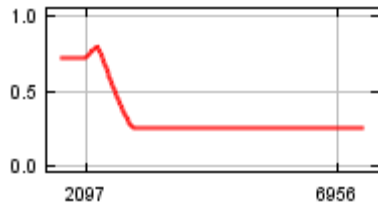
Percent Contribution (PC) to final model

<i>Environmental Variable</i>	<i>PC</i>
Relative Humidity of least humid month	49
Pinon-Juniper Index	14
Distance to Cave-forming Formations	12
Forest Cover Index	10
Herbaceous Cover Index	8
Distance to Permanent Water	7

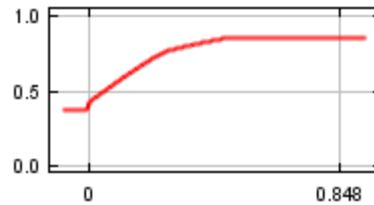
Response Curves

Each curve shows dependence of predicted suitability on input values of a single predictor variable considering correlations with others. Suitability is on the vertical axis (units: probability). Variable values are on the horizontal axis (units based on inputs; see Keinath et al 2010b for details).

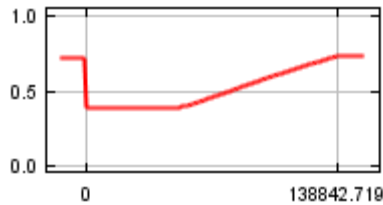
Relative Humidity of least humid month



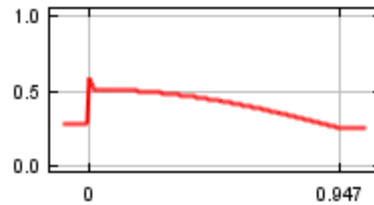
Pinon-Juniper Index



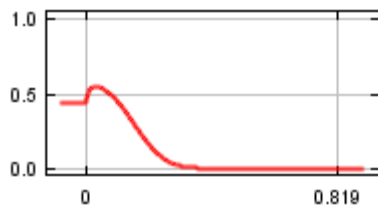
Distance to Cave-forming Formations



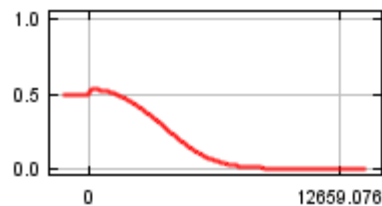
Forest Cover Index



Herbaceous Cover Index



Distance to Permanent Water

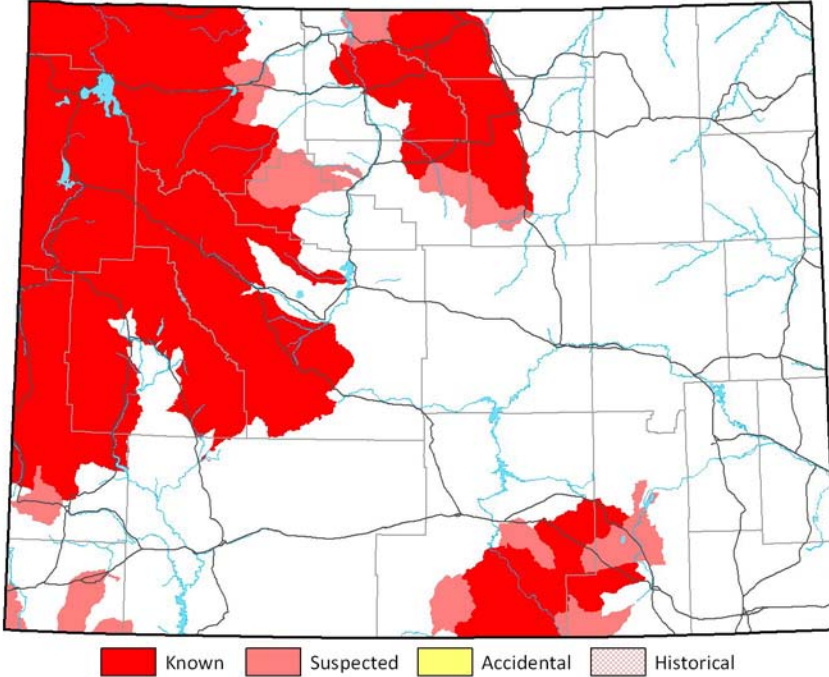


American Pika (*Ochotona princeps*) Range Map and Distribution Model Summary

August 20, 2010

This report presents range and distribution of American Pika (AMAEA01020) in Wyoming (see Keinath et al. 2010b). Similar reports were developed by the Wyoming Natural Diversity Database for terrestrial vertebrate species of conservation need in Wyoming's State Wildlife Action Plan. This effort was supported by the Wyoming Game and Fish Department and the U.S. Geological Survey.

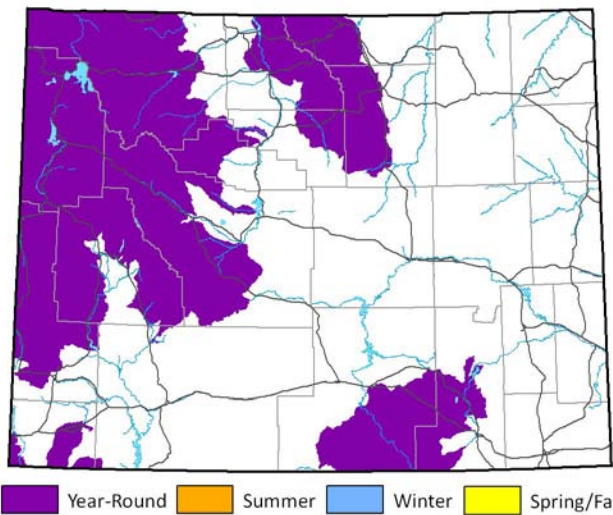
Range Map - Occupancy



Range Notes

- Version: 2010-01-19
- Proportion of range deemed known based on documented occurrences: 0.847
- Details of range map creation noted in Keinath et al. (2010a).

Range Map - Seasonality



Maps, models and report were created by and are available from the Wyoming Natural Diversity Database. (<http://uwadmnweb.uwyo.edu/wyndd/>).

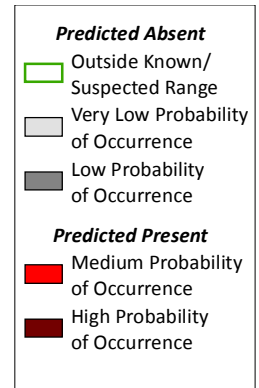
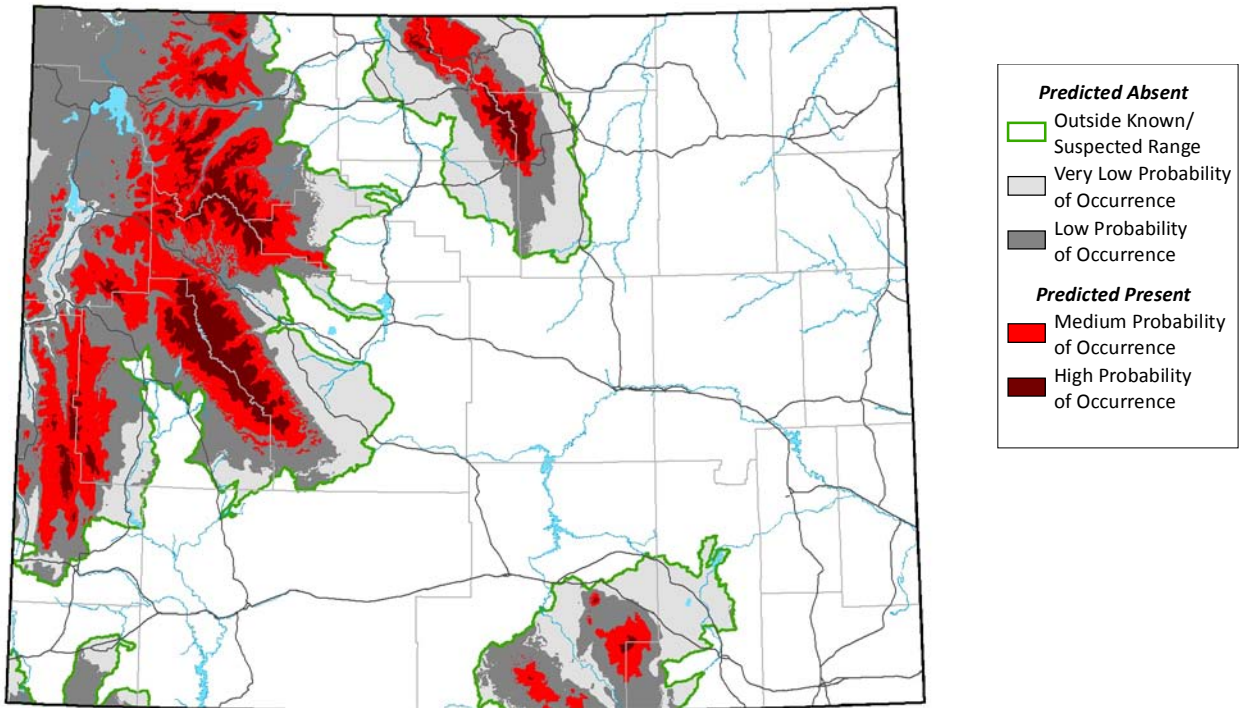
Doug Keinath, Senior Zoologist

Mark Andersen, GIS Specialist

© 2010, WYNDD

Distribution Model (Version: Fri Mar 12 08:17:35 MST 2010)

Details of distribution model creation are presented in Keinath et al. (2010b)



Model Parameters

- Season Modeled: Year-Round
- Algorithm: Maxent version 3.3.1
- Feature Types: Linear, Product, Quadratic, Hinge, Threshold
- Binary Threshold Rule: Maximum training sensitivity plus specificity
- Binary Threshold Value: 0.1460540
- High-Probability Threshold Value: 0.6122611
- Low-Probability Threshold Value: 0.0085874

Model Quality Summary

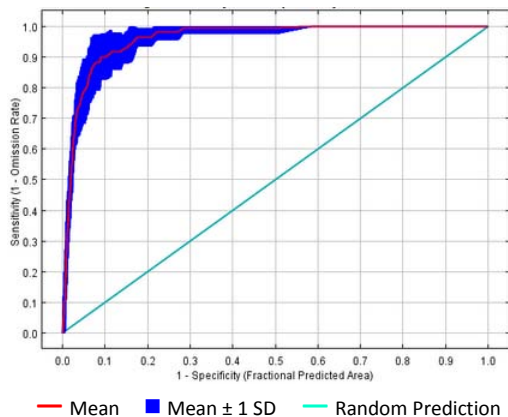
Overall Assessment of Model Quality: HIGH
 Expert Assessment: High
 Occurrence Sample Size: High
 Quality of Occurrences: Medium
 Positive Success Rate: High
 Test AUC and Model Gain: High

Model Evaluation Statistics

Final Model Statistics

Training AUC: 0.968
 Regularized Training Gain: 2.364

Model Evaluation - ROC Plot

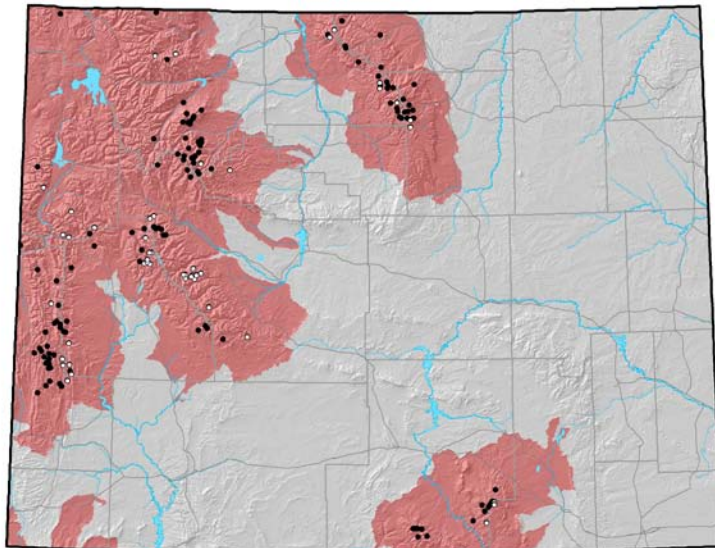


Cross-Validation Statistics

- Average Test AUC: 0.960 ± 0.017
- Upper Bound on Test AUC: 0.961
- Average Test Gain: 2.269 ± 0.356
- Omission Error (fraction of test points omitted during 10-fold cross validation): 0.11 ± 0.08

Occurrence Data for Distribution Model

Occurrence Map



Points Used in Modeling, by Year of Observation

- Pre-1985
- 1985 or Later

Known and Suspected Range

Occurrence Summary Statistics

- Number of Occurrences in AWVED master dataset: 325
- Number of Occurrences used to create distribution model: 170
- Average Point Quality Index (highest quality is 12.00): 6.08 ± 1.97
- Most recent occurrence used: 2006
- Oldest occurrence used: 1939
- Occurrence File:
REVISED_SAMPLE_POINTS_ALL_SPP.csv

Comments

There are no additional comments specific to this species range map or distribution model.

References

- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010a. Range maps for Wyoming's species of greatest conservation need. Report prepared for the Wyoming Game and Fish Department by the Wyoming Natural Diversity Database, Laramie, Wyoming. January 19, 2010.
- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010b. Range and modeled distribution of Wyoming's species of greatest conservation need. Report prepared by the Wyoming Natural Diversity Database, Laramie Wyoming for the Wyoming Game and Fish Department, Cheyenne, Wyoming and the U.S. Geological Survey, Fort Collins, Colorado. August 20, 2010.

Predictor Variables used in the Distribution Model

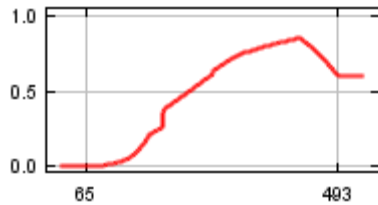
Percent Contribution (PC) to final model

<i>Environmental Variable</i>	<i>PC</i>
Interannual variation in annual frost days	49
Hottest month mean maximum temperature	26
Elevation	14
Warmest quarter mean temperature	5
Precipitation of the warmest quarter	4
Variation in monthly radiation	2

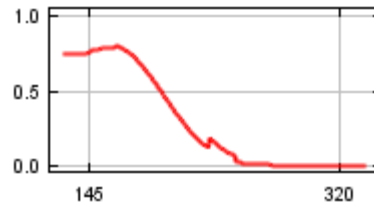
Response Curves

Each curve shows dependence of predicted suitability on input values of a single predictor variable considering correlations with others. Suitability is on the vertical axis (units: probability). Variable values are on the horizontal axis (units based on inputs; see Keinath et al 2010b for details).

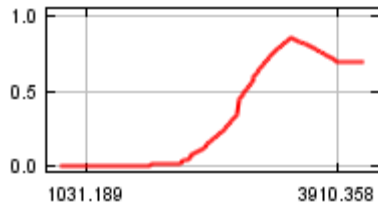
Interannual variation in annual frost days



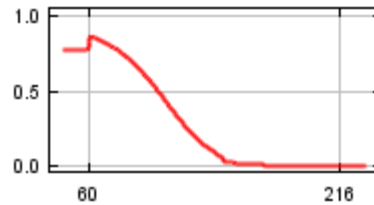
Hottest month mean maximum temperature



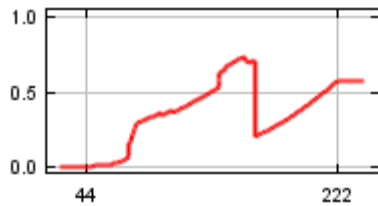
Elevation



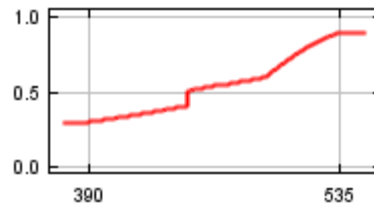
Warmest quarter mean temperature



Precipitation of the warmest quarter



Variation in monthly radiation

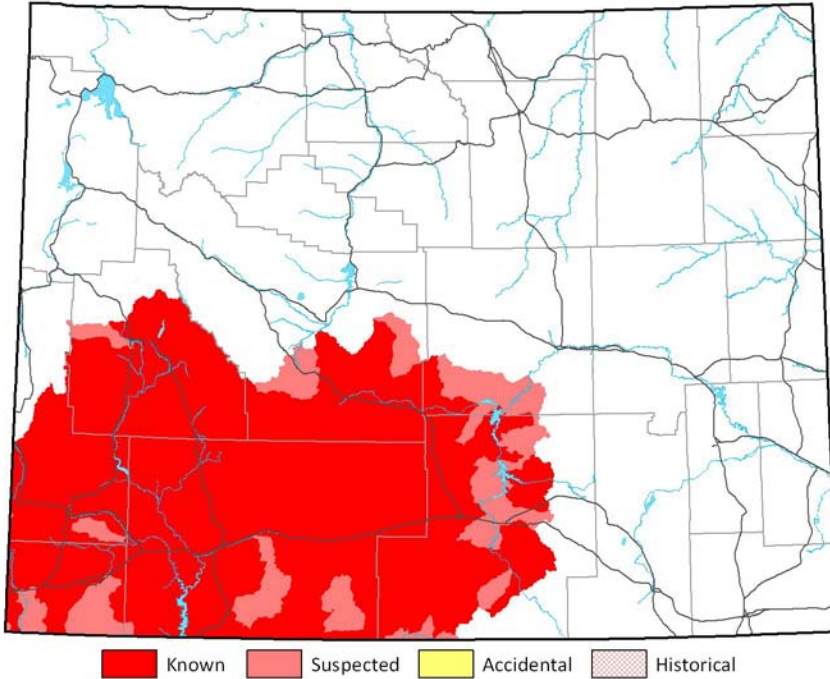


Pygmy Rabbit (*Brachylagus idahoensis*) Range Map and Distribution Model Summary

August 20, 2010

This report presents range and distribution of Pygmy Rabbit (AMAEB04010) in Wyoming (see Keinath et al. 2010b). Similar reports were developed by the Wyoming Natural Diversity Database for terrestrial vertebrate species of conservation need in Wyoming's State Wildlife Action Plan. This effort was supported by the Wyoming Game and Fish Department and the U.S. Geological Survey.

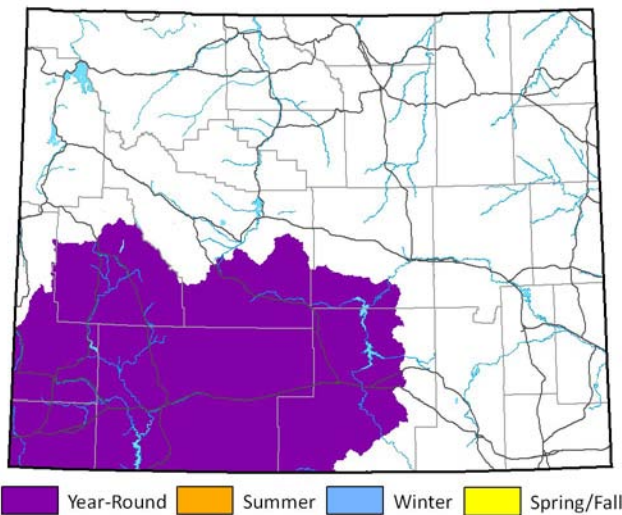
Range Map - Occupancy



Range Notes

- Version: 2010-01-19
- Proportion of range deemed known based on documented occurrences: 0.793
- Details of range map creation noted in Keinath et al. (2010a).

Range Map - Seasonality



Maps, models and report were created by and are available from the Wyoming Natural Diversity Database. (<http://uwadmnweb.uwyo.edu/wyndd/>).

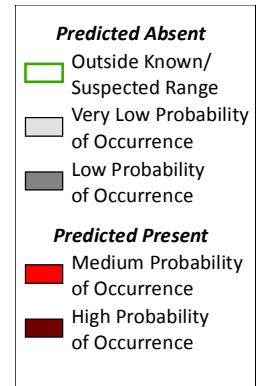
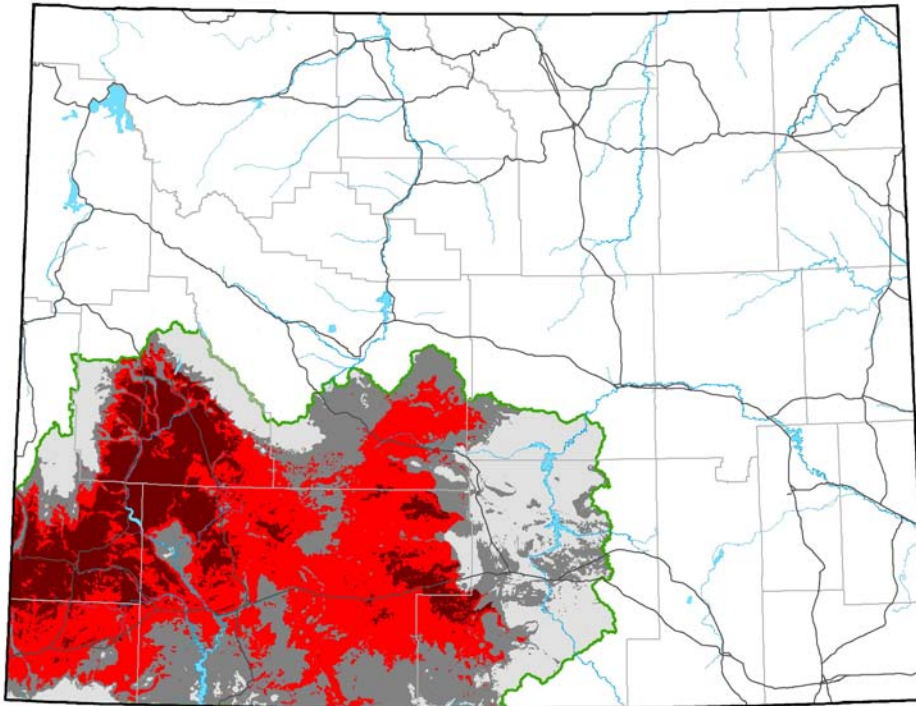
Doug Keinath, Senior Zoologist

Mark Andersen, GIS Specialist

© 2010, WYNDD

Distribution Model (Version: Wed Mar 17 11:15:40 MDT 2010)

Details of distribution model creation are presented in Keinath et al. (2010b)



Model Parameters

- Season Modeled: Year-Round
- Algorithm: Maxent version 3.3.1
- Feature Types: Linear, Product, Quadratic, Hinge, Threshold
- Binary Threshold Rule: Maximum training sensitivity plus specificity
- Binary Threshold Value: 0.2467570
- High-Probability Threshold Value: 0.5445419
- Low-Probability Threshold Value: 0.0250009

Model Quality Summary

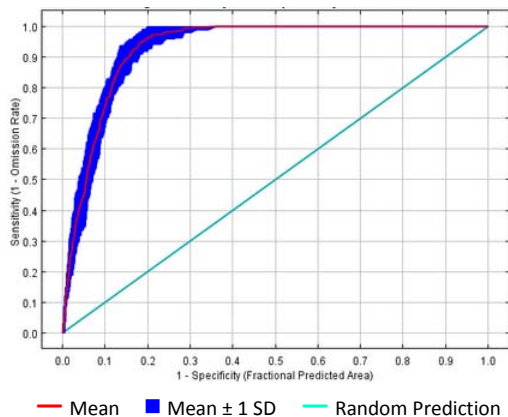
Overall Assessment of Model Quality: HIGH
 Expert Assessment: High
 Occurrence Sample Size: High
 Quality of Occurrences: High
 Positive Success Rate: Very High
 Test AUC and Model Gain: High

Model Evaluation Statistics

Final Model Statistics

Training AUC: 0.942
 Regularized Training Gain: 1.697

Model Evaluation - ROC Plot

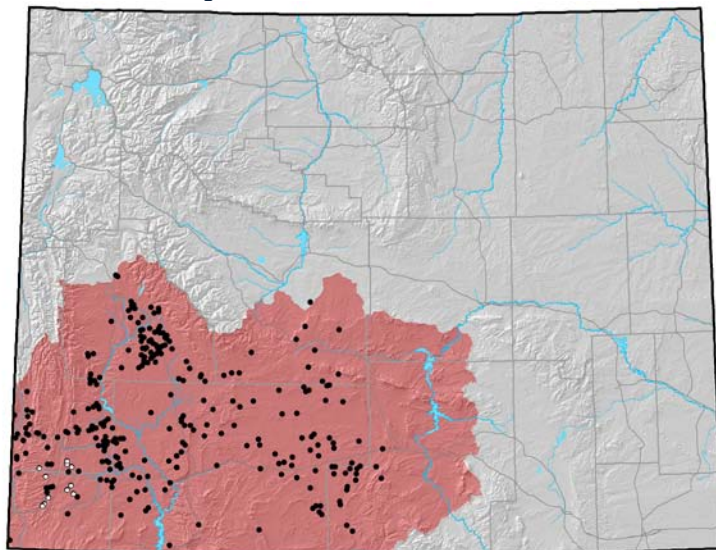


Cross-Validation Statistics

- Average Test AUC: 0.930 ± 0.012
- Upper Bound on Test AUC: 0.931
- Average Test Gain: 1.658 ± 0.169
- Omission Error (fraction of test points omitted during 10-fold cross validation): 0.09 ± 0.07

Occurrence Data for Distribution Model

Occurrence Map



Points Used in Modeling, by Year of Observation

- Pre-1985
- 1985 or Later

Known and Suspected Range

Occurrence Summary Statistics

- Number of Occurrences in AWVED master dataset: 7,387
- Number of Occurrences used to create distribution model: 278
- Average Point Quality Index (highest quality is 12.00): 10.39 ± 2.40
- Most recent occurrence used: 2008
- Oldest occurrence used: 1981
- Occurrence File:
LOCAL_SAMPLE_POINTS_W_PDGO_2.CSV

Comments

Conclusive identification of this species is difficult unless the observer is experienced with the species. We suspect numerous occurrences could be in error, thus resulting in lower than expected model quality. The lack of supporting data provided with many occurrences (notably those from the Wildlife Observation System) makes it impossible to assess the accuracy of such observations. Supplementation/replacement of the existing data set with high-quality occurrence locations could greatly improve the modeled distribution for this species.

References

- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010a. Range maps for Wyoming's species of greatest conservation need. Report prepared for the Wyoming Game and Fish Department by the Wyoming Natural Diversity Database, Laramie, Wyoming. January 19, 2010.
- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010b. Range and modeled distribution of Wyoming's species of greatest conservation need. Report prepared by the Wyoming Natural Diversity Database, Laramie Wyoming for the Wyoming Game and Fish Department, Cheyenne, Wyoming and the U.S. Geological Survey, Fort Collins, Colorado. August 20, 2010.

Predictor Variables used in the Distribution Model

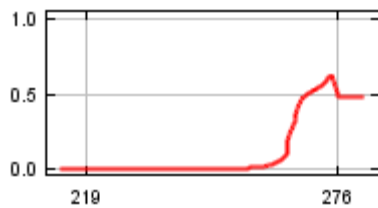
Percent Contribution (PC) to final model

<i>Environmental Variable</i>	<i>PC</i>
Radiation of the lightest month	33
Coldest quarter mean temperature	20
Annual total radiation	15
Coldest month mean minimum temperature	10
Relative Humidity of least humid month	9
Precipitation of the wettest quarter	8
Sagebrush Index	5

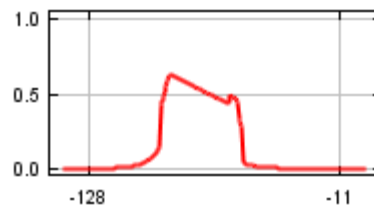
Response Curves

Each curve shows dependence of predicted suitability on input values of a single predictor variable considering correlations with others. Suitability is on the vertical axis (units: probability). Variable values are on the horizontal axis (units based on inputs; see Keinath et al 2010b for details).

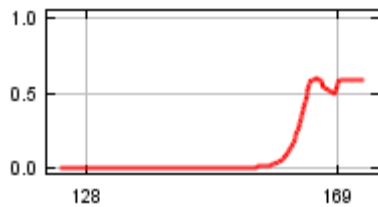
Radiation of the lightest month



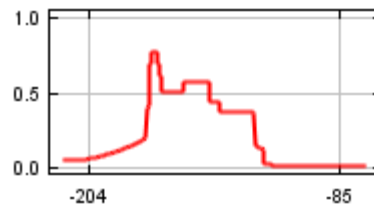
Coldest quarter mean temperature



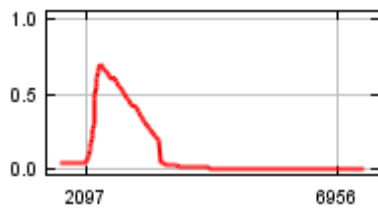
Annual total radiation



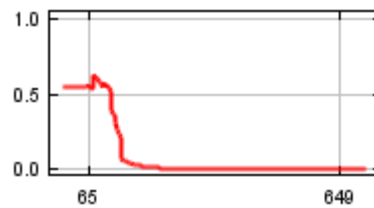
Coldest month mean minimum temperature



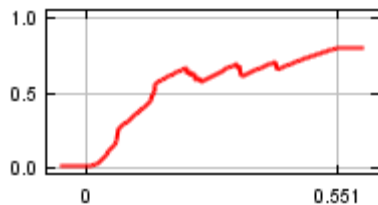
Relative Humidity of least humid month



Precipitation of the wettest quarter



Sagebrush Index

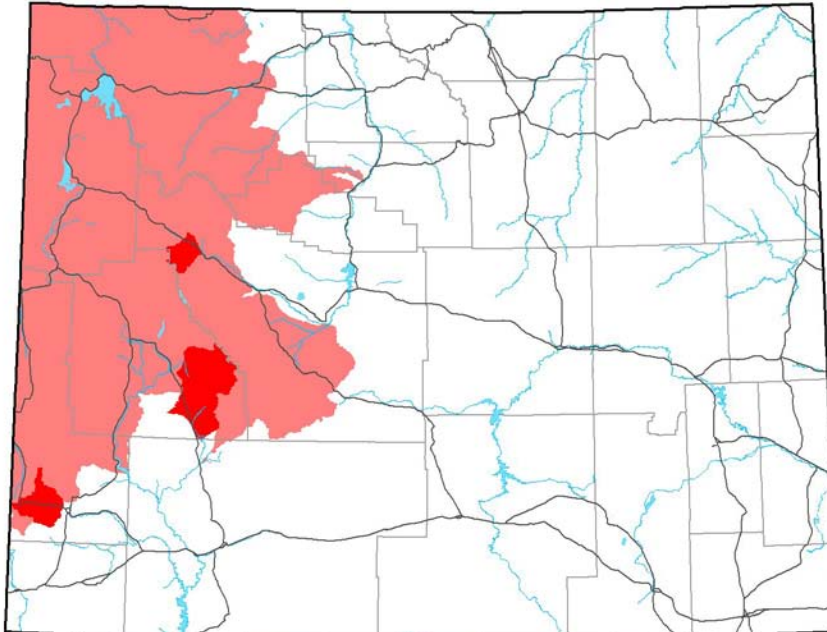


Yellow-pine Chipmunk (*Neotamias amoenus*) Range Map and Distribution Model Summary

August 20, 2010

This report presents range and distribution of Yellow-pine Chipmunk (AMAFB02030) in Wyoming (see Keinath et al. 2010b). Similar reports were developed by the Wyoming Natural Diversity Database for terrestrial vertebrate species of conservation need in Wyoming's State Wildlife Action Plan. This effort was supported by the Wyoming Game and Fish Department and the U.S. Geological Survey.

Range Map - Occupancy

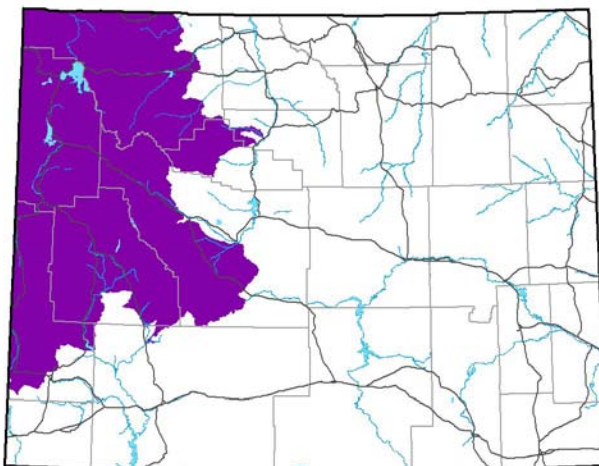


Known Suspected Accidental Historical

Range Notes

- Version: 2010-01-19
- Proportion of range deemed known based on documented occurrences: 0.039
- Details of range map creation noted in Keinath et al. (2010a).

Range Map - Seasonality



Year-Round Summer Winter Spring/Fall

Maps, models and report were created by and are available from the Wyoming Natural Diversity Database. (<http://uwadmnweb.uwyo.edu/wyndd/>).

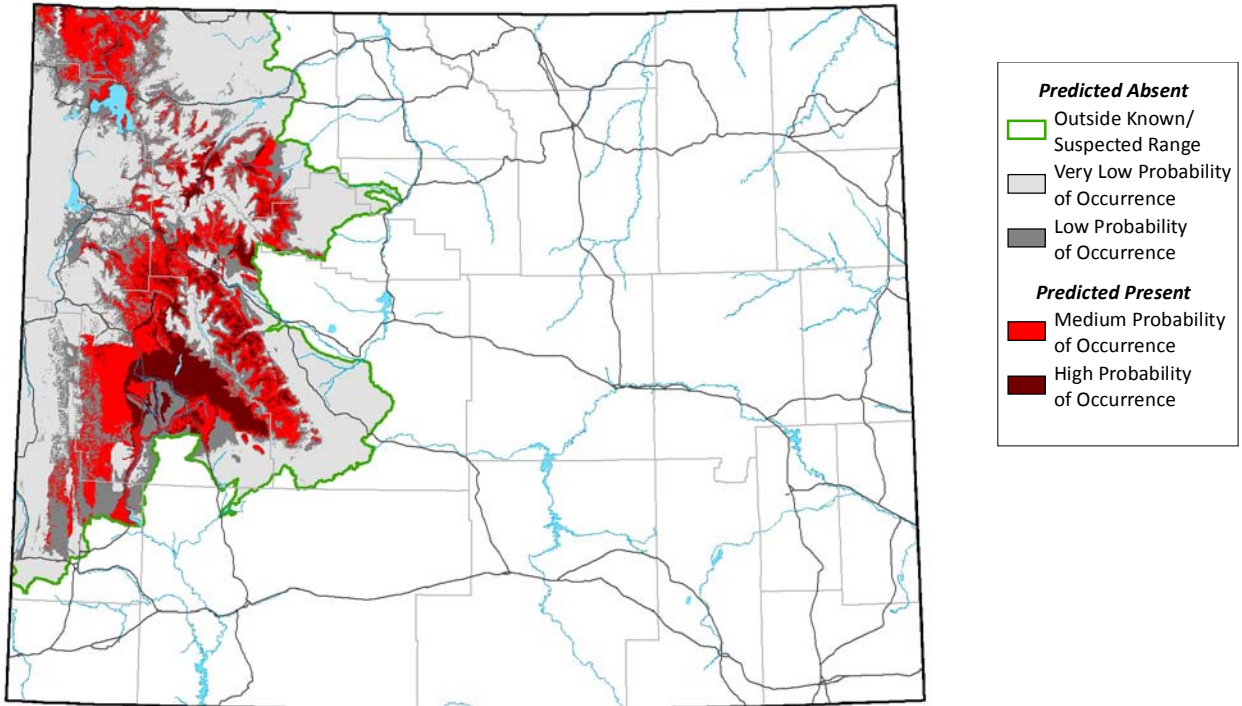
Doug Keinath, Senior Zoologist

Mark Andersen, GIS Specialist

© 2010, WYNDD

Distribution Model (Version: Wed Dec 09 09:09:13 MST 2009)

Details of distribution model creation are presented in Keinath et al. (2010b)



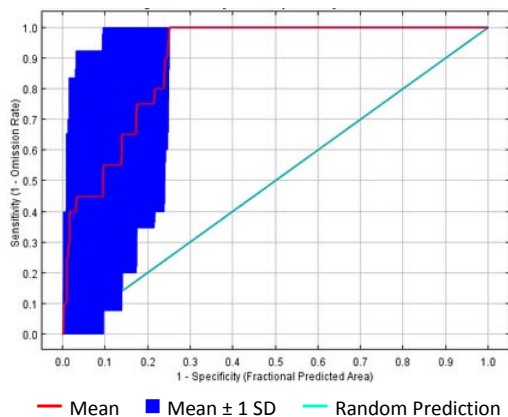
Model Parameters

- Season Modeled: Year-Round
- Algorithm: Maxent version 3.3.1
- Feature Types: Linear, Quadratic
- Binary Threshold Rule: Maximum training sensitivity plus specificity
- Binary Threshold Value: 0.4004510
- High-Probability Threshold Value: 0.6324966
- Low-Probability Threshold Value: 0.2274546

Model Quality Summary

Overall Assessment of Model Quality: LOW
 Expert Assessment: Medium
 Occurrence Sample Size: Low
 Quality of Occurrences: Low
 Positive Success Rate: Low
 Test AUC and Model Gain: Medium

Model Evaluation - ROC Plot



Model Evaluation Statistics

Final Model Statistics

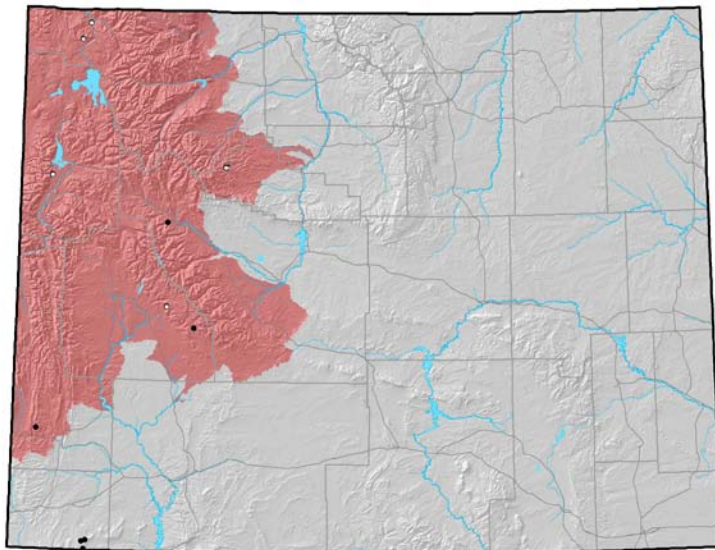
Training AUC: 0.953
 Regularized Training Gain: 1.495

Cross-Validation Statistics

- Average Test AUC: 0.894 ± 0.094
- Upper Bound on Test AUC: 0.910
- Average Test Gain: 1.244 ± 1.177
- Omission Error (fraction of test points omitted during 10-fold cross validation): 0.35 ± 0.47

Occurrence Data for Distribution Model

Occurrence Map



Points Used in Modeling, by Year of Observation

- Pre-1985
- 1985 or Later

Known and Suspected Range

Occurrence Summary Statistics

- Number of Occurrences in AWVED master dataset: 39
- Number of Occurrences used to create distribution model: 12
- Average Point Quality Index (highest quality is 12.00): 4.25 ± 2.22
- Most recent occurrence used: 1991
- Oldest occurrence used: 1934
- Occurrence File:
LOCAL_SAMPLE_POINTS.csv

Comments

There are no additional comments specific to this species range map or distribution model.

References

- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010a. Range maps for Wyoming's species of greatest conservation need. Report prepared for the Wyoming Game and Fish Department by the Wyoming Natural Diversity Database, Laramie, Wyoming. January 19, 2010.
- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010b. Range and modeled distribution of Wyoming's species of greatest conservation need. Report prepared by the Wyoming Natural Diversity Database, Laramie Wyoming for the Wyoming Game and Fish Department, Cheyenne, Wyoming and the U.S. Geological Survey, Fort Collins, Colorado. August 20, 2010.

Predictor Variables used in the Distribution Model

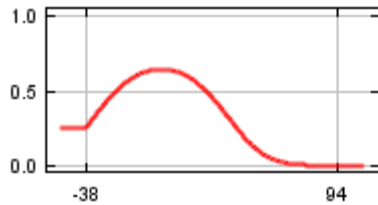
Percent Contribution (PC) to final model

<i>Environmental Variable</i>	<i>PC</i>
Annual mean temperature	65
Isothermality (T2/T5)	17
Depth to Shallowest Restrictive Layer	6
Precipitation of the coldest quarter	5
Percent Forest Cover	4
Driest quarter mean temperature	3

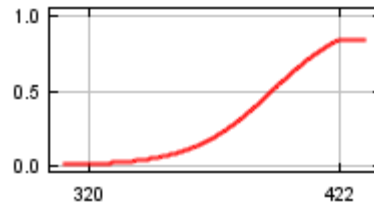
Response Curves

Each curve shows dependence of predicted suitability on input values of a single predictor variable considering correlations with others. Suitability is on the vertical axis (units: probability). Variable values are on the horizontal axis (units based on inputs; see Keinath et al 2010b for details).

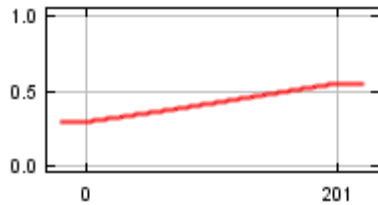
Annual mean temperature



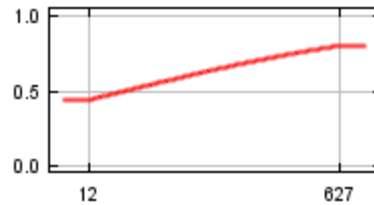
Isothermality (T2/T5)



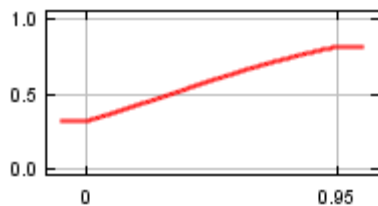
Depth to Shallowest Restrictive Layer



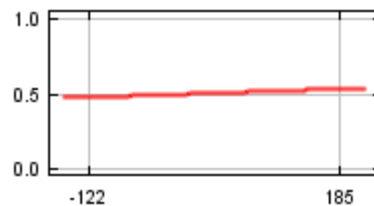
Precipitation of the coldest quarter



Percent Forest Cover



Driest quarter mean temperature

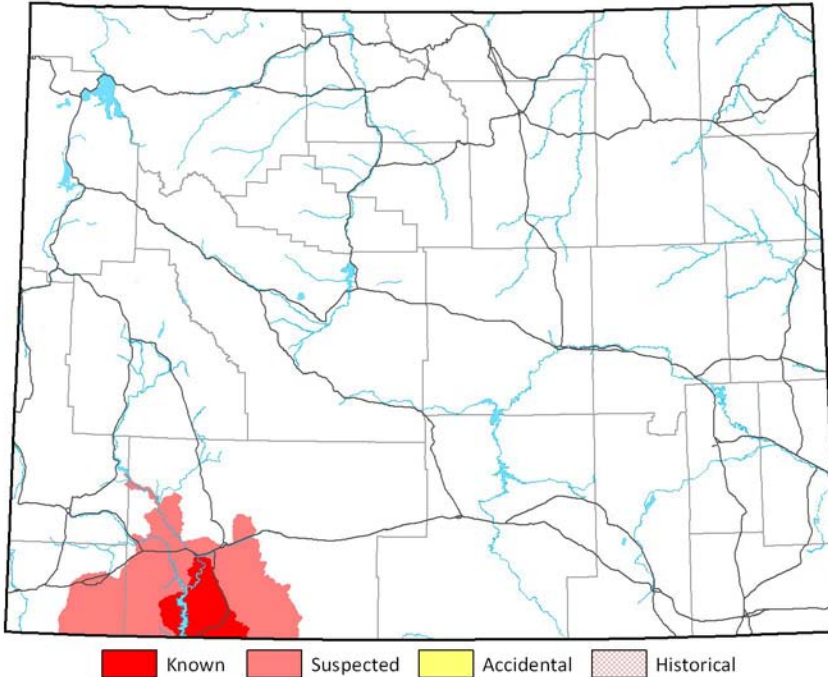


Cliff Chipmunk (*Neotamias dorsalis*) Range Map and Distribution Model Summary

August 20, 2010

This report presents range and distribution of Cliff Chipmunk (AMAFB02110) in Wyoming (see Keinath et al. 2010b). Similar reports were developed by the Wyoming Natural Diversity Database for terrestrial vertebrate species of conservation need in Wyoming's State Wildlife Action Plan. This effort was supported by the Wyoming Game and Fish Department and the U.S. Geological Survey.

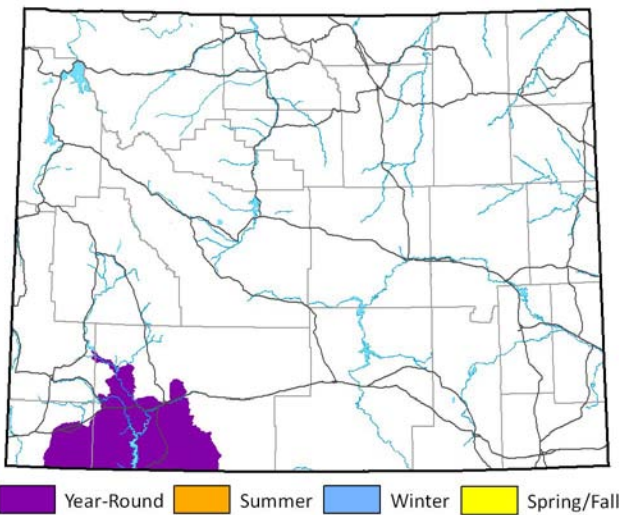
Range Map - Occupancy



Range Notes

- Version: 2010-01-19
- Proportion of range deemed known based on documented occurrences: 0.176
- Details of range map creation noted in Keinath et al. (2010a).

Range Map - Seasonality



Maps, models and report were created by and are available from the Wyoming Natural Diversity Database. (<http://uwadmnweb.uwyo.edu/wyndd/>).

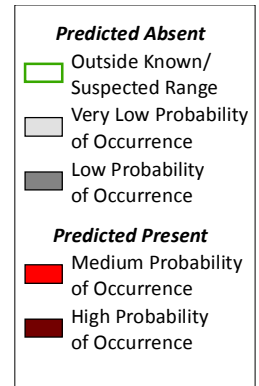
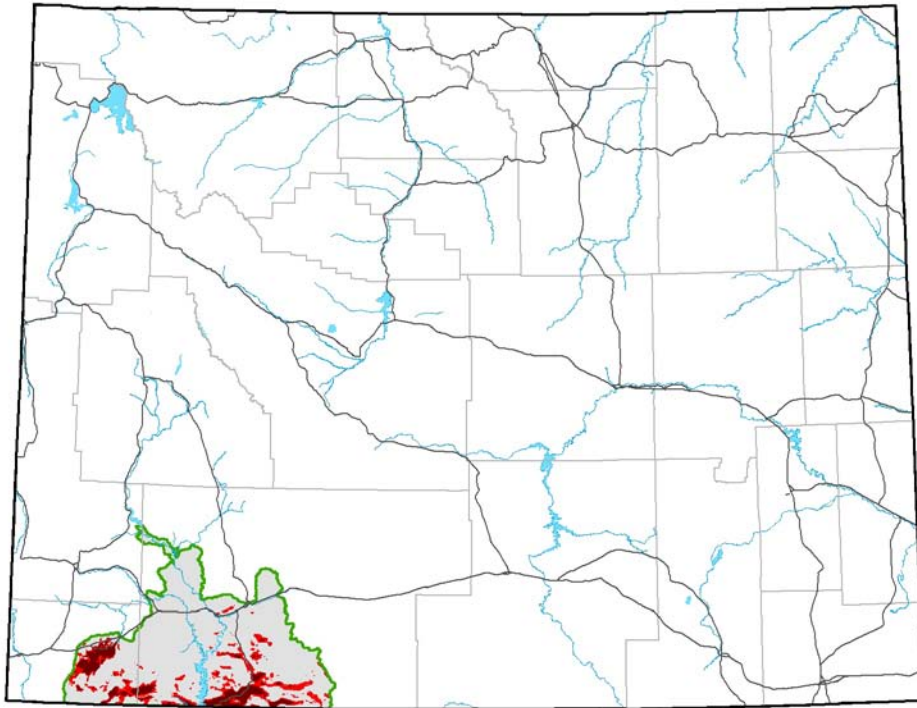
Doug Keinath, Senior Zoologist

Mark Andersen, GIS Specialist

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Distribution Model (Version: Wed Mar 17 16:09:32 MDT 2010)

Details of distribution model creation are presented in Keinath et al. (2010b)



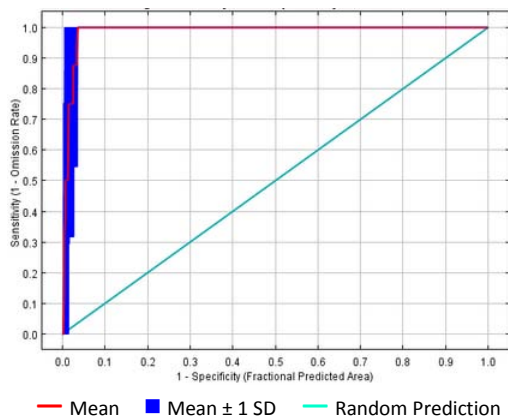
Model Parameters

- Season Modeled: Year-Round
- Algorithm: Maxent version 3.3.1
- Feature Types: Linear
- Binary Threshold Rule: Maximum training sensitivity plus specificity
- Binary Threshold Value: 0.4256530
- High-Probability Threshold Value: 0.6352693
- Low-Probability Threshold Value: 0.4256529

Model Quality Summary

Overall Assessment of Model Quality: LOW
 Expert Assessment: Low
 Occurrence Sample Size: Low
 Quality of Occurrences: Medium
 Positive Success Rate: High
 Test AUC and Model Gain: Medium

Model Evaluation - ROC Plot



Model Evaluation Statistics

Final Model Statistics

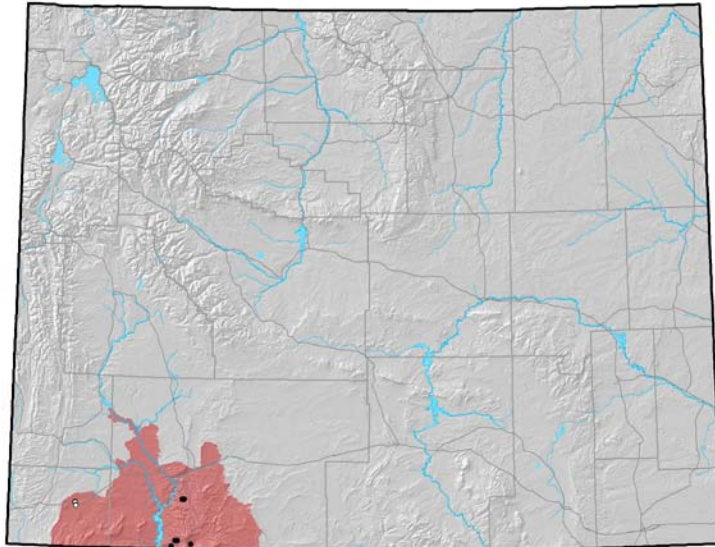
Training AUC: 0.990
 Regularized Training Gain: 2.339

Cross-Validation Statistics

- Average Test AUC: 0.790 ± 0.416
- Upper Bound on Test AUC: 0.945
- Average Test Gain: 2.201 ± 1.297
- Omission Error (fraction of test points omitted during 8-fold cross validation): 0.13 ± 0.35

Occurrence Data for Distribution Model

Occurrence Map



Points Used in Modeling, by Year of Observation

- Pre-1985
- 1985 or Later

Known and Suspected Range

Occurrence Summary Statistics

- Number of Occurrences in AWVED master dataset: 35
- Number of Occurrences used to create distribution model: 8
- Average Point Quality Index (highest quality is 12.00): 6.25 ± 1.39
- Most recent occurrence used: 1998
- Oldest occurrence used: 1940
- Occurrence File:
REVISED_SAMPLE_POINTS_ALL_SPP.csv

Comments

The model for this species is based on a small sample size of occurrence locations, which often results in low model quality. Collection of additional, high-quality occurrence locations could greatly improve the modeled distribution for this species.

References

- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010a. Range maps for Wyoming's species of greatest conservation need. Report prepared for the Wyoming Game and Fish Department by the Wyoming Natural Diversity Database, Laramie, Wyoming. January 19, 2010.
- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010b. Range and modeled distribution of Wyoming's species of greatest conservation need. Report prepared by the Wyoming Natural Diversity Database, Laramie Wyoming for the Wyoming Game and Fish Department, Cheyenne, Wyoming and the U.S. Geological Survey, Fort Collins, Colorado. August 20, 2010.

Predictor Variables used in the Distribution Model

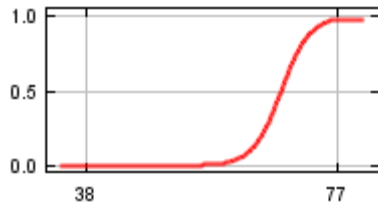
Percent Contribution (PC) to final model

<i>Environmental Variable</i>	<i>PC</i>
Radiation of the darkest month	69
Bare Ground Index	12
Variation of monthly precipitation	11
Conifer Index	5
Coldest quarter mean temperature	2
Wettest quarter mean temperature	1

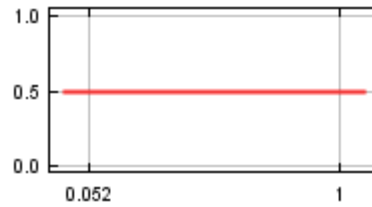
Response Curves

Each curve shows dependence of predicted suitability on input values of a single predictor variable considering correlations with others. Suitability is on the vertical axis (units: probability). Variable values are on the horizontal axis (units based on inputs; see Keinath et al 2010b for details).

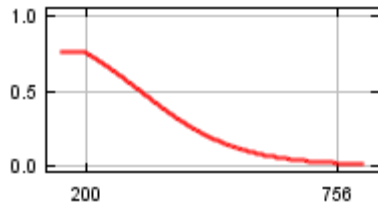
Radiation of the darkest month



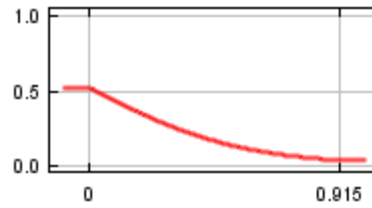
Bare Ground Index



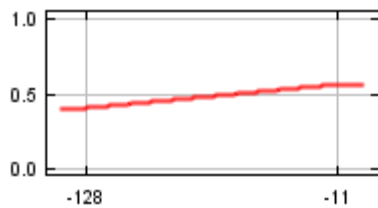
Variation of monthly precipitation



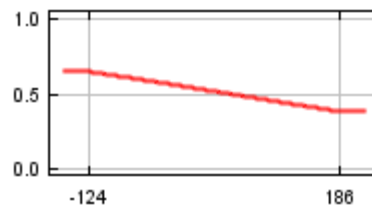
Conifer Index



Coldest quarter mean temperature



Wettest quarter mean temperature

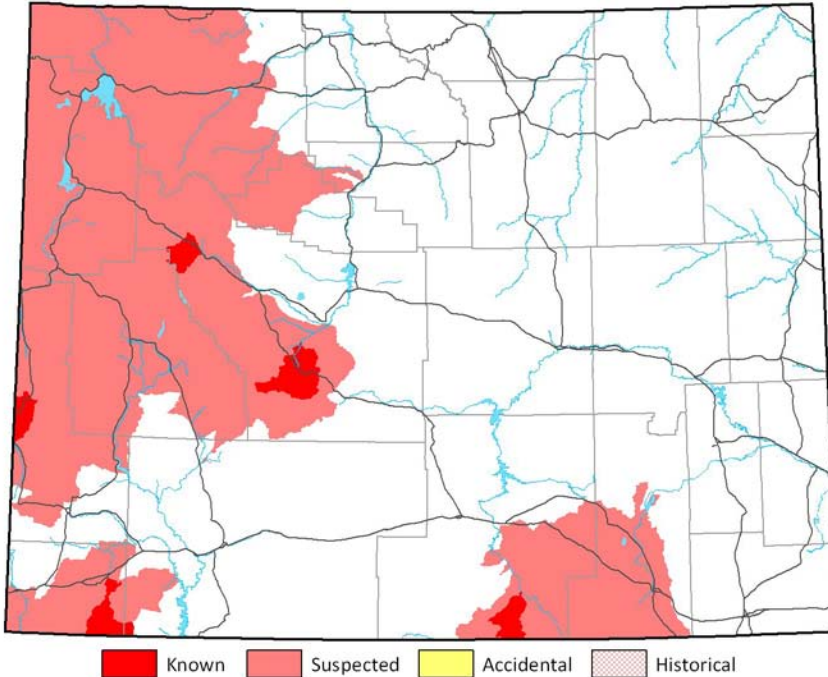


Unita Chipmunk (*Neotamias umbrinus*) Range Map and Distribution Model Summary

August 20, 2010

This report presents range and distribution of Unita Chipmunk (AMAFB02190) in Wyoming (see Keinath et al. 2010b). Similar reports were developed by the Wyoming Natural Diversity Database for terrestrial vertebrate species of conservation need in Wyoming's State Wildlife Action Plan. This effort was supported by the Wyoming Game and Fish Department and the U.S. Geological Survey.

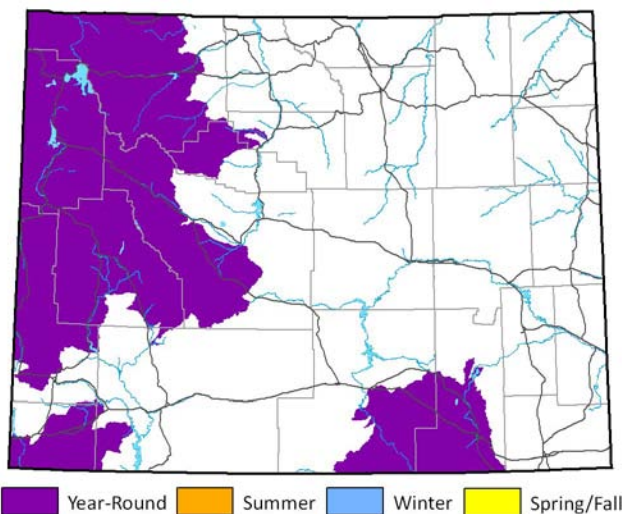
Range Map - Occupancy



Range Notes

- Version: 2010-01-19
- Proportion of range deemed known based on documented occurrences: 0.045
- Details of range map creation noted in Keinath et al. (2010a).

Range Map - Seasonality



Maps, models and report were created by and are available from the Wyoming Natural Diversity Database. (<http://uwadmnweb.uwyo.edu/wyndd/>).

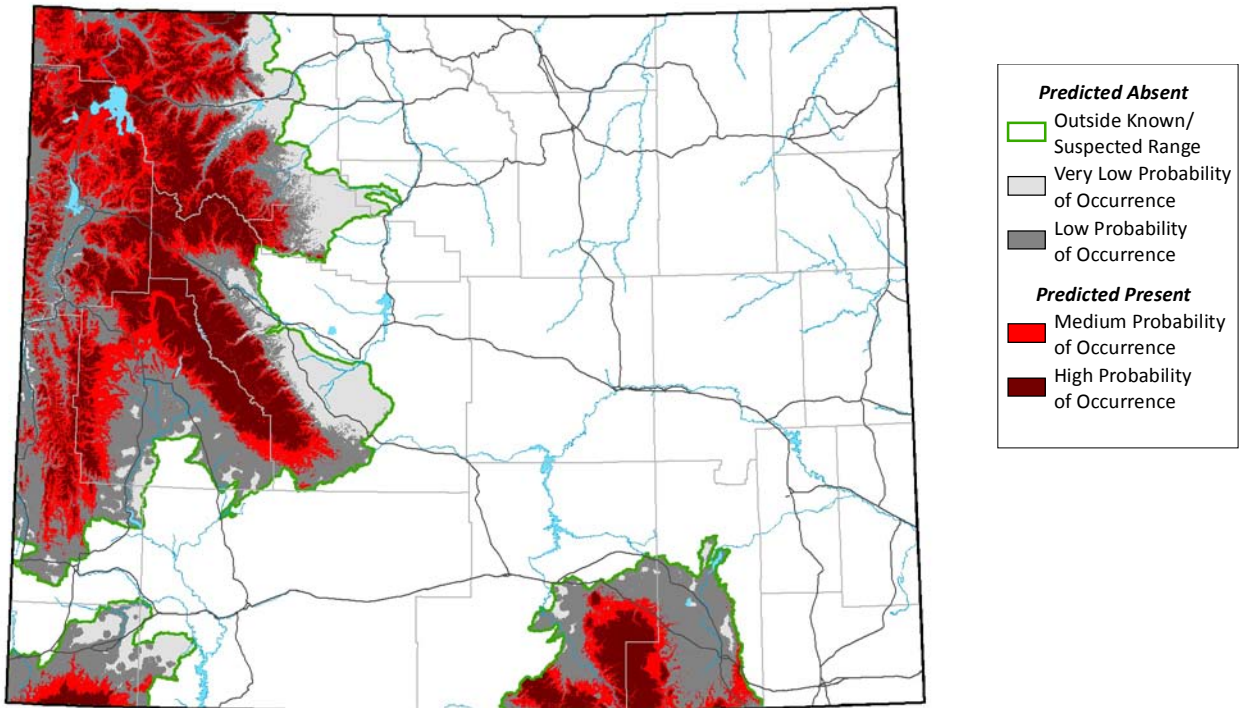
Doug Keinath, Senior Zoologist

Mark Andersen, GIS Specialist

© 2010, WYNDD

Distribution Model (Version: Wed Mar 17 11:23:02 MDT 2010)

Details of distribution model creation are presented in Keinath et al. (2010b)



Model Parameters

- Season Modeled: Year-Round
- Algorithm: Maxent version 3.3.1
- Feature Types: Linear, Product
- Binary Threshold Rule: Maximum training sensitivity plus specificity
- Binary Threshold Value: 0.4032680
- High-Probability Threshold Value: 0.5785689
- Low-Probability Threshold Value: 0.1642015

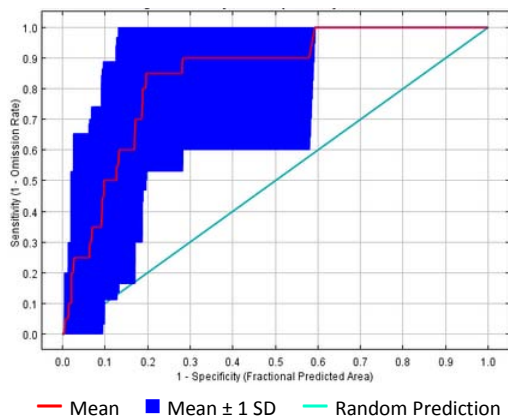
Model Quality Summary

Overall Assessment of Model Quality:

MEDIUM

- Expert Assessment: Medium
- Occurrence Sample Size: Low
- Quality of Occurrences: Low
- Positive Success Rate: Very High
- Test AUC and Model Gain: Medium

Model Evaluation - ROC Plot



Model Evaluation Statistics

Final Model Statistics

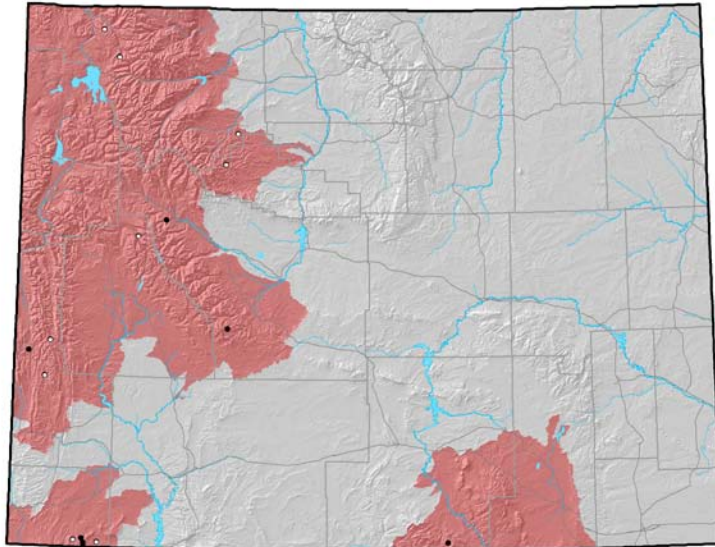
- Training AUC: 0.892
- Regularized Training Gain: 0.819

Cross-Validation Statistics

- Average Test AUC: 0.844 ± 0.163
- Upper Bound on Test AUC: 0.833
- Average Test Gain: 0.762 ± 0.973
- Omission Error (fraction of test points omitted during 10-fold cross validation): 0.06 ± 0.02

Occurrence Data for Distribution Model

Occurrence Map



Points Used in Modeling, by Year of Observation

- Pre-1985
- 1985 or Later

Known and Suspected Range

Occurrence Summary Statistics

- Number of Occurrences in AWVED master dataset: 60
- Number of Occurrences used to create distribution model: 16
- Average Point Quality Index (highest quality is 12.00): 4.25 ± 2.27
- Most recent occurrence used: 1992
- Oldest occurrence used: 1939
- Occurrence File:
REVISED_SAMPLE_POINTS_ALL_SPP.csv

Comments

There are no additional comments specific to this species range map or distribution model.

References

- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010a. Range maps for Wyoming's species of greatest conservation need. Report prepared for the Wyoming Game and Fish Department by the Wyoming Natural Diversity Database, Laramie, Wyoming. January 19, 2010.
- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010b. Range and modeled distribution of Wyoming's species of greatest conservation need. Report prepared by the Wyoming Natural Diversity Database, Laramie Wyoming for the Wyoming Game and Fish Department, Cheyenne, Wyoming and the U.S. Geological Survey, Fort Collins, Colorado. August 20, 2010.

Predictor Variables used in the Distribution Model

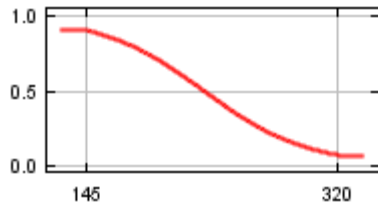
Percent Contribution (PC) to final model

<i>Environmental Variable</i>	<i>PC</i>
Hottest month mean maximum temperature	86
Elevation	7
Distance to Permanent Water	3
Variation of monthly precipitation	2
Degree Slope	1
Conifer Index	0

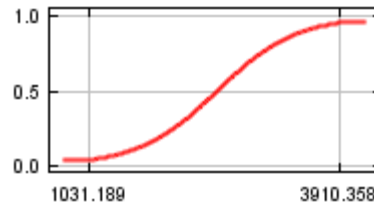
Response Curves

Each curve shows dependence of predicted suitability on input values of a single predictor variable considering correlations with others. Suitability is on the vertical axis (units: probability). Variable values are on the horizontal axis (units based on inputs; see Keinath et al 2010b for details).

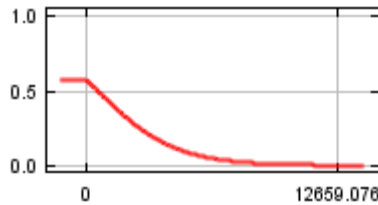
Hottest month mean maximum temperature



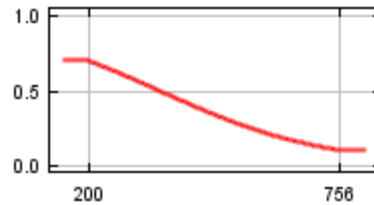
Elevation



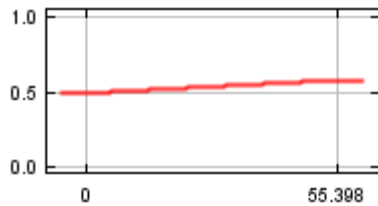
Distance to Permanent Water



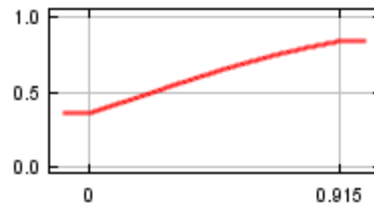
Variation of monthly precipitation



Degree Slope



Conifer Index

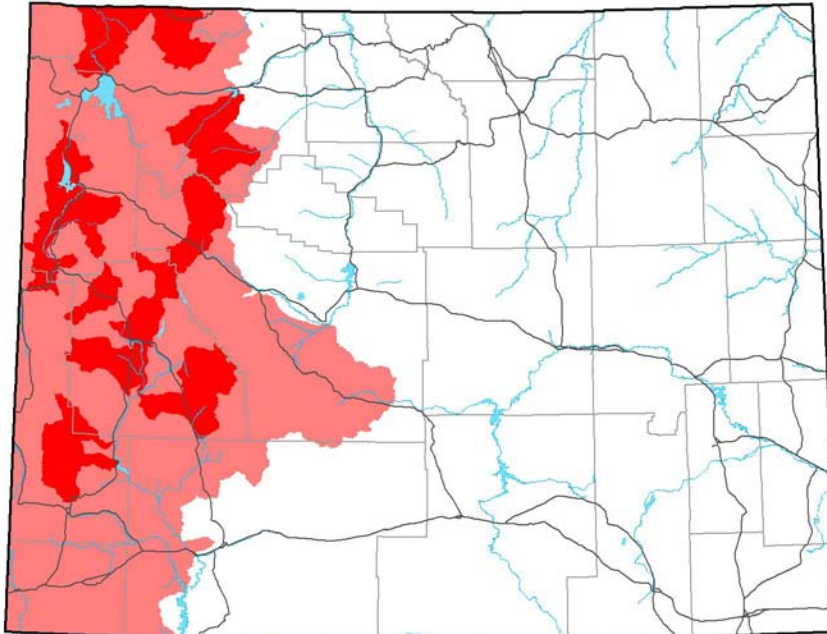


Uinta Ground Squirrel (*Spermophilus armatus*) Range Map and Distribution Model Summary

August 20, 2010

This report presents range and distribution of Uinta Ground Squirrel (AMAFB05050) in Wyoming (see Keinath et al. 2010b). Similar reports were developed by the Wyoming Natural Diversity Database for terrestrial vertebrate species of conservation need in Wyoming's State Wildlife Action Plan. This effort was supported by the Wyoming Game and Fish Department and the U.S. Geological Survey.

Range Map - Occupancy

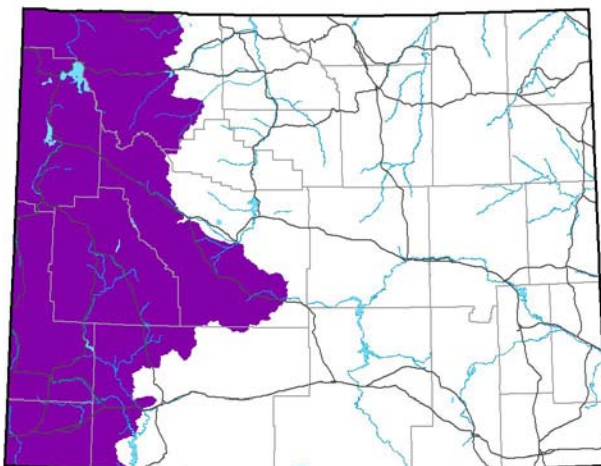


Known Suspected Accidental Historical

Range Notes

- Version: 2010-01-19
- Proportion of range deemed known based on documented occurrences: 0.205
- Details of range map creation noted in Keinath et al. (2010a).

Range Map - Seasonality



Year-Round Summer Winter Spring/Fall

Maps, models and report were created by and are available from the Wyoming Natural Diversity Database. (<http://uwadmnweb.uwyo.edu/wyndd/>).

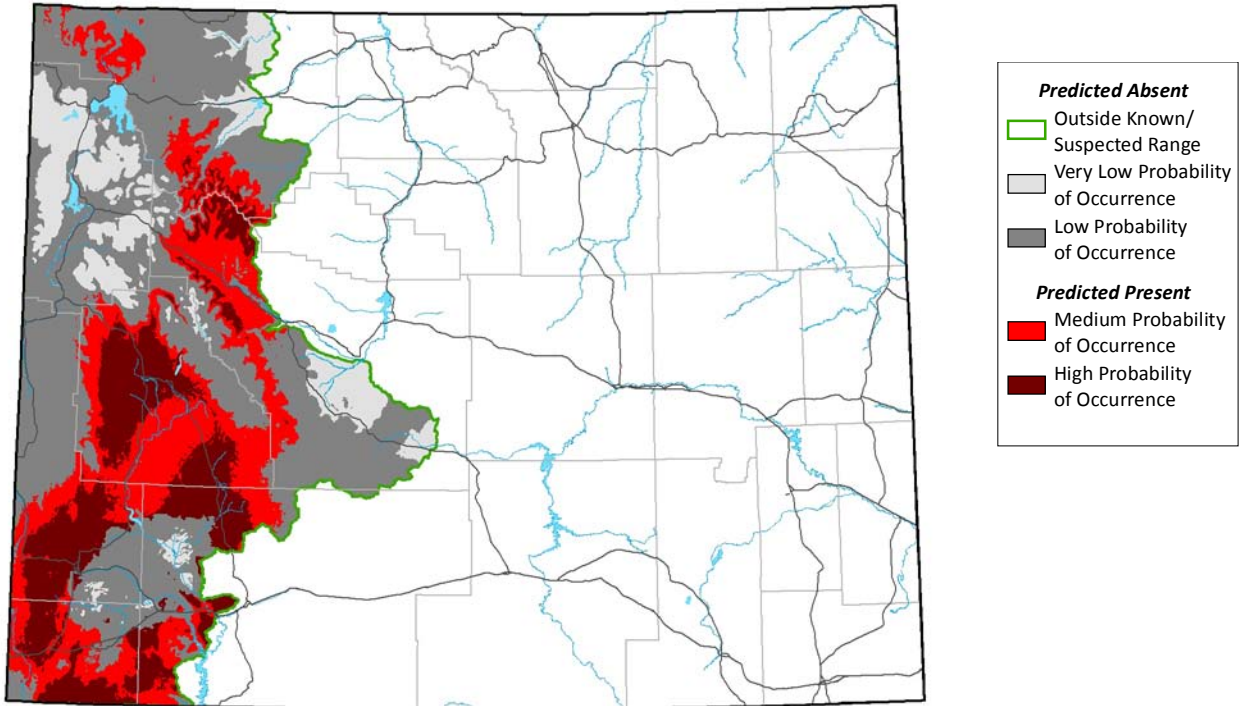
Doug Keinath, Senior Zoologist

Mark Andersen, GIS Specialist

© 2010, WYNDD

Distribution Model (Version: Wed Mar 17 18:41:15 MDT 2010)

Details of distribution model creation are presented in Keinath et al. (2010b)



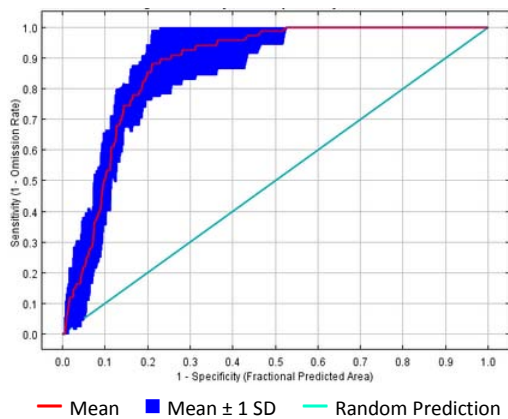
Model Parameters

- Season Modeled: Year-Round
- Algorithm: Maxent version 3.3.1
- Feature Types: Linear, Quadratic, Hinge
- Binary Threshold Rule: Maximum training sensitivity plus specificity
- Binary Threshold Value: 0.4175420
- High-Probability Threshold Value: 0.5924668
- Low-Probability Threshold Value: 0.0784044

Model Quality Summary

Overall Assessment of Model Quality: LOW
 Expert Assessment: Low
 Occurrence Sample Size: Medium-High
 Quality of Occurrences: Medium
 Positive Success Rate: Medium
 Test AUC and Model Gain: Medium

Model Evaluation - ROC Plot



Model Evaluation Statistics

Final Model Statistics

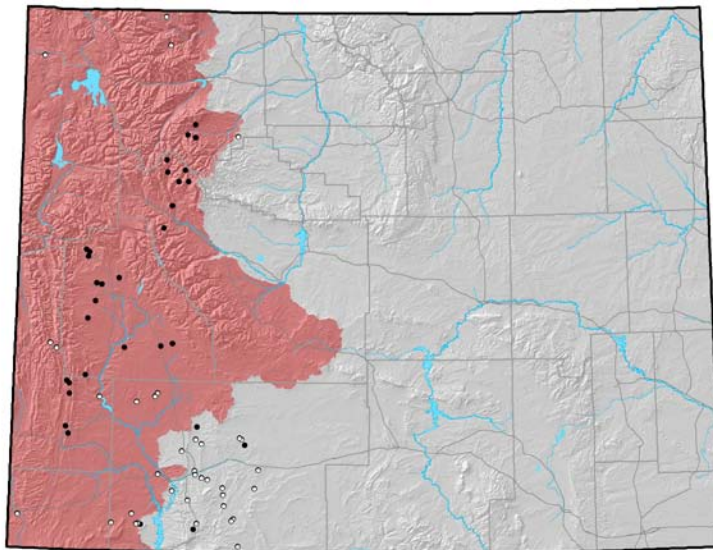
Training AUC: 0.903
 Regularized Training Gain: 1.007

Cross-Validation Statistics

- Average Test AUC: 0.876 ± 0.030
- Upper Bound on Test AUC: 0.864
- Average Test Gain: 1.060 ± 0.220
- Omission Error (fraction of test points omitted during 10-fold cross validation): 0.20 ± 0.10

Occurrence Data for Distribution Model

Occurrence Map



Points Used in Modeling, by Year of Observation

- Pre-1985
- 1985 or Later

Known and Suspected Range

Occurrence Summary Statistics

- Number of Occurrences in AWVED master dataset: 669
- Number of Occurrences used to create distribution model: 67
- Average Point Quality Index (highest quality is 12.00): 6.88 ± 3.14
- Most recent occurrence used: 2006
- Oldest occurrence used: 1934
- Occurrence File:
REVISED_SAMPLE_POINTS_ALL_SPP.csv

Comments

There is a high likelihood of confusing the identification of Wyoming and Uinta Ground Squirrels, which is compounded by a general misunderstanding of where they occur in the state. This confusion has resulted in many occurrence points of each being mistakenly labeled as the other species. We eliminated clearly erroneous records, but many misidentifications likely remain in both data sets. Conclusive identification of this species is difficult unless the observer is experienced with the species. We suspect numerous occurrences could be in error, thus resulting in lower than expected model quality. The lack of supporting data provided with many occurrences (notably those from the Wildlife Observation System) makes it impossible to assess the accuracy of such observations. Supplementation/replacement of the existing data set with high-quality occurrence locations could greatly improve the modeled distribution for this species. Due to timing of range map edits, the distribution model for Uinta ground squirrel was created before final edits were made to the range map. As a result, several datapoints used in the model fall outside the accepted range of the species. Future versions of the model should eliminate these occurrences, as they are likely records of Wyoming ground squirrel.

References

- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010a. Range maps for Wyoming's species of greatest conservation need. Report prepared for the Wyoming Game and Fish Department by the Wyoming Natural Diversity Database, Laramie, Wyoming. January 19, 2010.
- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010b. Range and modeled distribution of Wyoming's species of greatest conservation need. Report prepared by the Wyoming Natural Diversity Database, Laramie Wyoming for the Wyoming Game and Fish Department, Cheyenne, Wyoming and the U.S. Geological Survey, Fort Collins, Colorado. August 20, 2010.

Predictor Variables used in the Distribution Model

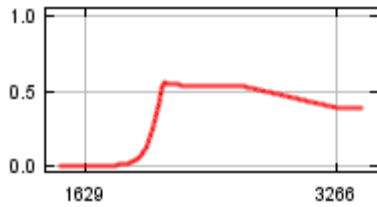
Percent Contribution (PC) to final model

<i>Environmental Variable</i>	<i>PC</i>
Annual number of Frost Days	39
Coldest month mean minimum temperature	22
Annual precipitation range (P3 – P2)	16
Warmest quarter mean temperature	11
Radiation of the lightest month	8
Relative Humidity of most humid month	4

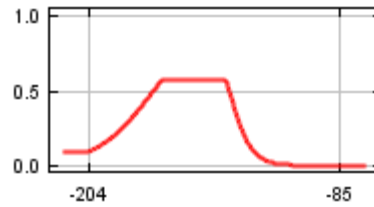
Response Curves

Each curve shows dependence of predicted suitability on input values of a single predictor variable considering correlations with others. Suitability is on the vertical axis (units: probability). Variable values are on the horizontal axis (units based on inputs; see Keinath et al 2010b for details).

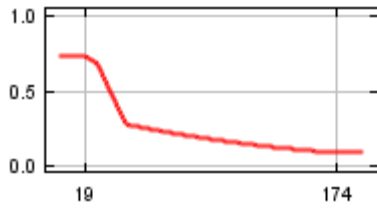
Annual number of Frost Days



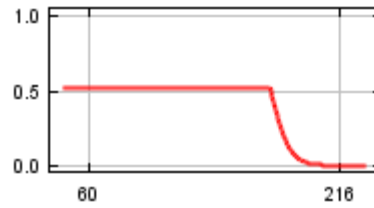
Coldest month mean minimum temperature



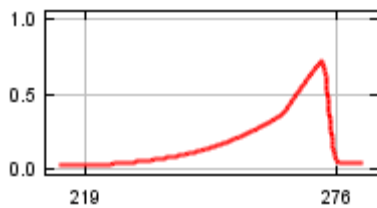
Annual precipitation range (P3 – P2)



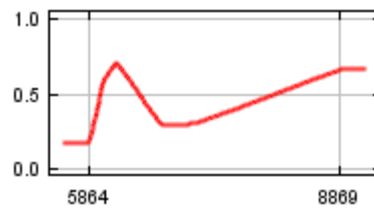
Warmest quarter mean temperature



Radiation of the lightest month



Relative Humidity of most humid month

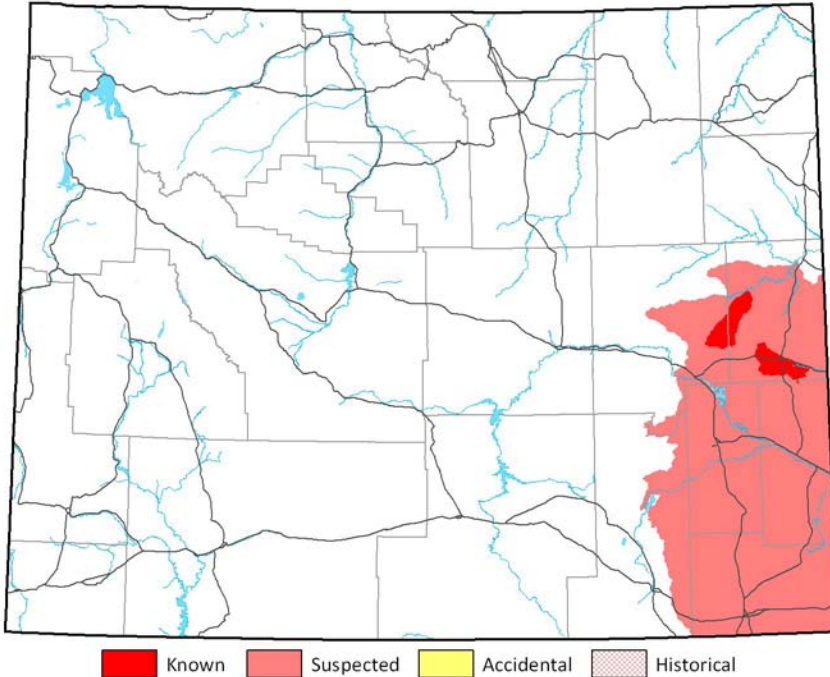


Spotted Ground Squirrel (*Spermophilus spilosoma*) Range Map and Distribution Model Summary

August 20, 2010

This report presents range and distribution of Spotted Ground Squirrel (AMAFB05110) in Wyoming (see Keinath et al. 2010b). Similar reports were developed by the Wyoming Natural Diversity Database for terrestrial vertebrate species of conservation need in Wyoming's State Wildlife Action Plan. This effort was supported by the Wyoming Game and Fish Department and the U.S. Geological Survey.

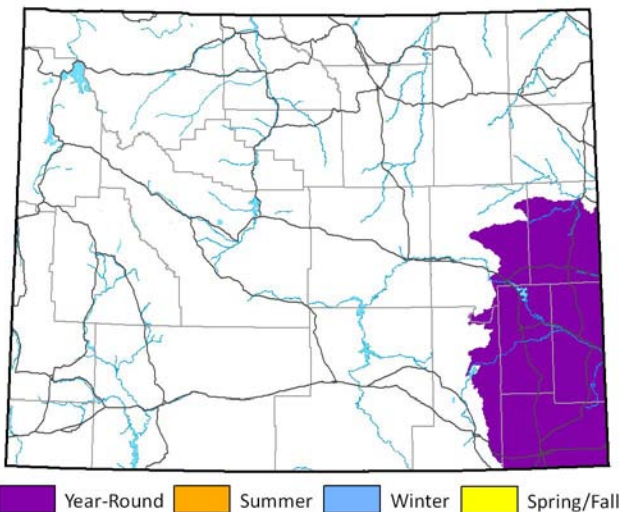
Range Map - Occupancy



Range Notes

- Version: 2010-01-19
- Proportion of range deemed known based on documented occurrences: 0.035
- Details of range map creation noted in Keinath et al. (2010a).

Range Map - Seasonality



Maps, models and report were created by and are available from the Wyoming Natural Diversity Database. (<http://uwadmnweb.uwyo.edu/wyndd/>).

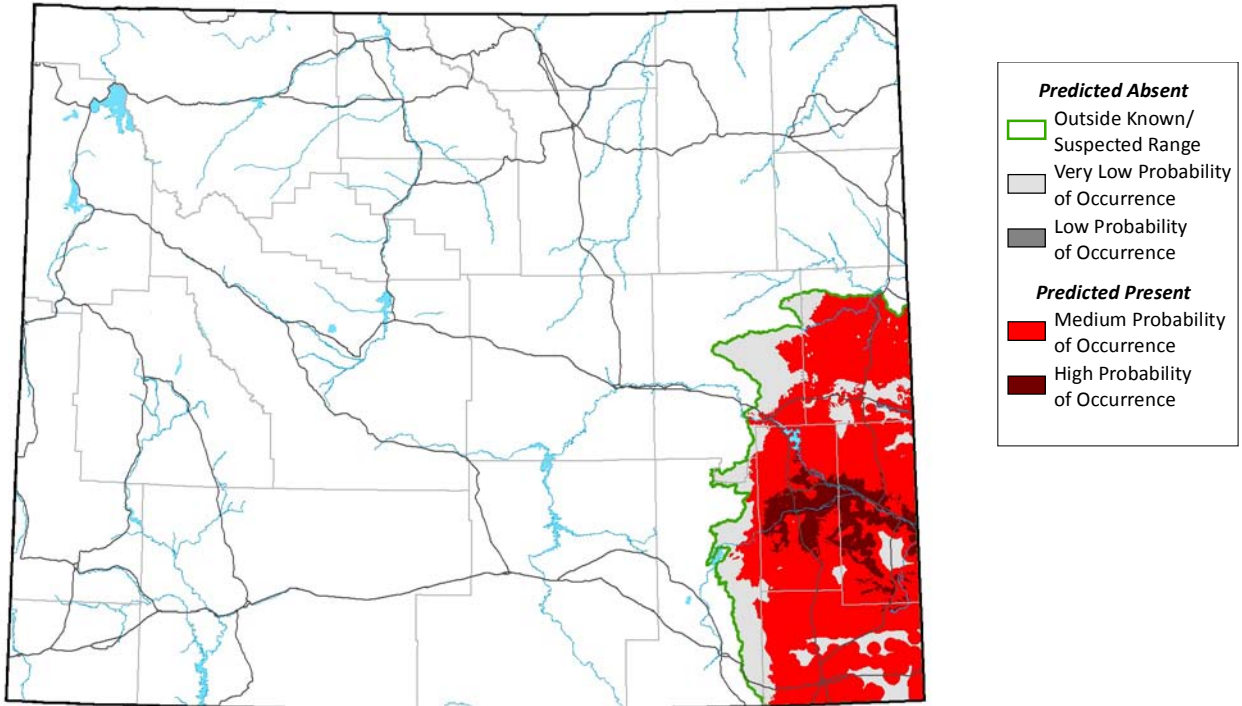
Doug Keinath, Senior Zoologist

Mark Andersen, GIS Specialist

© 2010, WYNDD

Distribution Model (Version: Thu Mar 18 06:20:53 MDT 2010)

Details of distribution model creation are presented in Keinath et al. (2010b)



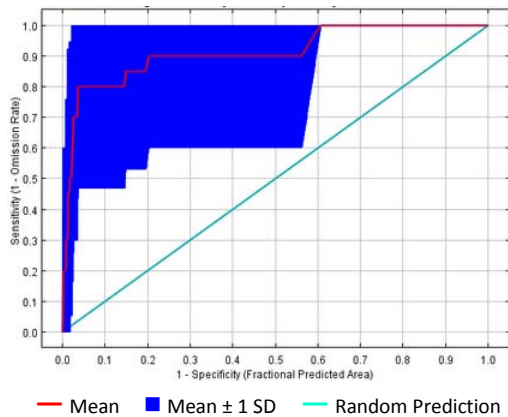
Model Parameters

- Season Modeled: Year-Round
- Algorithm: Maxent version 3.3.1
- Feature Types: Linear, Quadratic
- Binary Threshold Rule: Maximum training sensitivity plus specificity
- Binary Threshold Value: 0.0786670
- High-Probability Threshold Value: 0.6481876
- Low-Probability Threshold Value: 0.0786670

Model Quality Summary

Overall Assessment of Model Quality: LOW
 Expert Assessment: Medium
 Occurrence Sample Size: Low
 Quality of Occurrences: Low
 Positive Success Rate: Low
 Test AUC and Model Gain: High

Model Evaluation - ROC Plot



Model Evaluation Statistics

Final Model Statistics

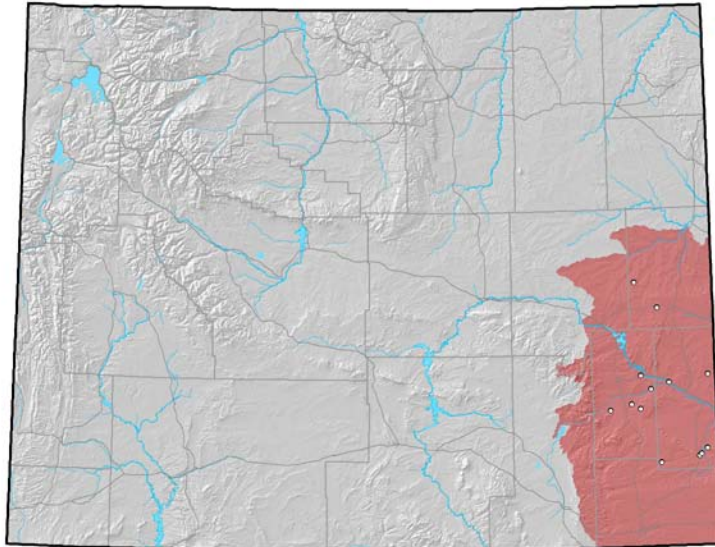
Training AUC: 0.966
 Regularized Training Gain: 2.225

Cross-Validation Statistics

- Average Test AUC: 0.912 ± 0.180
- Upper Bound on Test AUC: 0.953
- Average Test Gain: 1.176 ± 4.561
- Omission Error (fraction of test points omitted during 10-fold cross validation): 0.45 ± 0.38

Occurrence Data for Distribution Model

Occurrence Map



Points Used in Modeling, by Year of Observation

- Pre-1985
- 1985 or Later

■ Known and Suspected Range

Occurrence Summary Statistics

- Number of Occurrences in AWVED master dataset: 22
- Number of Occurrences used to create distribution model: 13
- Average Point Quality Index (highest quality is 12.00): 5.46 ± 2.07
- Most recent occurrence used: 1985
- Oldest occurrence used: 1909
- Occurrence File:
LOCAL_SAMPLE_POINTS_W_PDOG_2.csv

Comments

There are no additional comments specific to this species range map or distribution model.

References

- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010a. Range maps for Wyoming's species of greatest conservation need. Report prepared for the Wyoming Game and Fish Department by the Wyoming Natural Diversity Database, Laramie, Wyoming. January 19, 2010.
- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010b. Range and modeled distribution of Wyoming's species of greatest conservation need. Report prepared by the Wyoming Natural Diversity Database, Laramie Wyoming for the Wyoming Game and Fish Department, Cheyenne, Wyoming and the U.S. Geological Survey, Fort Collins, Colorado. August 20, 2010.

Predictor Variables used in the Distribution Model

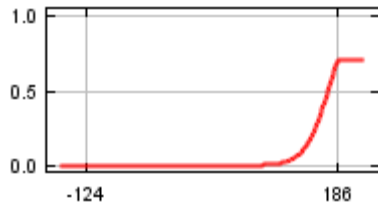
Percent Contribution (PC) to final model

<i>Environmental Variable</i>	<i>PC</i>
Wettest quarter mean temperature	60
Isothermality (T2/T5)	19
Coldest quarter mean temperature	10
Potential for Rock Outcrop	6
Depth to Shallowest Restrictive Layer	5
Warmest quarter mean temperature	0

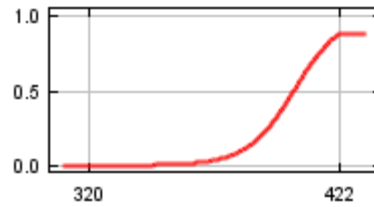
Response Curves

Each curve shows dependence of predicted suitability on input values of a single predictor variable considering correlations with others. Suitability is on the vertical axis (units: probability). Variable values are on the horizontal axis (units based on inputs; see Keinath et al 2010b for details).

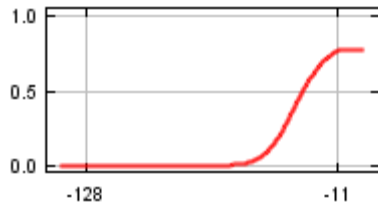
Wettest quarter mean temperature



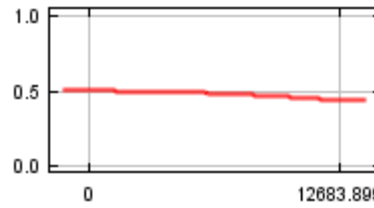
Isothermality (T2/T5)



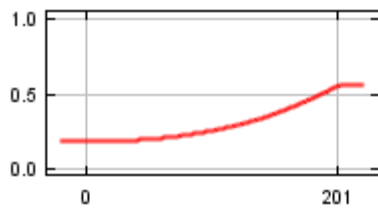
Coldest quarter mean temperature



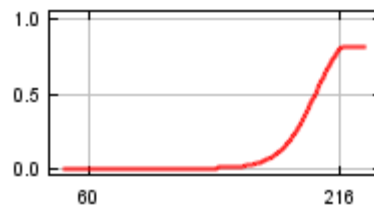
Potential for Rock Outcrop



Depth to Shallowest Restrictive Layer



Warmest quarter mean temperature

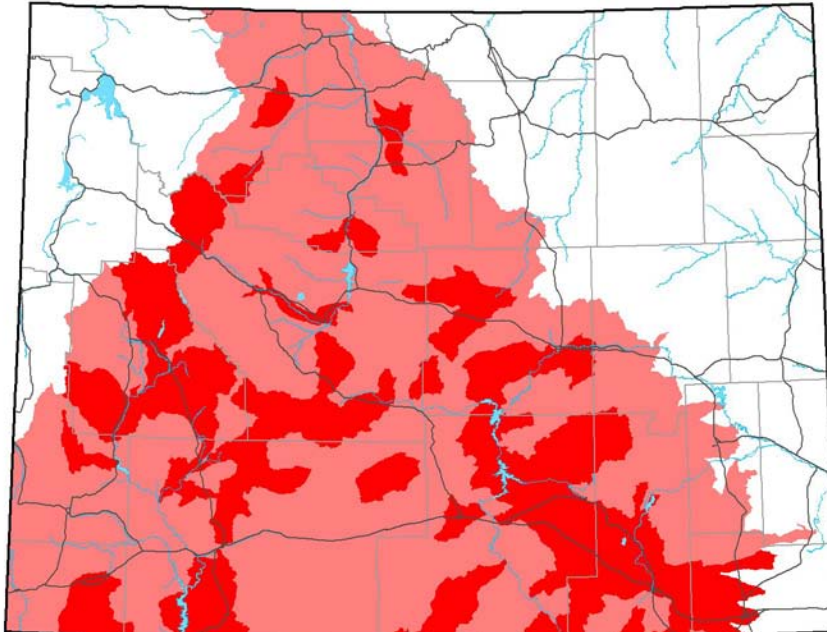


Wyoming Ground Squirrel (*Spermophilus elegans*) Range Map and Distribution Model Summary

August 20, 2010

This report presents range and distribution of Wyoming Ground Squirrel (AMAFB05190) in Wyoming (see Keinath et al. 2010b). Similar reports were developed by the Wyoming Natural Diversity Database for terrestrial vertebrate species of conservation need in Wyoming's State Wildlife Action Plan. This effort was supported by the Wyoming Game and Fish Department and the U.S. Geological Survey.

Range Map - Occupancy

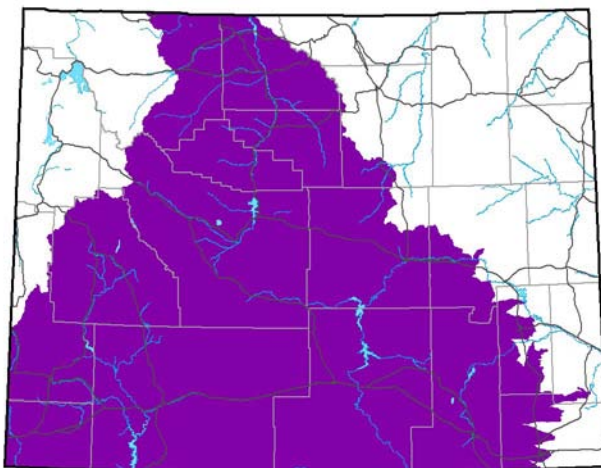


■ Known ■ Suspected ■ Accidental ■ Historical

Range Notes

- Version: 2010-01-19
- Proportion of range deemed known based on documented occurrences: 0.296
- Details of range map creation noted in Keinath et al. (2010a).

Range Map - Seasonality



■ Year-Round ■ Summer ■ Winter ■ Spring/Fall

Maps, models and report were created by and are available from the Wyoming Natural Diversity Database. (<http://uwadmnweb.uwyo.edu/wyndd/>).

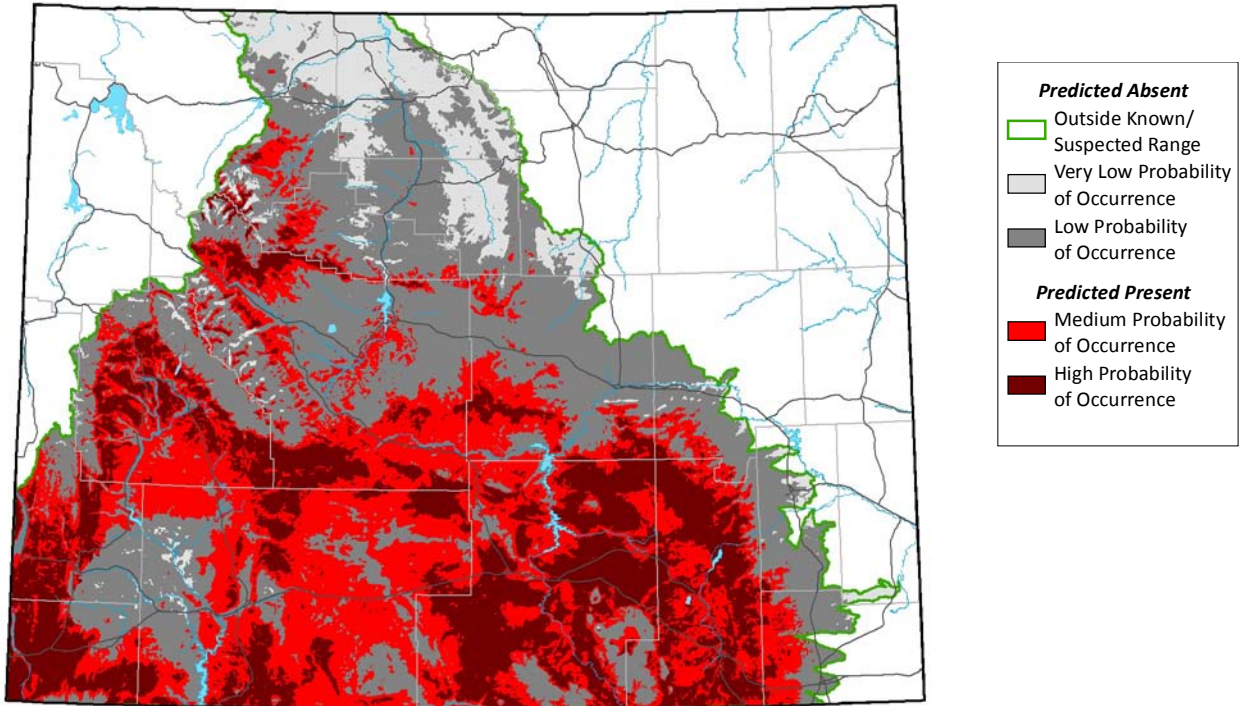
Doug Keinath, Senior Zoologist

Mark Andersen, GIS Specialist

© 2010, WYNDD

Distribution Model (Version: Fri Dec 04 21:31:05 MST 2009)

Details of distribution model creation are presented in Keinath et al. (2010b)



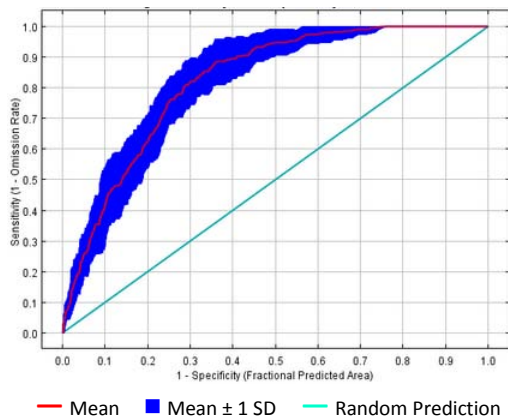
Model Parameters

- Season Modeled: Year-Round
- Algorithm: Maxent version 3.3.1
- Feature Types: Linear, Product, Quadratic, Hinge, Threshold
- Binary Threshold Rule: Maximum training sensitivity plus specificity
- Binary Threshold Value: 0.3018450
- High-Probability Threshold Value: 0.5341207
- Low-Probability Threshold Value: 0.0436438

Model Quality Summary

Overall Assessment of Model Quality: LOW
 Expert Assessment: Low
 Occurrence Sample Size: High
 Quality of Occurrences: Medium
 Positive Success Rate: High
 Test AUC and Model Gain: Medium

Model Evaluation - ROC Plot



Model Evaluation Statistics

Final Model Statistics

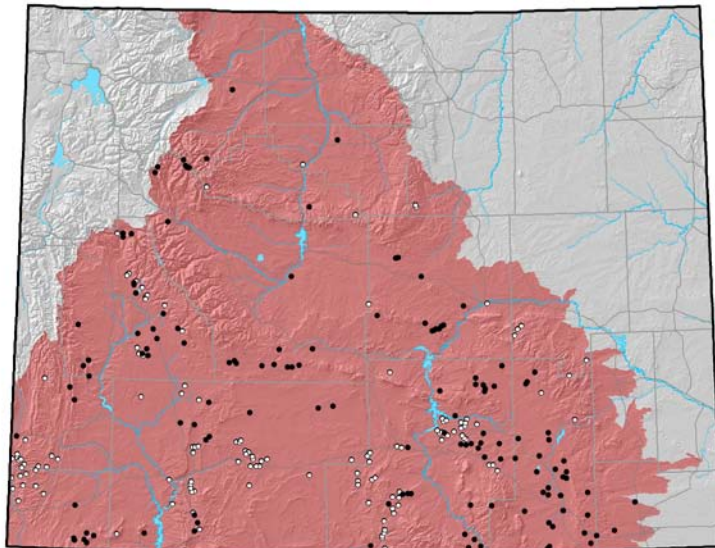
Training AUC: 0.858
 Regularized Training Gain: 0.854

Cross-Validation Statistics

- Average Test AUC: 0.822 ± 0.036
- Upper Bound on Test AUC: 0.840
- Average Test Gain: 0.729 ± 0.200
- Omission Error (fraction of test points omitted during 10-fold cross validation): 0.17 ± 0.10

Occurrence Data for Distribution Model

Occurrence Map



Points Used in Modeling, by Year of Observation

- Pre-1985
- 1985 or Later

Known and Suspected Range

Occurrence Summary Statistics

- Number of Occurrences in AWVED master dataset: 509
- Number of Occurrences used to create distribution model: 268
- Average Point Quality Index (highest quality is 12.00): 6.13 ± 2.16
- Most recent occurrence used: 2008
- Oldest occurrence used: 1929
- Occurrence File:
LOCAL_SAMPLE_POINTS.csv

Comments

There is a high likelihood of confusing the identification of Wyoming and Uinta Ground Squirrels, which is compounded by a general misunderstanding of where they occur in the state. This confusion has resulted in many occurrence points of each being mistakenly labeled as the other species. We eliminated clearly erroneous records, but many misidentifications likely remain in both data sets. Conclusive identification of this species is difficult unless the observer is experienced with the species. We suspect numerous occurrences could be in error, thus resulting in lower than expected model quality. The lack of supporting data provided with many occurrences (notably those from the Wildlife Observation System) makes it impossible to assess the accuracy of such observations. Supplementation/replacement of the existing data set with high-quality occurrence locations could greatly improve the modeled distribution for this species.

References

- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010a. Range maps for Wyoming's species of greatest conservation need. Report prepared for the Wyoming Game and Fish Department by the Wyoming Natural Diversity Database, Laramie, Wyoming. January 19, 2010.
- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010b. Range and modeled distribution of Wyoming's species of greatest conservation need. Report prepared by the Wyoming Natural Diversity Database, Laramie Wyoming for the Wyoming Game and Fish Department, Cheyenne, Wyoming and the U.S. Geological Survey, Fort Collins, Colorado. August 20, 2010.

Predictor Variables used in the Distribution Model

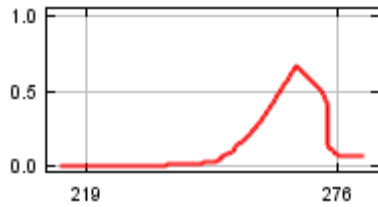
Percent Contribution (PC) to final model

<i>Environmental Variable</i>	<i>PC</i>
Radiation of the lightest month	25
Annual total radiation	22
Elevation	21
Sagebrush Index	17
Annual temperature range (T3 – T4)	10
Standard deviation of monthly temperature	4

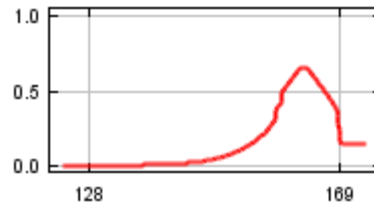
Response Curves

Each curve shows dependence of predicted suitability on input values of a single predictor variable considering correlations with others. Suitability is on the vertical axis (units: probability). Variable values are on the horizontal axis (units based on inputs; see Keinath et al 2010b for details).

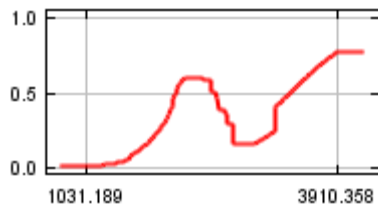
Radiation of the lightest month



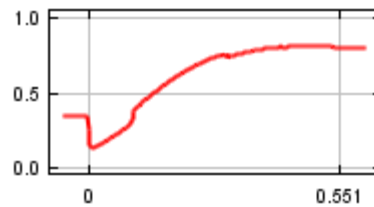
Annual total radiation



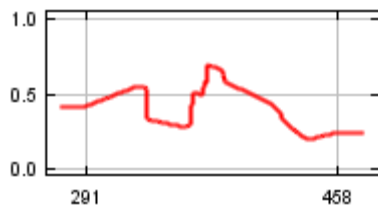
Elevation



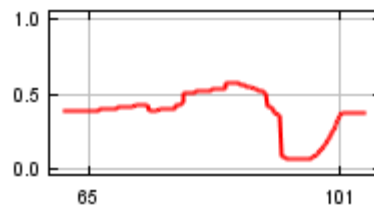
Sagebrush Index



Annual temperature range (T3 – T4)



Standard deviation of monthly temperature

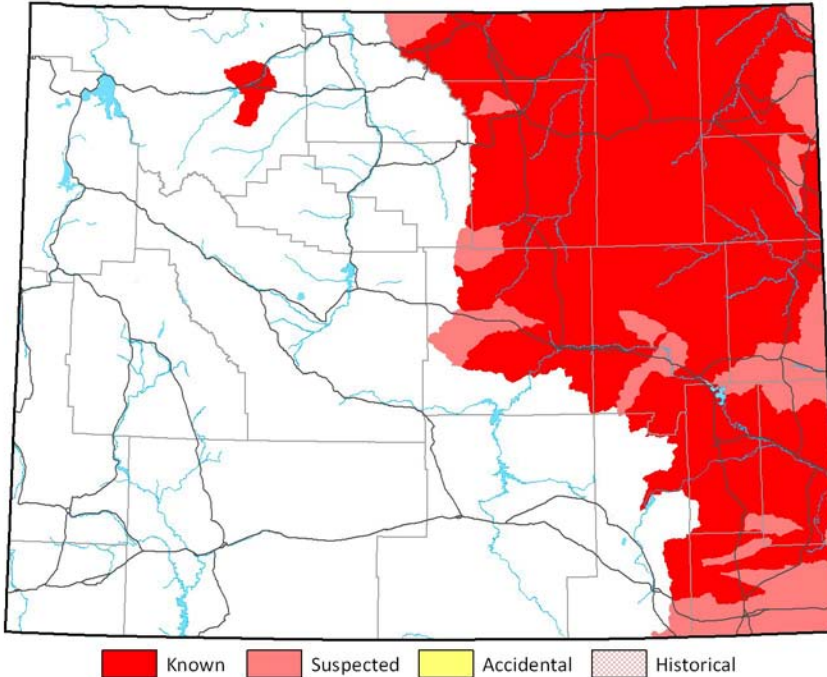


Black-tailed Prairie Dog (*Cynomys ludovicianus*) Range Map and Distribution Model Summary

August 20, 2010

This report presents range and distribution of Black-tailed Prairie Dog (AMAFB06010) in Wyoming (see Keinath et al. 2010b). Similar reports were developed by the Wyoming Natural Diversity Database for terrestrial vertebrate species of conservation need in Wyoming's State Wildlife Action Plan. This effort was supported by the Wyoming Game and Fish Department and the U.S. Geological Survey.

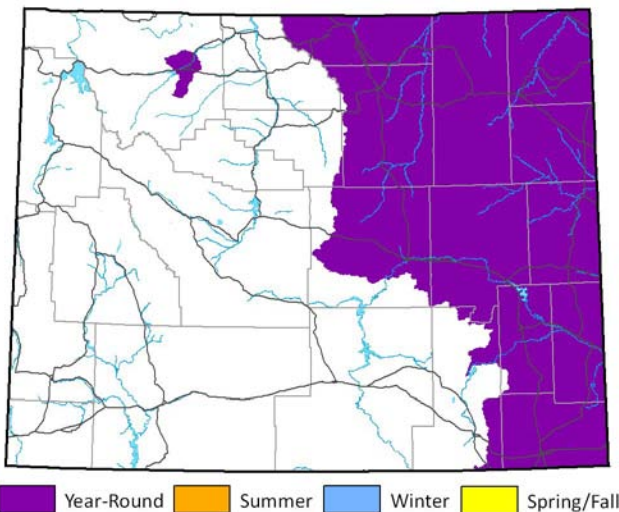
Range Map - Occupancy



Range Notes

- Version: 2010-01-19
- Proportion of range deemed known based on documented occurrences: 0.693
- Details of range map creation noted in Keinath et al. (2010a).

Range Map - Seasonality



Maps, models and report were created by and are available from the Wyoming Natural Diversity Database. (<http://uwadmnweb.uwyo.edu/wyndd/>).

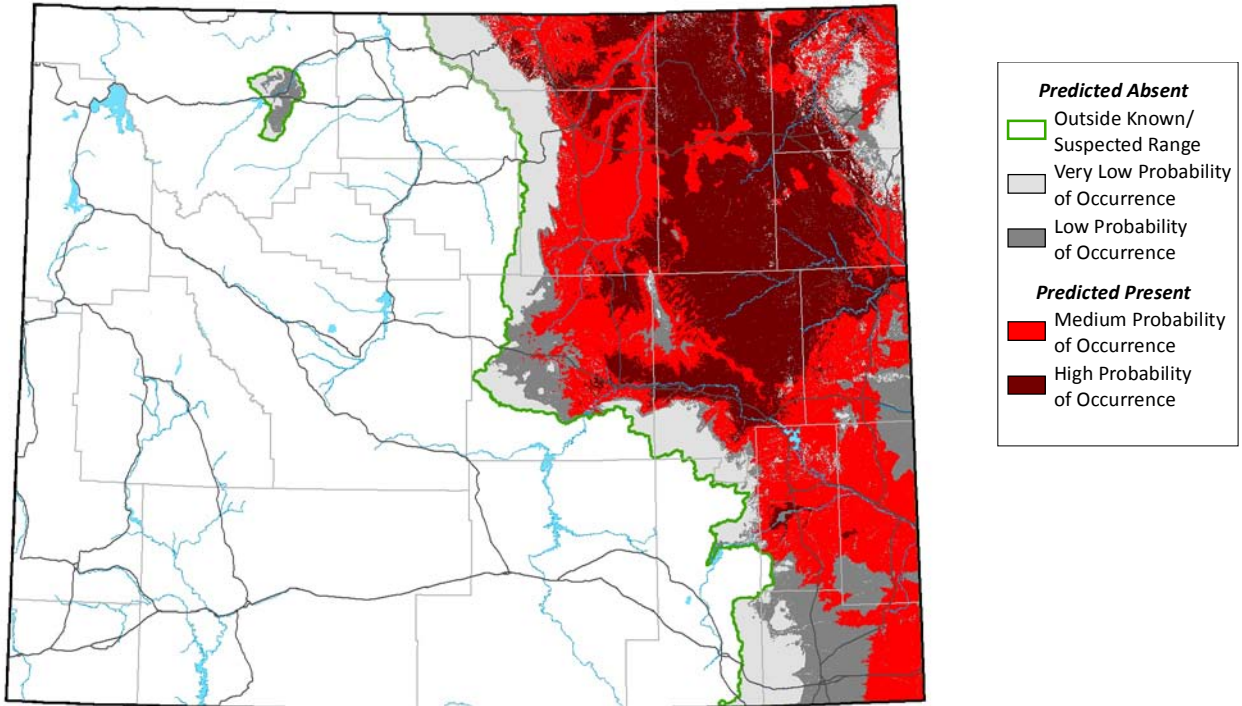
Doug Keinath, Senior Zoologist

Mark Andersen, GIS Specialist

© 2010, WYNDD

Distribution Model (Version: Sat Dec 05 02:02:16 MST 2009)

Details of distribution model creation are presented in Keinath et al. (2010b)



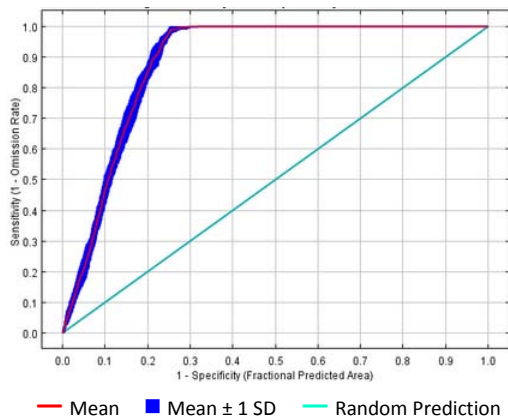
Model Parameters

- Season Modeled: Year-Round
- Algorithm: Maxent version 3.3.1
- Feature Types: Linear, Product, Quadratic, Hinge, Threshold
- Binary Threshold Rule: Maximum training sensitivity plus specificity
- Binary Threshold Value: 0.2625890
- High-Probability Threshold Value: 0.5286132
- Low-Probability Threshold Value: 0.0187500

Model Quality Summary

Overall Assessment of Model Quality: HIGH
 Expert Assessment: High
 Occurrence Sample Size: High
 Quality of Occurrences: High
 Positive Success Rate: Very High
 Test AUC and Model Gain: Medium

Model Evaluation - ROC Plot



Model Evaluation Statistics

Final Model Statistics

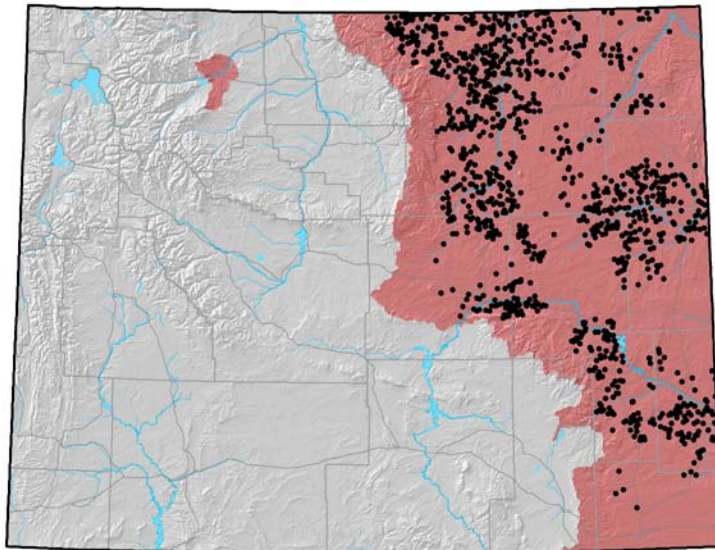
Training AUC: 0.887
 Regularized Training Gain: 1.291

Cross-Validation Statistics

- Average Test AUC: 0.885 ± 0.007
- Upper Bound on Test AUC: 0.882
- Average Test Gain: 1.334 ± 0.049
- Omission Error (fraction of test points omitted during 10-fold cross validation): 0.03 ± 0.01

Occurrence Data for Distribution Model

Occurrence Map



Points Used in Modeling, by Year of Observation

- Pre-1985
- 1985 or Later

■ Known and Suspected Range

Occurrence Summary Statistics

- Number of Occurrences in AWVED master dataset: 1,614
- Number of Occurrences used to create distribution model: 1,132
- Average Point Quality Index (highest quality is 12.00): 12.00 ± 0.00
- Most recent occurrence used: 2006
- Oldest occurrence used: 2002
- Occurrence File:
LOCAL_SAMPLE_POINTS.csv

Comments

The western-most hydrologic unit where black-tailed prairie dogs are known to occur (i.e., near the town of Cody), was introduced by humans and should probably not be considered part of the species' natural range or distribution.

References

- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010a. Range maps for Wyoming's species of greatest conservation need. Report prepared for the Wyoming Game and Fish Department by the Wyoming Natural Diversity Database, Laramie, Wyoming. January 19, 2010.
- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010b. Range and modeled distribution of Wyoming's species of greatest conservation need. Report prepared by the Wyoming Natural Diversity Database, Laramie Wyoming for the Wyoming Game and Fish Department, Cheyenne, Wyoming and the U.S. Geological Survey, Fort Collins, Colorado. August 20, 2010.

Predictor Variables used in the Distribution Model

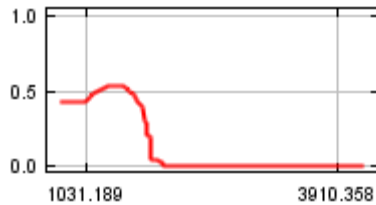
Percent Contribution (PC) to final model

<i>Environmental Variable</i>	<i>PC</i>
Elevation	37
Coldest quarter mean temperature	30
Annual precipitation range (P3 – P2)	11
Hottest month mean maximum temperature	9
Coldest month mean minimum temperature	7
Percent Forest Cover	6

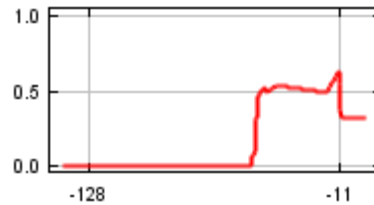
Response Curves

Each curve shows dependence of predicted suitability on input values of a single predictor variable considering correlations with others. Suitability is on the vertical axis (units: probability). Variable values are on the horizontal axis (units based on inputs; see Keinath et al 2010b for details).

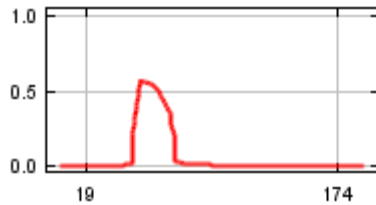
Elevation



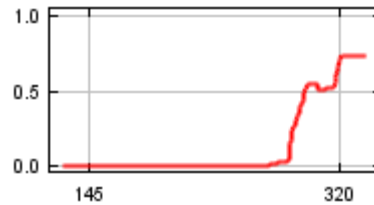
Coldest quarter mean temperature



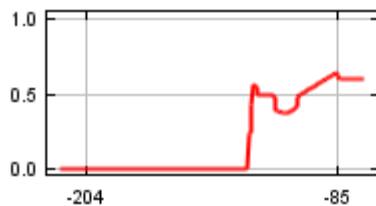
Annual precipitation range (P3 – P2)



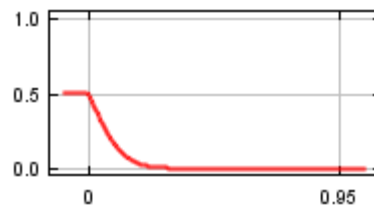
Hottest month mean maximum temperature



Coldest month mean minimum temperature



Percent Forest Cover

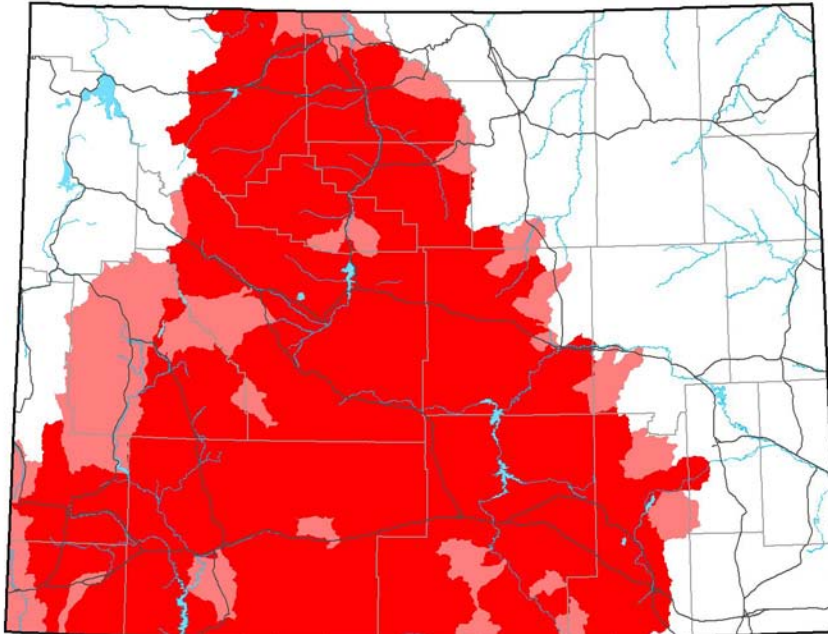


White-tailed Prairie Dog (*Cynomys leucurus*) Range Map and Distribution Model Summary

August 20, 2010

This report presents range and distribution of White-tailed Prairie Dog (AMAFB06020) in Wyoming (see Keinath et al. 2010b). Similar reports were developed by the Wyoming Natural Diversity Database for terrestrial vertebrate species of conservation need in Wyoming's State Wildlife Action Plan. This effort was supported by the Wyoming Game and Fish Department and the U.S. Geological Survey.

Range Map - Occupancy

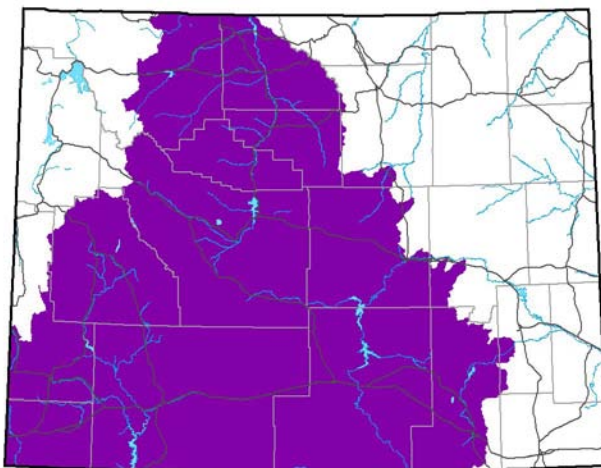


Known Suspected Accidental Historical

Range Notes

- Version: 2010-01-19
- Proportion of range deemed known based on documented occurrences: 0.752
- Details of range map creation noted in Keinath et al. (2010a).

Range Map - Seasonality



Year-Round Summer Winter Spring/Fall

Maps, models and report were created by and are available from the Wyoming Natural Diversity Database. (<http://uwadmnweb.uwyo.edu/wyndd/>).

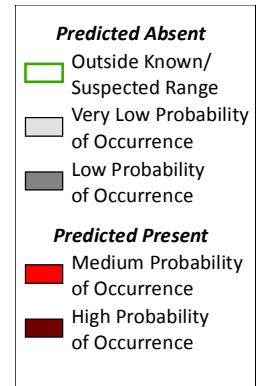
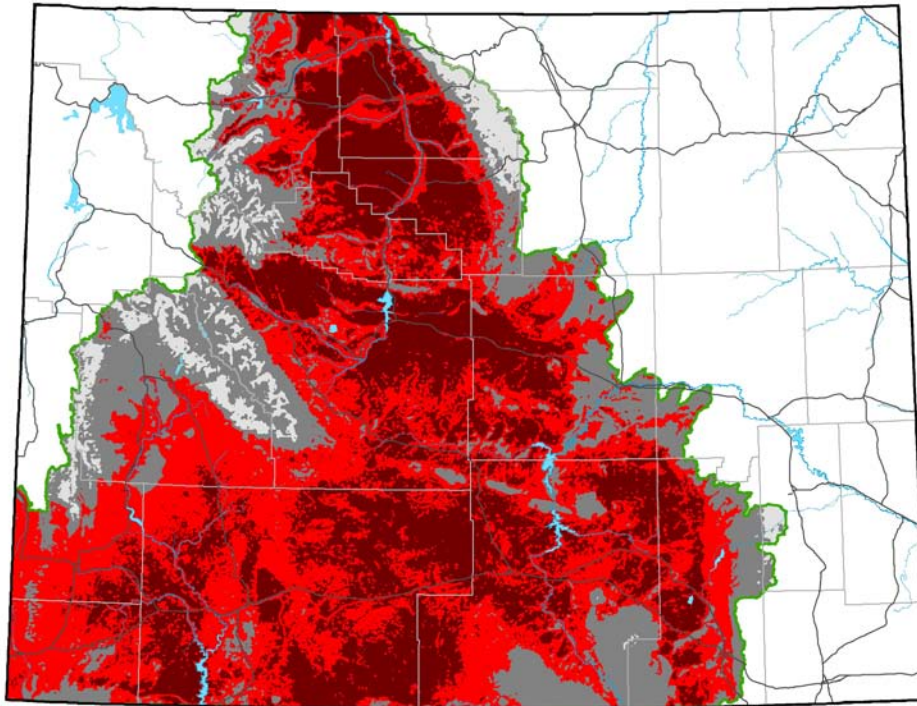
Doug Keinath, Senior Zoologist

Mark Andersen, GIS Specialist

© 2010, WYNDD

Distribution Model (Version: Sat Dec 05 06:17:04 MST 2009)

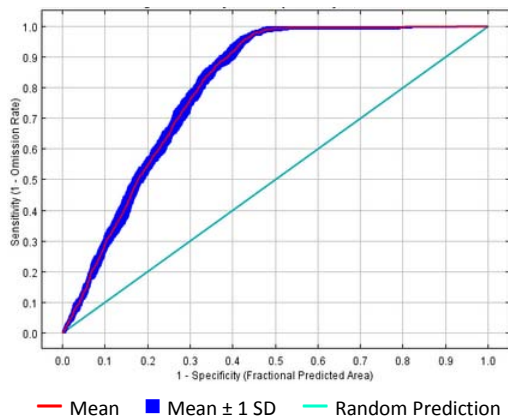
Details of distribution model creation are presented in Keinath et al. (2010b)



Model Parameters

- Season Modeled: Year-Round
- Algorithm: Maxent version 3.3.1
- Feature Types: Linear, Product, Quadratic, Hinge, Threshold
- Binary Threshold Rule: Maximum training sensitivity plus specificity
- Binary Threshold Value: 0.2656370
- High-Probability Threshold Value: 0.5386373
- Low-Probability Threshold Value: 0.0023347

Model Evaluation - ROC Plot



Model Quality Summary

Overall Assessment of Model Quality:

MEDIUM

- Expert Assessment: High
- Occurrence Sample Size: High
- Quality of Occurrences: Medium
- Positive Success Rate: Very High
- Test AUC and Model Gain: Medium

Model Evaluation Statistics

Final Model Statistics

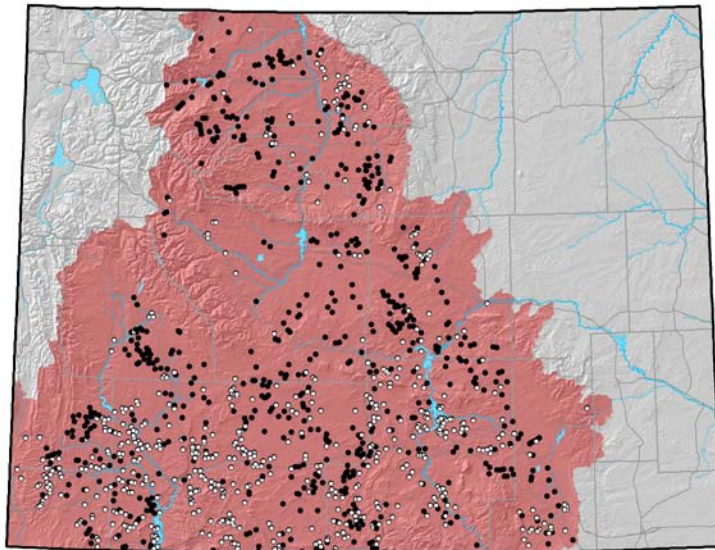
- Training AUC: 0.824
- Regularized Training Gain: 0.798

Cross-Validation Statistics

- Average Test AUC: 0.801 ± 0.009
- Upper Bound on Test AUC: 0.817
- Average Test Gain: 0.731 ± 0.046
- Omission Error (fraction of test points omitted during 10-fold cross validation): 0.06 ± 0.03

Occurrence Data for Distribution Model

Occurrence Map



Points Used in Modeling, by Year of Observation

- Pre-1985
- 1985 or Later

Known and Suspected Range

Occurrence Summary Statistics

- Number of Occurrences in AWVED master dataset: 2,749
- Number of Occurrences used to create distribution model: 1,175
- Average Point Quality Index (highest quality is 12.00): 6.10 ± 2.05
- Most recent occurrence used: 2007
- Oldest occurrence used: 1935
- Occurrence File:
LOCAL_SAMPLE_POINTS.csv

Comments

There are no additional comments specific to this species range map or distribution model.

References

- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010a. Range maps for Wyoming's species of greatest conservation need. Report prepared for the Wyoming Game and Fish Department by the Wyoming Natural Diversity Database, Laramie, Wyoming. January 19, 2010.
- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010b. Range and modeled distribution of Wyoming's species of greatest conservation need. Report prepared by the Wyoming Natural Diversity Database, Laramie Wyoming for the Wyoming Game and Fish Department, Cheyenne, Wyoming and the U.S. Geological Survey, Fort Collins, Colorado. August 20, 2010.

Predictor Variables used in the Distribution Model

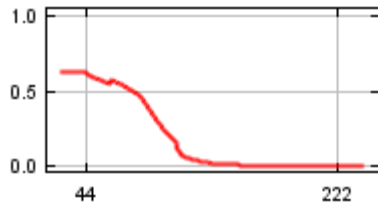
Percent Contribution (PC) to final model

<i>Environmental Variable</i>	<i>PC</i>
Precipitation of the warmest quarter	47
Bare Ground Index	21
Conifer Index	13
Coldest quarter mean temperature	9
Herbaceous Cover Index	5
Radiation of the lightest month	4

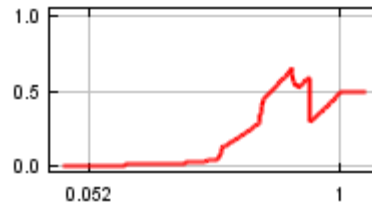
Response Curves

Each curve shows dependence of predicted suitability on input values of a single predictor variable considering correlations with others. Suitability is on the vertical axis (units: probability). Variable values are on the horizontal axis (units based on inputs; see Keinath et al 2010b for details).

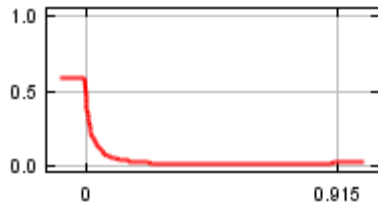
Precipitation of the warmest quarter



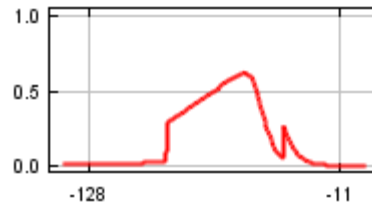
Bare Ground Index



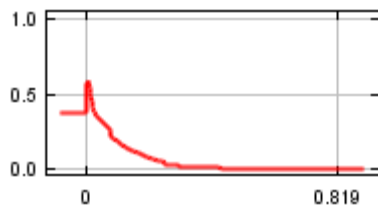
Conifer Index



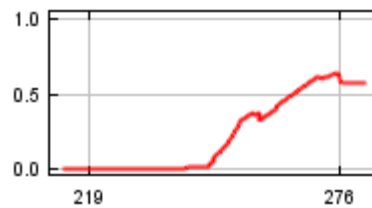
Coldest quarter mean temperature



Herbaceous Cover Index



Radiation of the lightest month

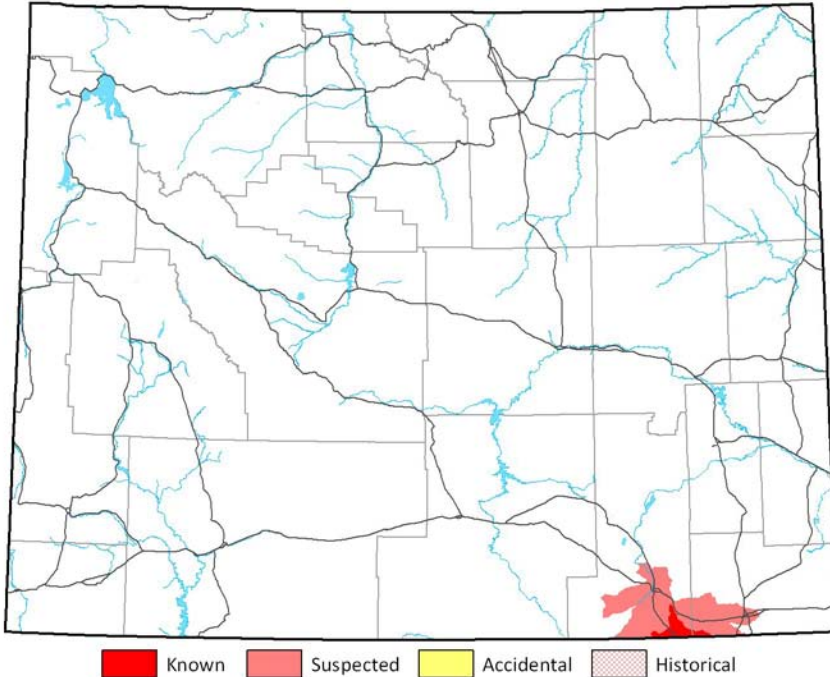


Abert's Squirrel (*Sciurus aberti*) Range Map and Distribution Model Summary

August 20, 2010

This report presents range and distribution of Abert's Squirrel (AMAFB07030) in Wyoming (see Keinath et al. 2010b). Similar reports were developed by the Wyoming Natural Diversity Database for terrestrial vertebrate species of conservation need in Wyoming's State Wildlife Action Plan. This effort was supported by the Wyoming Game and Fish Department and the U.S. Geological Survey.

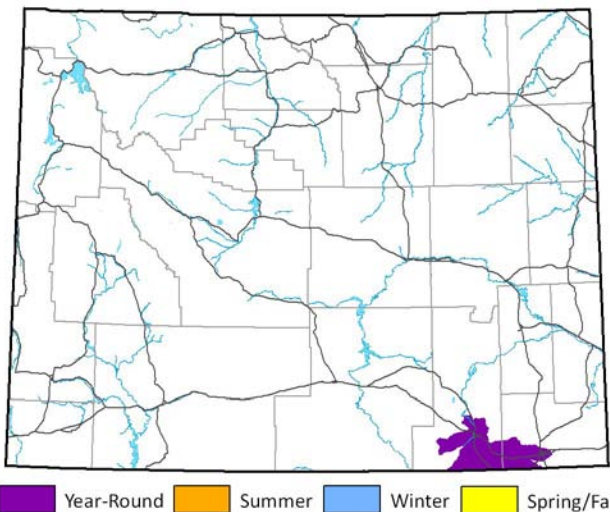
Range Map - Occupancy



Range Notes

- Version: 2010-01-19
- Proportion of range deemed known based on documented occurrences: 0.222
- Details of range map creation noted in Keinath et al. (2010a).

Range Map - Seasonality



Maps, models and report were created by and are available from the Wyoming Natural Diversity Database. (<http://uwadmnweb.uwyo.edu/wyndd/>).

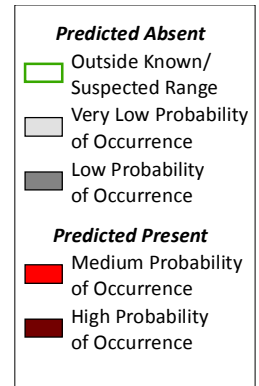
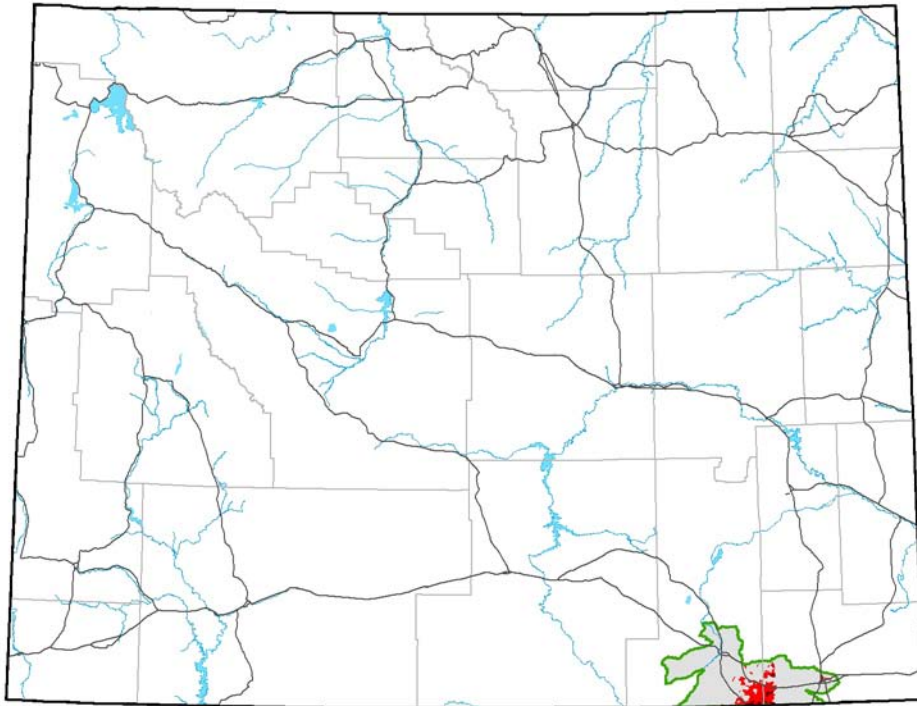
Doug Keinath, Senior Zoologist

Mark Andersen, GIS Specialist

© 2010, WYNDD

Distribution Model (Version: Wed Mar 17 07:12:55 MDT 2010)

Details of distribution model creation are presented in Keinath et al. (2010b)



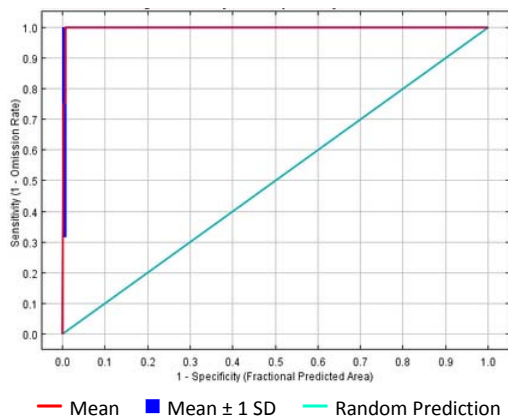
Model Parameters

- Season Modeled: Year-Round
- Algorithm: Maxent version 3.3.1
- Feature Types: Linear
- Binary Threshold Rule: Maximum training sensitivity plus specificity
- Binary Threshold Value: 0.4275270
- High-Probability Threshold Value: 0.8035750
- Low-Probability Threshold Value: 0.4275270

Model Quality Summary

Overall Assessment of Model Quality: LOW
 Expert Assessment: Medium
 Occurrence Sample Size: Very Low
 Quality of Occurrences: Low
 Positive Success Rate: Medium
 Test AUC and Model Gain: Low

Model Evaluation - ROC Plot



Model Evaluation Statistics

Final Model Statistics

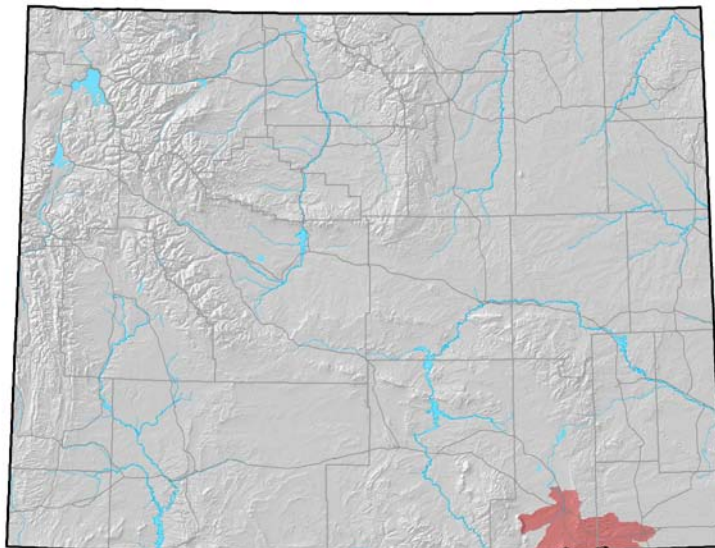
Training AUC: 0.999
 Regularized Training Gain: 4.868

Cross-Validation Statistics

- Average Test AUC: 0.399 ± 0.515
- Upper Bound on Test AUC: 0.984
- Average Test Gain: 1.992 ± 2.871
- Omission Error (fraction of test points omitted during 4-fold cross validation): 0.25 ± 0.50

Occurrence Data for Distribution Model

Occurrence Map



Points Used in Modeling, by Year of Observation

- Pre-1985
- 1985 or Later

■ Known and Suspected Range

Occurrence Summary Statistics

- Number of Occurrences in AWVED master dataset: 11
- Number of Occurrences used to create distribution model: 4
- Average Point Quality Index (highest quality is 12.00): 5.25 ± 1.50
- Most recent occurrence used: 1993
- Oldest occurrence used: 1978
- Occurrence File:
LOCAL_SAMPLE_POINTS_W_PDOG_2.csv

Comments

The model for this species is based on a small sample size of occurrence locations, which often results in low model quality. Collection of additional, high-quality occurrence locations could greatly improve the modeled distribution for this species.

References

- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010a. Range maps for Wyoming's species of greatest conservation need. Report prepared for the Wyoming Game and Fish Department by the Wyoming Natural Diversity Database, Laramie, Wyoming. January 19, 2010.
- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010b. Range and modeled distribution of Wyoming's species of greatest conservation need. Report prepared by the Wyoming Natural Diversity Database, Laramie Wyoming for the Wyoming Game and Fish Department, Cheyenne, Wyoming and the U.S. Geological Survey, Fort Collins, Colorado. August 20, 2010.

Predictor Variables used in the Distribution Model

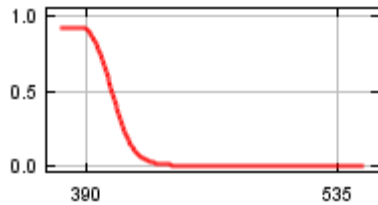
Percent Contribution (PC) to final model

<i>Environmental Variable</i>	<i>PC</i>
Variation in monthly radiation	65
Depth to Shallowest Restrictive Layer	10
Herbaceous Cover Index	10
Precipitation of the warmest quarter	9
Variation in monthly Relative Humidity	3
Soil - Fraction Sand	2
Forest Cover Index	0

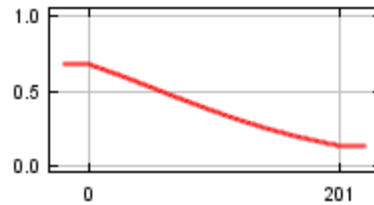
Response Curves

Each curve shows dependence of predicted suitability on input values of a single predictor variable considering correlations with others. Suitability is on the vertical axis (units: probability). Variable values are on the horizontal axis (units based on inputs; see Keinath et al 2010b for details).

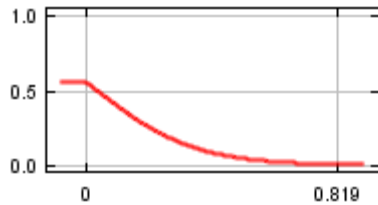
Variation in monthly radiation



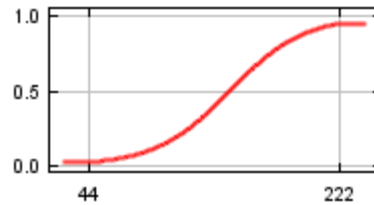
Depth to Shallowest Restrictive Layer



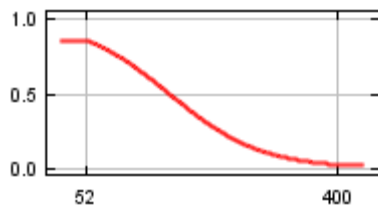
Herbaceous Cover Index



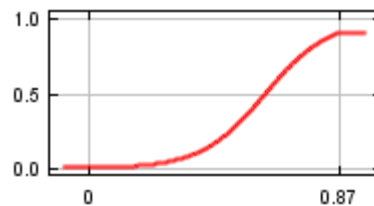
Precipitation of the warmest quarter



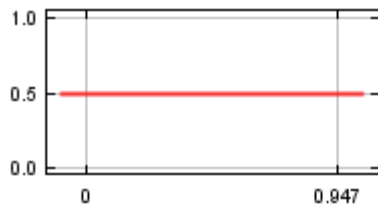
Variation in monthly Relative Humidity



Soil - Fraction Sand



Forest Cover Index

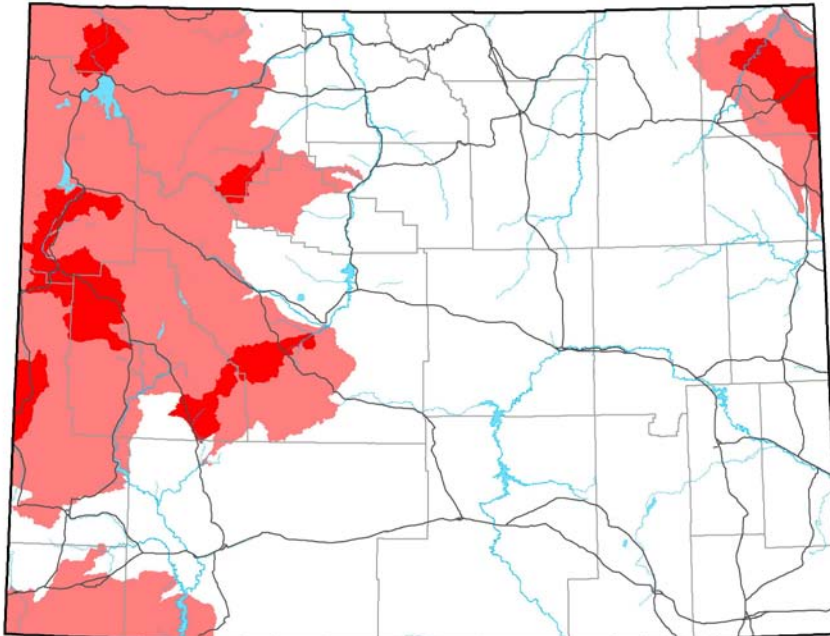


Northern Flying Squirrel (*Glaucomys sabrinus*) Range Map and Distribution Model Summary

August 20, 2010

This report presents range and distribution of Northern Flying Squirrel (AMAFB09020) in Wyoming (see Keinath et al. 2010b). Similar reports were developed by the Wyoming Natural Diversity Database for terrestrial vertebrate species of conservation need in Wyoming's State Wildlife Action Plan. This effort was supported by the Wyoming Game and Fish Department and the U.S. Geological Survey.

Range Map - Occupancy

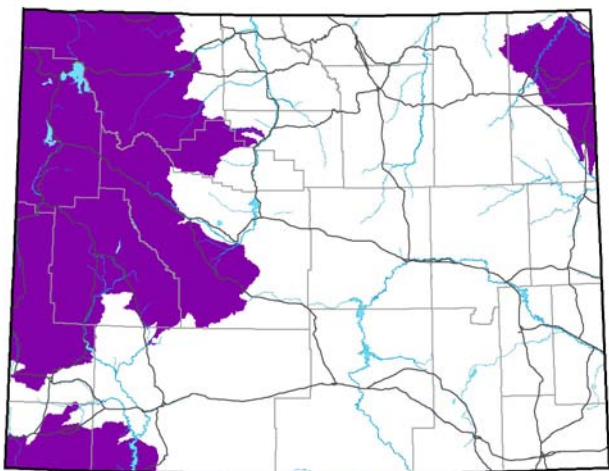


■ Known ■ Suspected ■ Accidental ■ Historical

Range Notes

- Version: 2010-01-19
- Proportion of range deemed known based on documented occurrences: 0.120
- Details of range map creation noted in Keinath et al. (2010a).

Range Map - Seasonality



■ Year-Round ■ Summer ■ Winter ■ Spring/Fall

Maps, models and report were created by and are available from the Wyoming Natural Diversity Database.
(<http://uwadmnweb.uwyo.edu/wyndd/>).

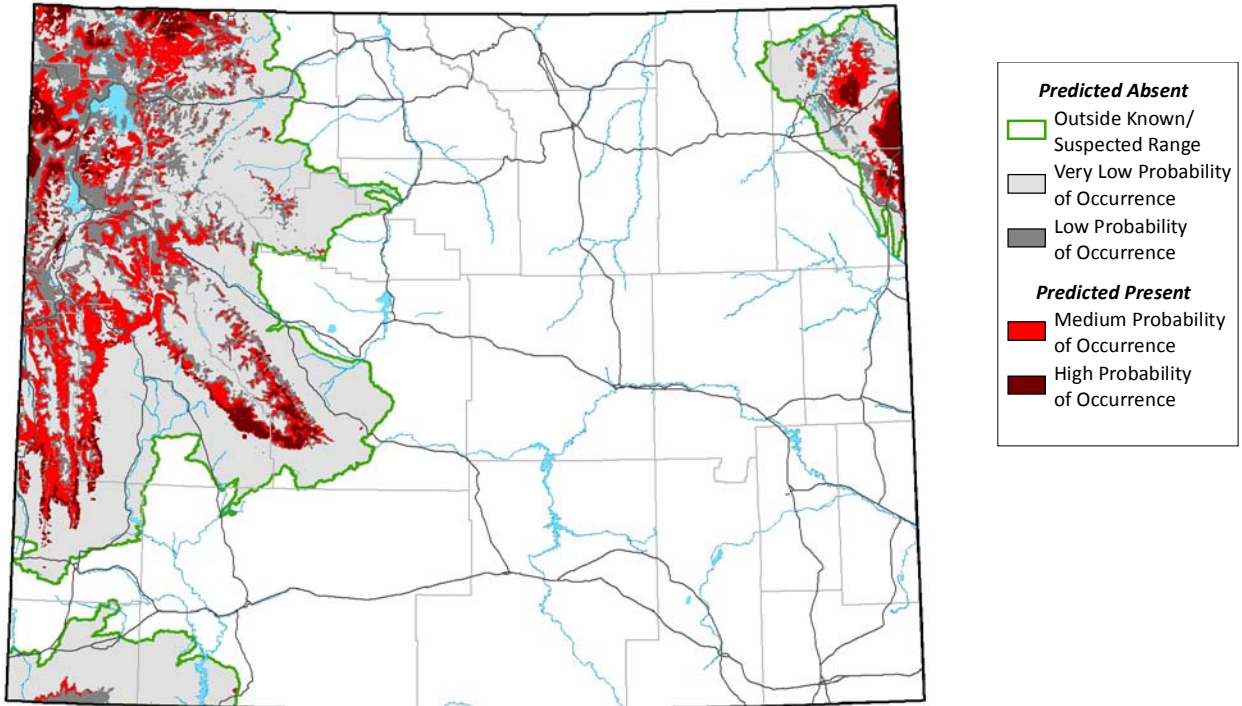
Doug Keinath, Senior Zoologist

Mark Andersen, GIS Specialist

© 2010, WYNDD

Distribution Model (Version: Wed Apr 21 21:41:26 MDT 2010)

Details of distribution model creation are presented in Keinath et al. (2010b)



Model Parameters

- Season Modeled: Year-Round
- Algorithm: Maxent version 3.3.1
- Feature Types: Linear, Quadratic, Hinge
- Binary Threshold Rule: Maximum training sensitivity plus specificity
- Binary Threshold Value: 0.4345600
- High-Probability Threshold Value: 0.6127997
- Low-Probability Threshold Value: 0.2402191

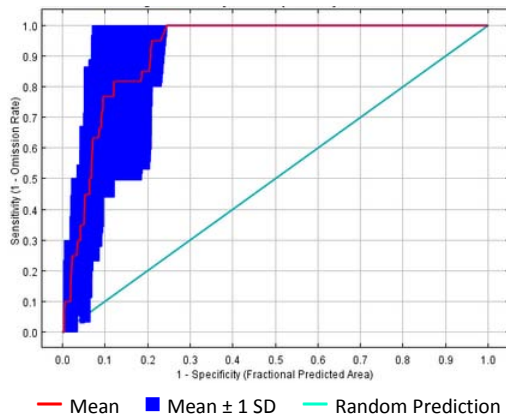
Model Quality Summary

Overall Assessment of Model Quality:

MEDIUM

- Expert Assessment: Medium
- Occurrence Sample Size: Medium
- Quality of Occurrences: Low
- Positive Success Rate: Medium
- Test AUC and Model Gain: High

Model Evaluation - ROC Plot



Model Evaluation Statistics

Final Model Statistics

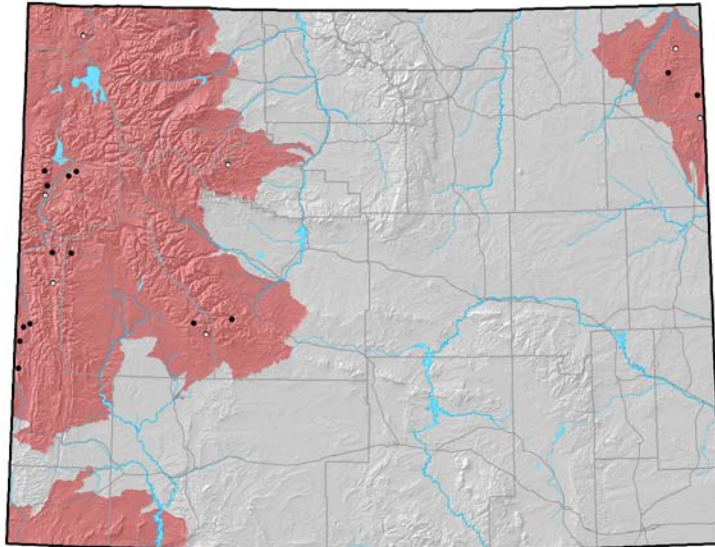
- Training AUC: 0.962
- Regularized Training Gain: 1.663

Cross-Validation Statistics

- Average Test AUC: 0.919 ± 0.064
- Upper Bound on Test AUC: 0.923
- Average Test Gain: 1.309 ± 0.984
- Omission Error (fraction of test points omitted during 10-fold cross validation): 0.27 ± 0.44

Occurrence Data for Distribution Model

Occurrence Map



Points Used in Modeling, by Year of Observation

- Pre-1985
- 1985 or Later

Known and Suspected Range

Occurrence Summary Statistics

- Number of Occurrences in AWVED master dataset: 22
- Number of Occurrences used to create distribution model: 21
- Average Point Quality Index (highest quality is 12.00): 5.57 ± 1.50
- Most recent occurrence used: 2006
- Oldest occurrence used: 1918
- Occurrence File:
AMAFB09020_REVISIED_SAMPLES.CSV

Comments

There are no additional comments specific to this species range map or distribution model.

References

- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010a. Range maps for Wyoming's species of greatest conservation need. Report prepared for the Wyoming Game and Fish Department by the Wyoming Natural Diversity Database, Laramie, Wyoming. January 19, 2010.
- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010b. Range and modeled distribution of Wyoming's species of greatest conservation need. Report prepared by the Wyoming Natural Diversity Database, Laramie Wyoming for the Wyoming Game and Fish Department, Cheyenne, Wyoming and the U.S. Geological Survey, Fort Collins, Colorado. August 20, 2010.

Predictor Variables used in the Distribution Model

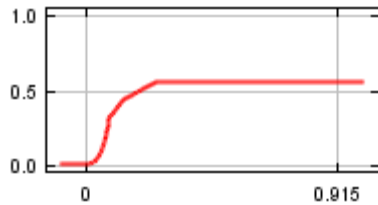
Percent Contribution (PC) to final model

<i>Environmental Variable</i>	<i>PC</i>
Conifer Index	73
Deciduous Forest Index	13
Precipitation of the warmest quarter	10
Interannual variation in annual frost days	5

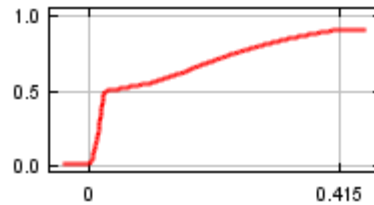
Response Curves

Each curve shows dependence of predicted suitability on input values of a single predictor variable considering correlations with others. Suitability is on the vertical axis (units: probability). Variable values are on the horizontal axis (units based on inputs; see Keinath et al 2010b for details).

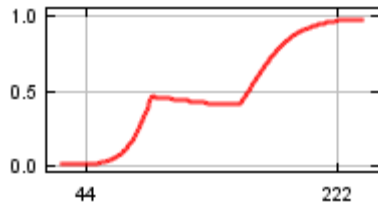
Conifer Index



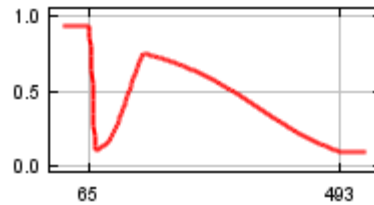
Deciduous Forest Index



Precipitation of the warmest quarter



Interannual variation in annual frost days

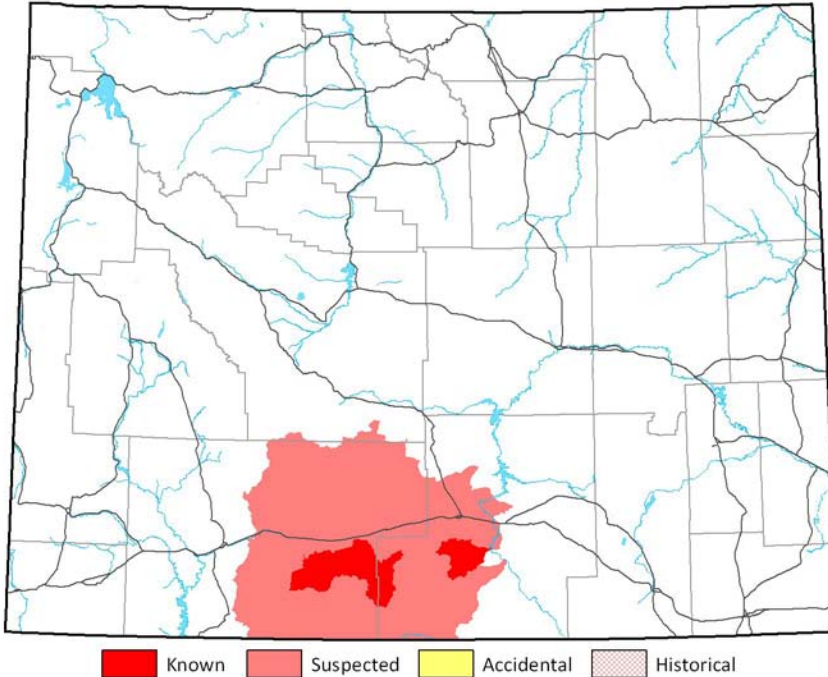


Wyoming Pocket Gopher (*Thomomys clusius*) Range Map and Distribution Model Summary

August 20, 2010

This report presents range and distribution of Wyoming Pocket Gopher (AMAF01050) in Wyoming (see Keinath et al. 2010b). Similar reports were developed by the Wyoming Natural Diversity Database for terrestrial vertebrate species of conservation need in Wyoming's State Wildlife Action Plan. This effort was supported by the Wyoming Game and Fish Department and the U.S. Geological Survey.

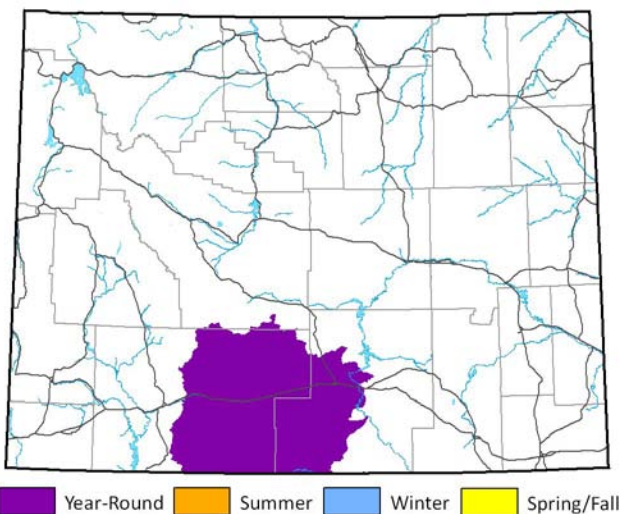
Range Map - Occupancy



Range Notes

- Version: 2010-01-19
- Proportion of range deemed known based on documented occurrences: 0.086
- Details of range map creation noted in Keinath et al. (2010a).

Range Map - Seasonality



Maps, models and report were created by and are available from the Wyoming Natural Diversity Database. (<http://uwadmnweb.uwyo.edu/wyndd/>).

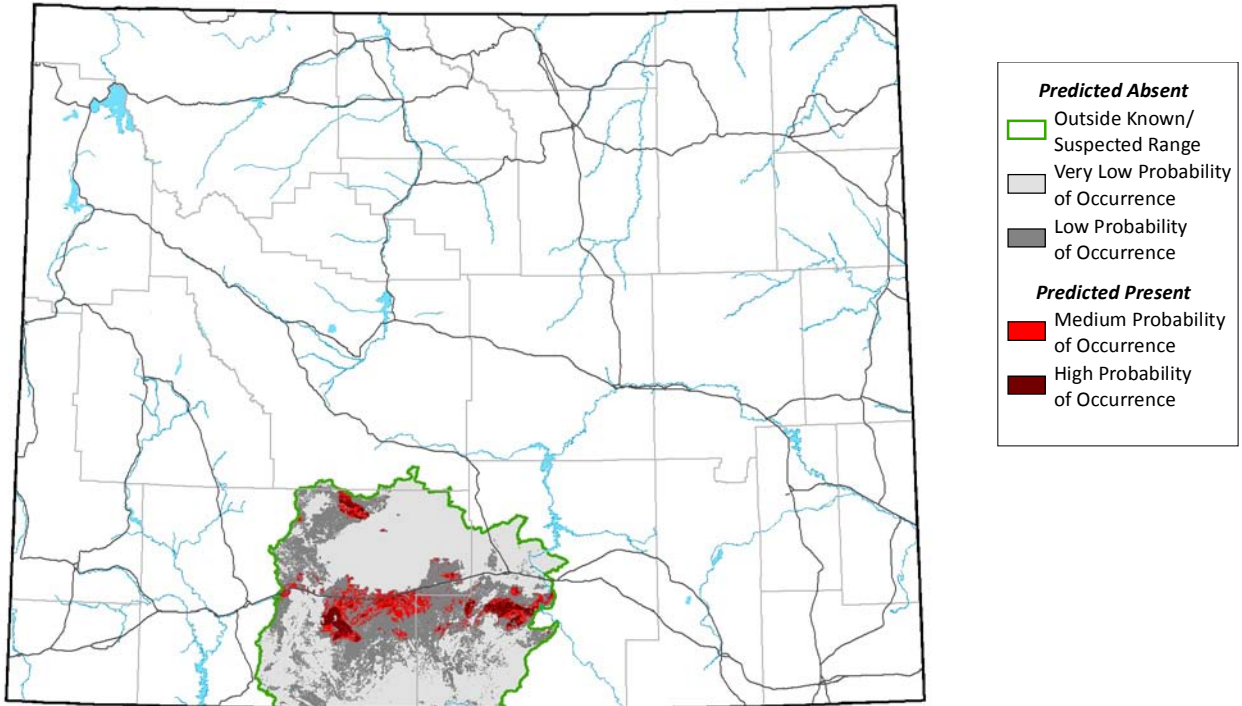
Doug Keinath, Senior Zoologist

Mark Andersen, GIS Specialist

© 2010, WYNDD

Distribution Model (Version: Fri Apr 02 15:34:06 MDT 2010)

Details of distribution model creation are presented in Keinath et al. (2010b)



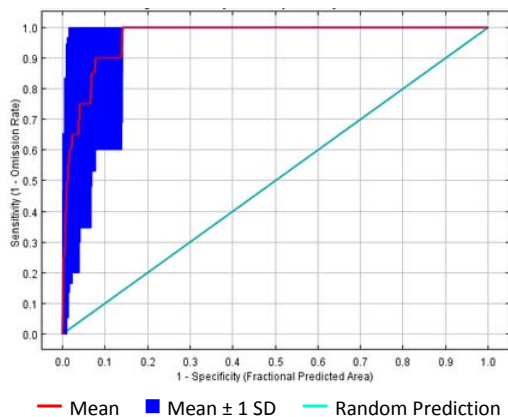
Model Parameters

- Season Modeled: Year-Round
- Algorithm: Maxent version 3.3.1
- Feature Types: Linear, Quadratic, Hinge
- Binary Threshold Rule: Maximum training sensitivity plus specificity
- Binary Threshold Value: 0.4581640
- High-Probability Threshold Value: 0.6796605
- Low-Probability Threshold Value: 0.0528027

Model Quality Summary

Overall Assessment of Model Quality: HIGH
 Expert Assessment: Medium
 Occurrence Sample Size: Low
 Quality of Occurrences: High
 Positive Success Rate: High
 Test AUC and Model Gain: High

Model Evaluation - ROC Plot



Model Evaluation Statistics

Final Model Statistics

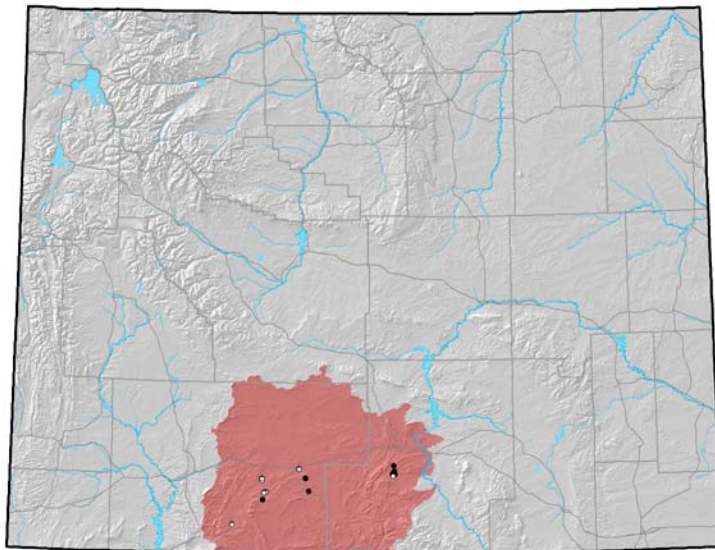
Training AUC: 0.990
 Regularized Training Gain: 3.093

Cross-Validation Statistics

- Average Test AUC: 0.967 ± 0.043
- Upper Bound on Test AUC: 0.977
- Average Test Gain: 2.413 ± 1.660
- Omission Error (fraction of test points omitted during 10-fold cross validation): 0.20 ± 0.42

Occurrence Data for Distribution Model

Occurrence Map



Points Used in Modeling, by Year of Observation

- Pre-1985
- 1985 or Later

Known and Suspected Range

Occurrence Summary Statistics

- Number of Occurrences in AWVED master dataset: 70
- Number of Occurrences used to create distribution model: 15
- Average Point Quality Index (highest quality is 12.00): 8.47 ± 3.52
- Most recent occurrence used: 2008
- Oldest occurrence used: 1857
- Occurrence File:
DRAFT_3_SAGE_WATER_RERUNS.csv

Comments

There are no additional comments specific to this species range map or distribution model.

References

- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010a. Range maps for Wyoming's species of greatest conservation need. Report prepared for the Wyoming Game and Fish Department by the Wyoming Natural Diversity Database, Laramie, Wyoming. January 19, 2010.
- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010b. Range and modeled distribution of Wyoming's species of greatest conservation need. Report prepared by the Wyoming Natural Diversity Database, Laramie Wyoming for the Wyoming Game and Fish Department, Cheyenne, Wyoming and the U.S. Geological Survey, Fort Collins, Colorado. August 20, 2010.

Predictor Variables used in the Distribution Model

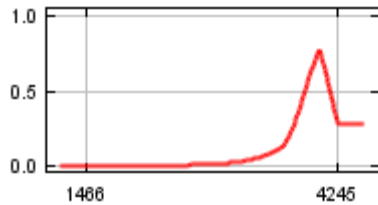
Percent Contribution (PC) to final model

<i>Environmental Variable</i>	<i>PC</i>
Annual Relative Humidity Range	35
Wettest quarter mean temperature	31
Pinon-Juniper Index	12
Percent Cover of sagebrush	12
Prevalence of flowing Water Wtihin 3200 meters	7
Conifer Index	4

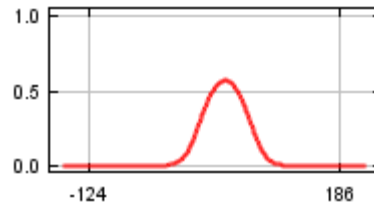
Response Curves

Each curve shows dependence of predicted suitability on input values of a single predictor variable considering correlations with others. Suitability is on the vertical axis (units: probability). Variable values are on the horizontal axis (units based on inputs; see Keinath et al 2010b for details).

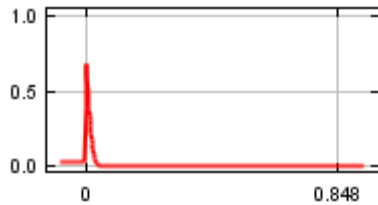
Annual Relative Humidity Range



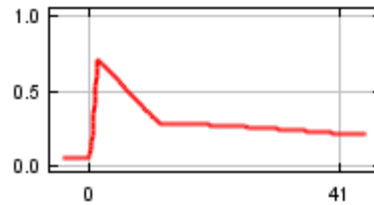
Wettest quarter mean temperature



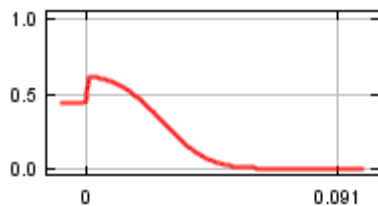
Pinon-Juniper Index



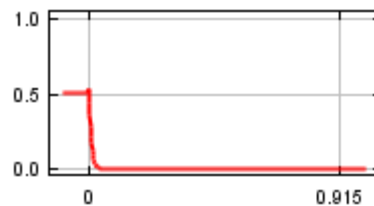
Percent Cover of sagebrush



Prevalence of flowing Water Wtihin 3200 meters



Conifer Index

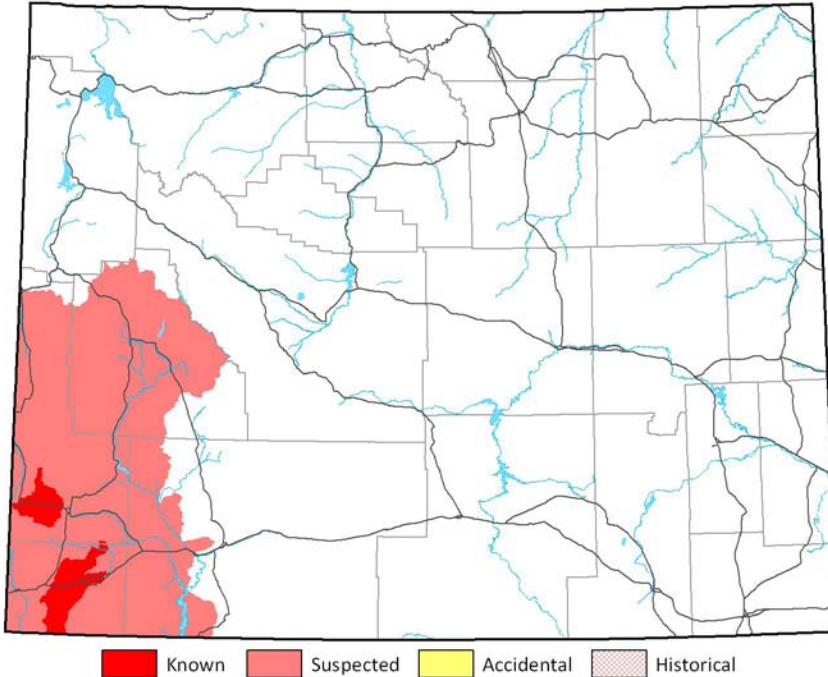


Idaho Pocket Gopher (*Thomomys idahoensis*) Range Map and Distribution Model Summary

August 20, 2010

This report presents range and distribution of Idaho Pocket Gopher (AMAF01070) in Wyoming (see Keinath et al. 2010b). Similar reports were developed by the Wyoming Natural Diversity Database for terrestrial vertebrate species of conservation need in Wyoming's State Wildlife Action Plan. This effort was supported by the Wyoming Game and Fish Department and the U.S. Geological Survey.

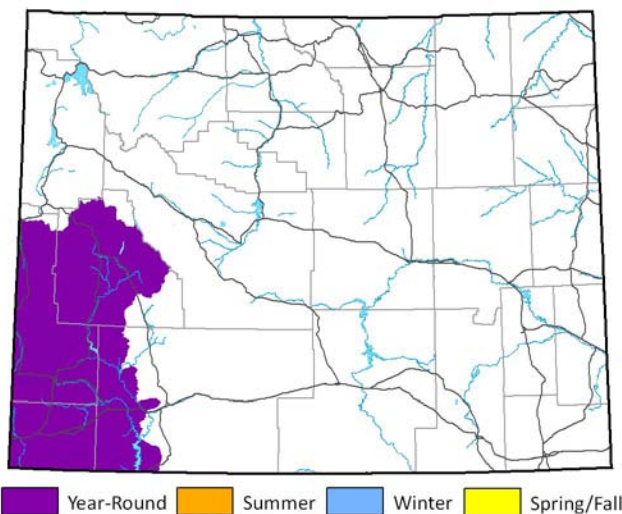
Range Map - Occupancy



Range Notes

- Version: 2010-01-19
- Proportion of range deemed known based on documented occurrences: 0.054
- Details of range map creation noted in Keinath et al. (2010a).

Range Map - Seasonality



Maps, models and report were created by and are available from the Wyoming Natural Diversity Database. (<http://uwadmnweb.uwyo.edu/wyndd/>).

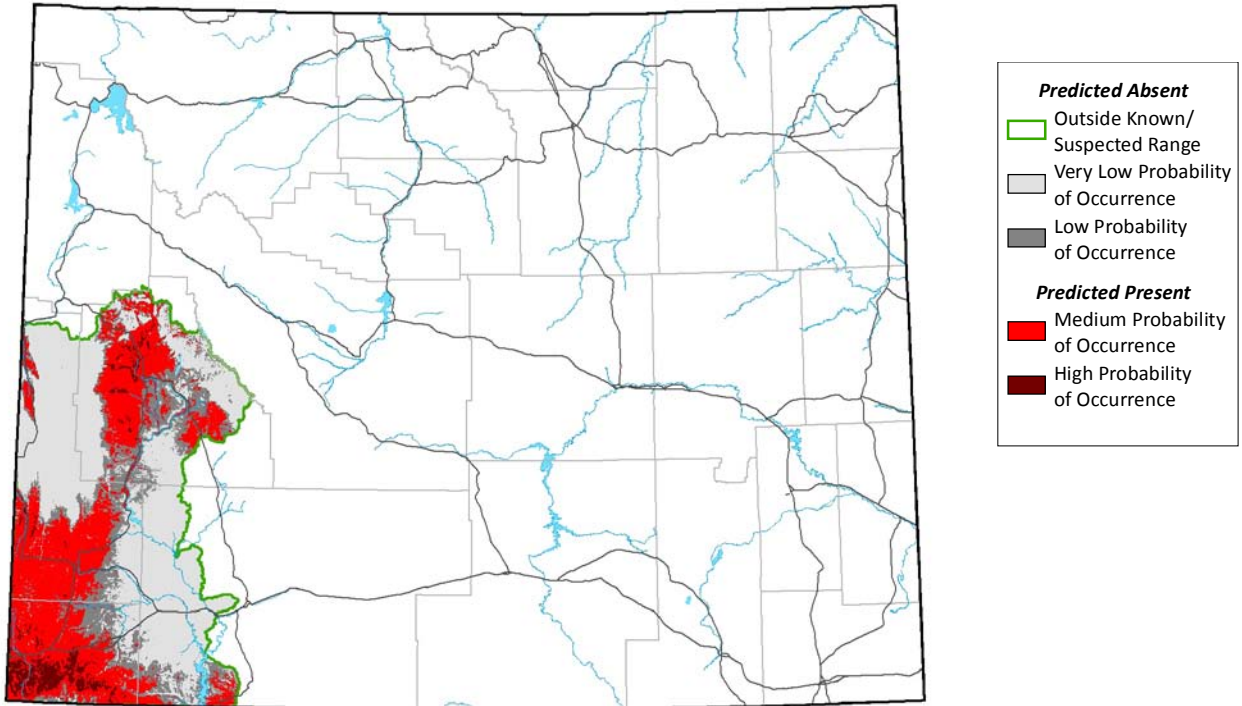
Doug Keinath, Senior Zoologist

Mark Andersen, GIS Specialist

© 2010, WYNDD

Distribution Model (Version: Sun Dec 06 20:25:38 MST 2009)

Details of distribution model creation are presented in Keinath et al. (2010b)



Model Parameters

- Season Modeled: Year-Round
- Algorithm: Maxent version 3.3.1
- Feature Types: Linear, Quadratic, Hinge
- Binary Threshold Rule: Maximum training sensitivity plus specificity
- Binary Threshold Value: 0.0522880
- High-Probability Threshold Value: 0.6895206
- Low-Probability Threshold Value: 0.0086165

Model Quality Summary

Overall Assessment of Model Quality:

MEDIUM

Expert Assessment: Medium

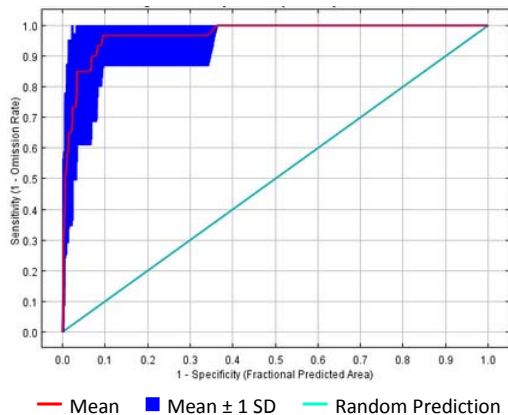
Occurrence Sample Size: Medium

Quality of Occurrences: Low

Positive Success Rate: Very High

Test AUC and Model Gain: High

Model Evaluation - ROC Plot



Model Evaluation Statistics

Final Model Statistics

Training AUC: 0.986

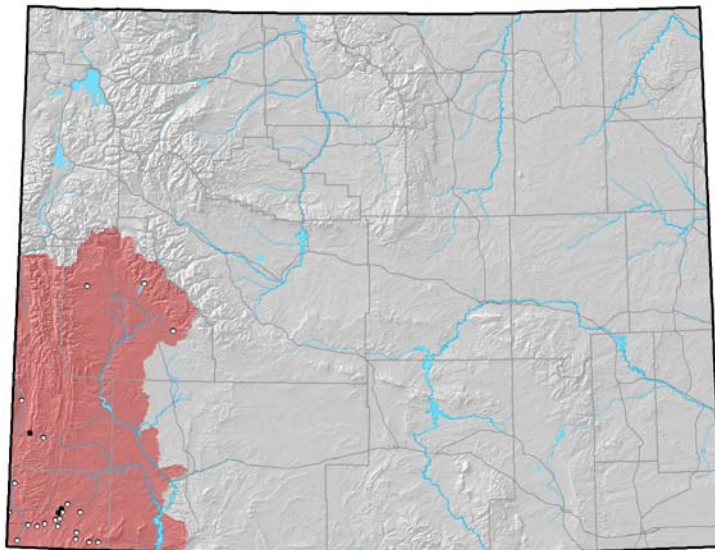
Regularized Training Gain: 3.209

Cross-Validation Statistics

- Average Test AUC: 0.970 ± 0.036
- Upper Bound on Test AUC: 0.978
- Average Test Gain: 2.753 ± 1.033
- Omission Error (fraction of test points omitted during 10-fold cross validation): 0.10 ± 0.22

Occurrence Data for Distribution Model

Occurrence Map



Points Used in Modeling, by Year of Observation

- Pre-1985
- 1985 or Later

■ Known and Suspected Range

Occurrence Summary Statistics

- Number of Occurrences in AWVED master dataset: 51
- Number of Occurrences used to create distribution model: 27
- Average Point Quality Index (highest quality is 12.00): 4.52 ± 1.16
- Most recent occurrence used: 1996
- Oldest occurrence used: 1896
- Occurrence File:
LOCAL_SAMPLE_POINTS.csv

Comments

There are no additional comments specific to this species range map or distribution model.

References

- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010a. Range maps for Wyoming's species of greatest conservation need. Report prepared for the Wyoming Game and Fish Department by the Wyoming Natural Diversity Database, Laramie, Wyoming. January 19, 2010.
- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010b. Range and modeled distribution of Wyoming's species of greatest conservation need. Report prepared by the Wyoming Natural Diversity Database, Laramie Wyoming for the Wyoming Game and Fish Department, Cheyenne, Wyoming and the U.S. Geological Survey, Fort Collins, Colorado. August 20, 2010.

Predictor Variables used in the Distribution Model

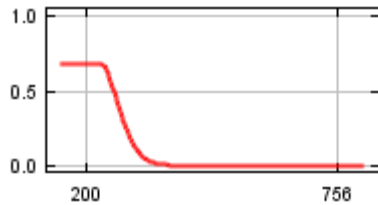
Percent Contribution (PC) to final model

<i>Environmental Variable</i>	<i>PC</i>
Variation of monthly precipitation	39
Annual precipitation range (P3 – P2)	25
Forest Cover Index	14
Sagebrush Index	9
Vector Ruggedness Measure	7
Isothermality (T2/T5)	7

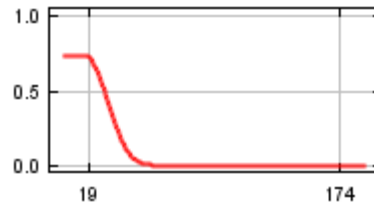
Response Curves

Each curve shows dependence of predicted suitability on input values of a single predictor variable considering correlations with others. Suitability is on the vertical axis (units: probability). Variable values are on the horizontal axis (units based on inputs; see Keinath et al 2010b for details).

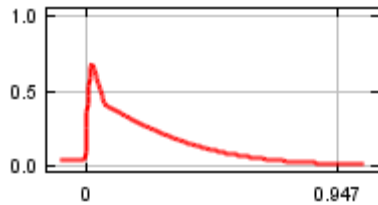
Variation of monthly precipitation



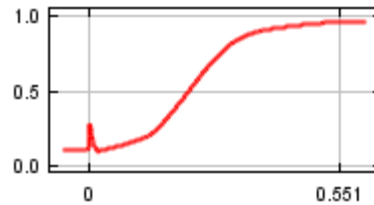
Annual precipitation range (P3 – P2)



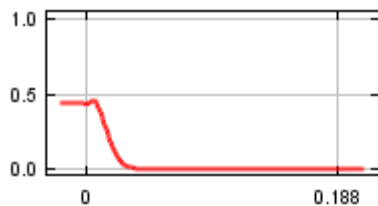
Forest Cover Index



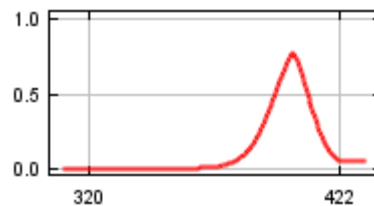
Sagebrush Index



Vector Ruggedness Measure



Isothermality (T2/T5)

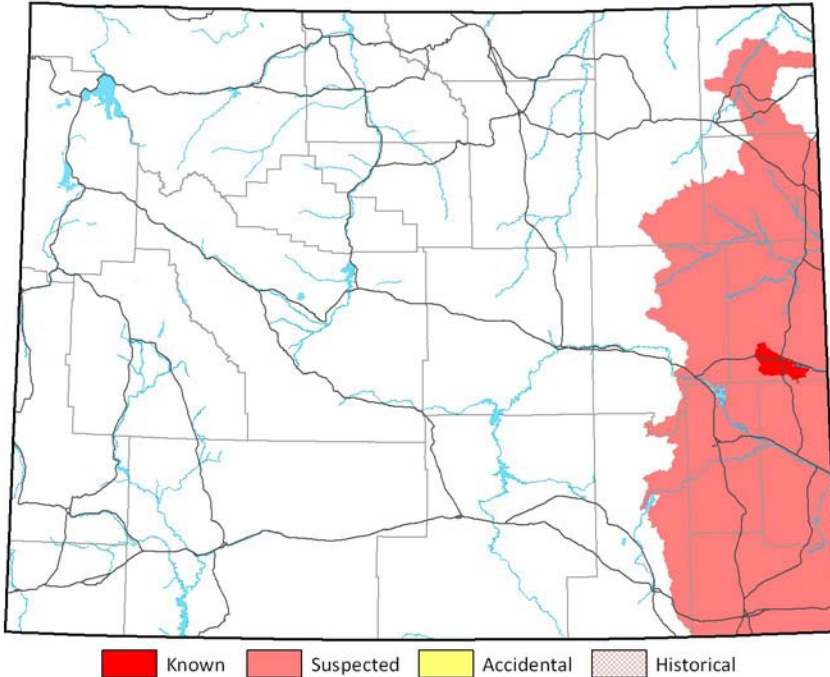


Plains Pocket Gopher (*Geomys bursarius*) Range Map and Distribution Model Summary

August 20, 2010

This report presents range and distribution of Plains Pocket Gopher (AMAF02010) in Wyoming (see Keinath et al. 2010b). Similar reports were developed by the Wyoming Natural Diversity Database for terrestrial vertebrate species of conservation need in Wyoming's State Wildlife Action Plan. This effort was supported by the Wyoming Game and Fish Department and the U.S. Geological Survey.

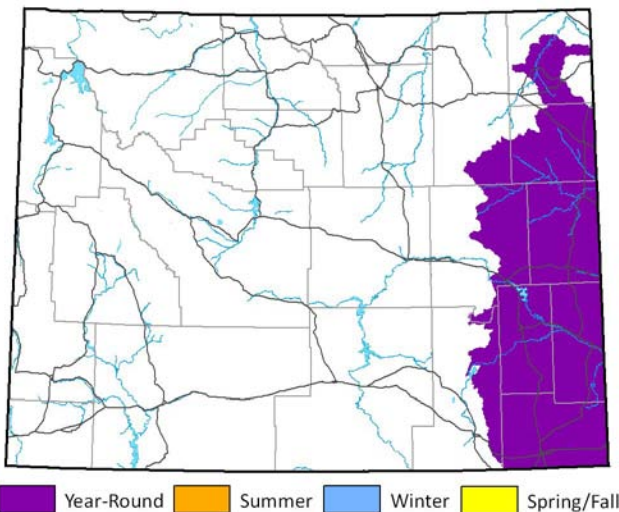
Range Map - Occupancy



Range Notes

- Version: 2010-01-19
- Proportion of range deemed known based on documented occurrences: 0.013
- Details of range map creation noted in Keinath et al. (2010a).

Range Map - Seasonality



Maps, models and report were created by and are available from the Wyoming Natural Diversity Database. (<http://uwadmnweb.uwyo.edu/wyndd/>).

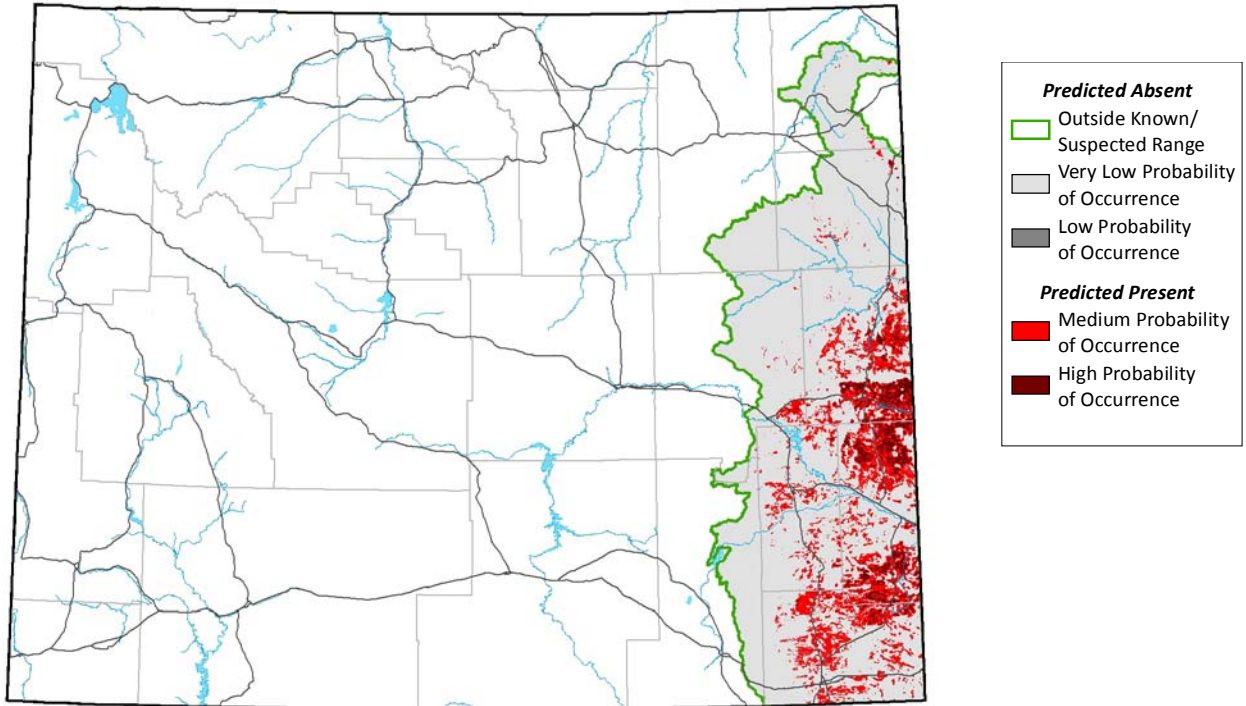
Doug Keinath, Senior Zoologist

Mark Andersen, GIS Specialist

© 2010, WYNDD

Distribution Model (Version: Tue Mar 16 23:05:56 MDT 2010)

Details of distribution model creation are presented in Keinath et al. (2010b)



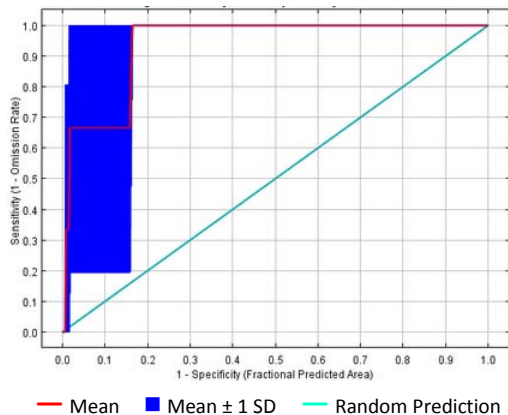
Model Parameters

- Season Modeled: Year-Round
- Algorithm: Maxent version 3.3.1
- Feature Types: Linear
- Binary Threshold Rule: Maximum training sensitivity plus specificity
- Binary Threshold Value: 0.4367150
- High-Probability Threshold Value: 0.7559069
- Low-Probability Threshold Value: 0.4367150

Model Quality Summary

Overall Assessment of Model Quality: LOW
 Expert Assessment: Low
 Occurrence Sample Size: Very Low
 Quality of Occurrences: Low
 Positive Success Rate: Low
 Test AUC and Model Gain: Low

Model Evaluation - ROC Plot



Model Evaluation Statistics

Final Model Statistics

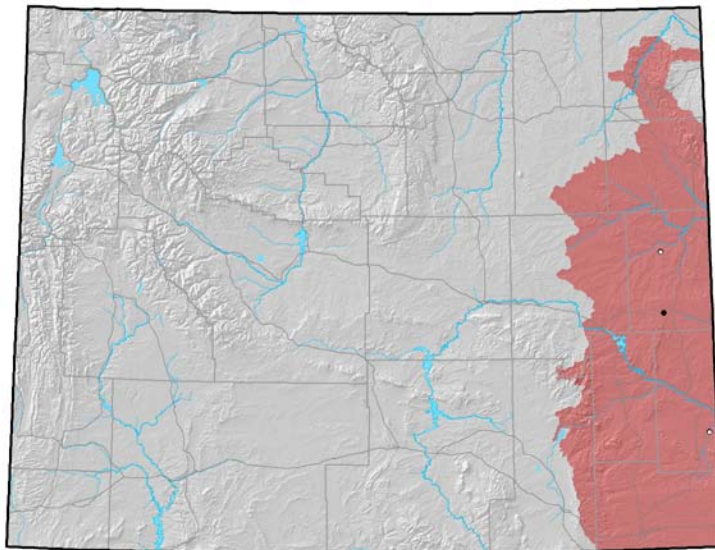
Training AUC: 0.989
 Regularized Training Gain: 2.454

Cross-Validation Statistics

- Average Test AUC: 0.282 ± 0.456
- Upper Bound on Test AUC: 0.960
- Average Test Gain: 0.419 ± 1.445
- Omission Error (fraction of test points omitted during 3-fold cross validation): 0.33 ± 0.58

Occurrence Data for Distribution Model

Occurrence Map



Points Used in Modeling, by Year of Observation

- Pre-1985
- 1985 or Later

■ Known and Suspected Range

Occurrence Summary Statistics

- Number of Occurrences in AWVED master dataset: 5
- Number of Occurrences used to create distribution model: 3
- Average Point Quality Index (highest quality is 12.00): 5.00 ± 1.00
- Most recent occurrence used: 1989
- Oldest occurrence used: 1949
- Occurrence File:
LOCAL_SAMPLE_POINTS_W_PDOG_2.csv

Comments

The model for this species is based on a small sample size of occurrence locations, which often results in low model quality. Collection of additional, high-quality occurrence locations could greatly improve the modeled distribution for this species.

References

- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010a. Range maps for Wyoming's species of greatest conservation need. Report prepared for the Wyoming Game and Fish Department by the Wyoming Natural Diversity Database, Laramie, Wyoming. January 19, 2010.
- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010b. Range and modeled distribution of Wyoming's species of greatest conservation need. Report prepared by the Wyoming Natural Diversity Database, Laramie Wyoming for the Wyoming Game and Fish Department, Cheyenne, Wyoming and the U.S. Geological Survey, Fort Collins, Colorado. August 20, 2010.

Predictor Variables used in the Distribution Model

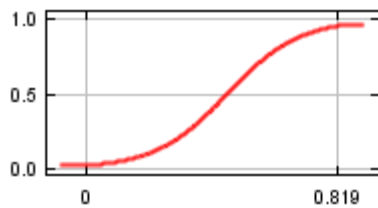
Percent Contribution (PC) to final model

<i>Environmental Variable</i>	<i>PC</i>
Herbaceous Cover Index	73
Wettest quarter mean temperature	10
Annual precipitation range (P3 – P2)	8
Pinon-Juniper Index	4
Vector Ruggedness Measure	4
Distance to Water	2

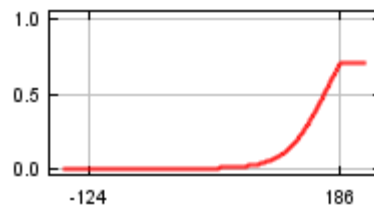
Response Curves

Each curve shows dependence of predicted suitability on input values of a single predictor variable considering correlations with others. Suitability is on the vertical axis (units: probability). Variable values are on the horizontal axis (units based on inputs; see Keinath et al 2010b for details).

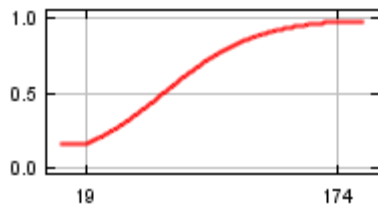
Herbaceous Cover Index



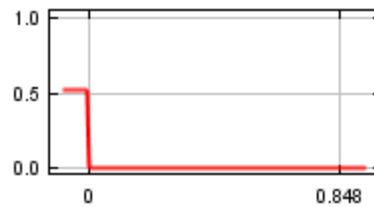
Wettest quarter mean temperature



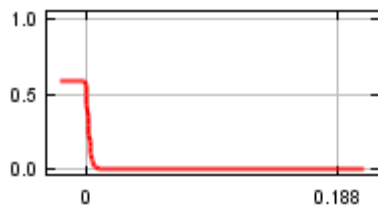
Annual precipitation range (P3 – P2)



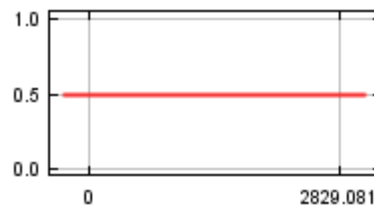
Pinon-Juniper Index



Vector Ruggedness Measure



Distance to Water

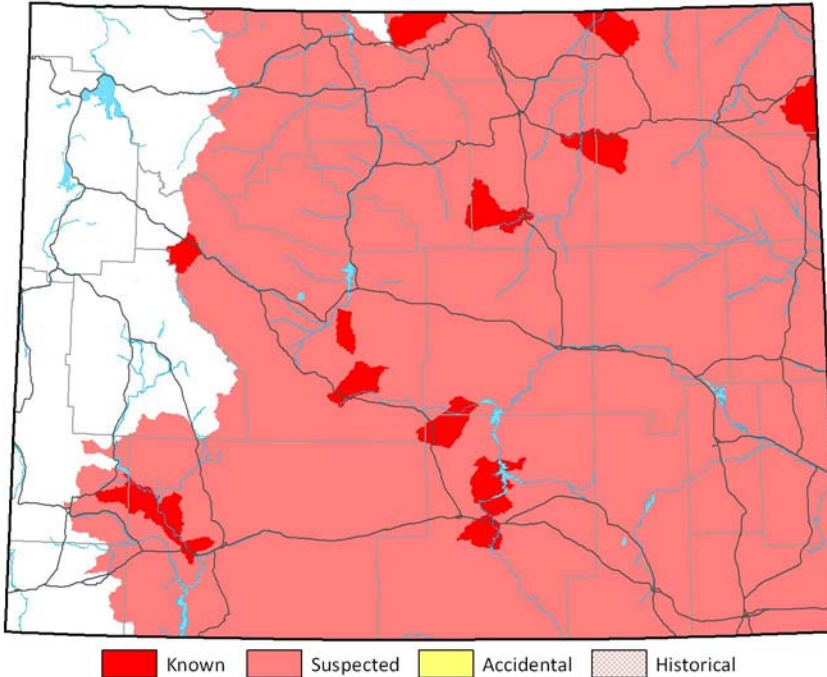


Olive-backed Pocket Mouse (*Perognathus fasciatus*) Range Map and Distribution Model Summary

August 20, 2010

This report presents range and distribution of Olive-backed Pocket Mouse (AMAFD01010) in Wyoming (see Keinath et al. 2010b). Similar reports were developed by the Wyoming Natural Diversity Database for terrestrial vertebrate species of conservation need in Wyoming's State Wildlife Action Plan. This effort was supported by the Wyoming Game and Fish Department and the U.S. Geological Survey.

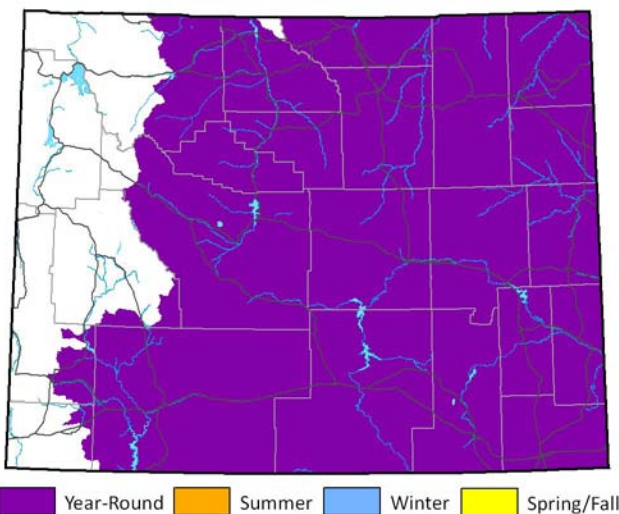
Range Map - Occupancy



Range Notes

- Version: 2010-01-19
- Proportion of range deemed known based on documented occurrences: 0.040
- Details of range map creation noted in Keinath et al. (2010a).

Range Map - Seasonality



Maps, models and report were created by and are available from the Wyoming Natural Diversity Database. (<http://uwadmnweb.uwyo.edu/wyndd/>).

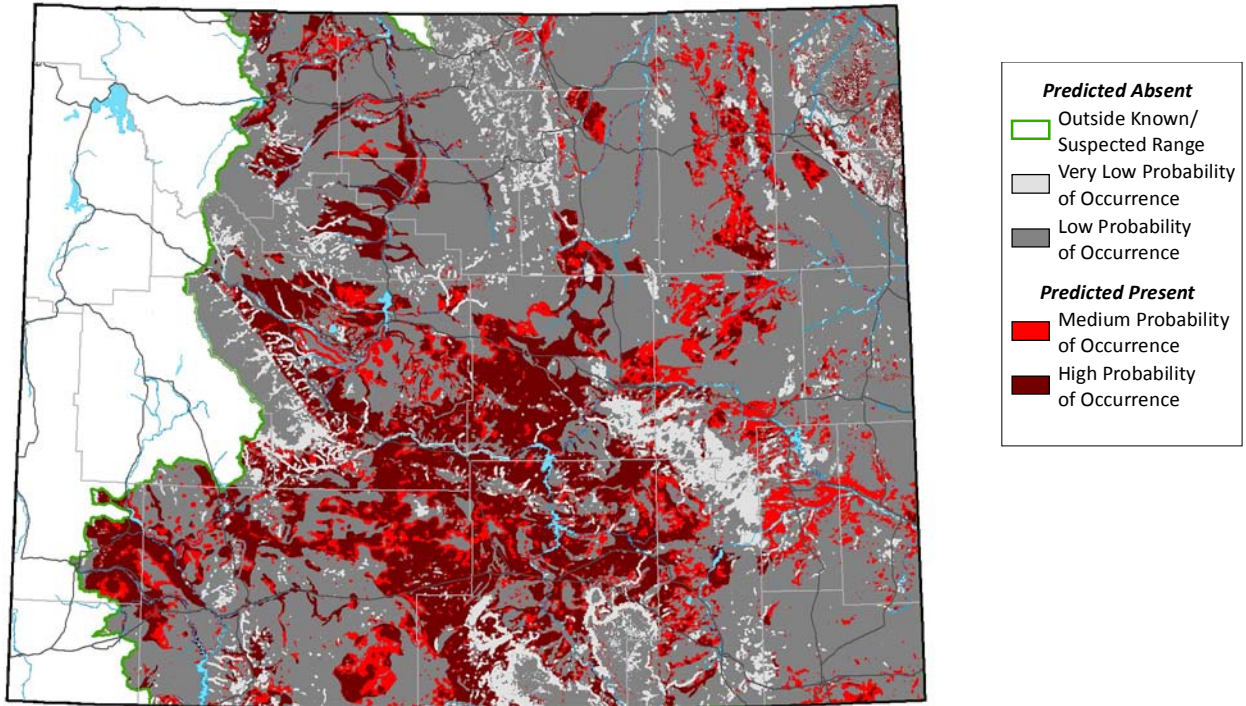
Doug Keinath, Senior Zoologist

Mark Andersen, GIS Specialist

© 2010, WYNDD

Distribution Model (Version: Thu Mar 18 01:17:00 MDT 2010)

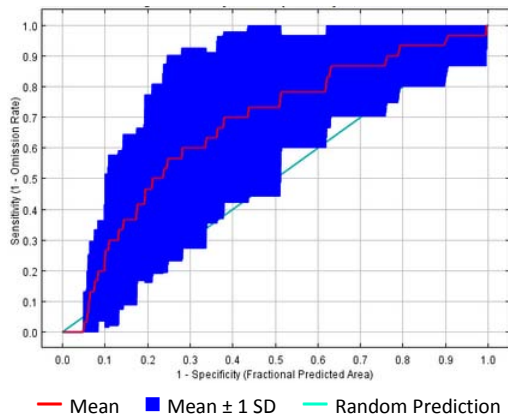
Details of distribution model creation are presented in Keinath et al. (2010b)



Model Parameters

- Season Modeled: Year-Round
- Algorithm: Maxent version 3.3.1
- Feature Types: Linear, Product
- Binary Threshold Rule: Maximum training sensitivity plus specificity
- Binary Threshold Value: 0.4890230
- High-Probability Threshold Value: 0.5501582
- Low-Probability Threshold Value: 0.2121401

Model Evaluation - ROC Plot



Model Quality Summary

Overall Assessment of Model Quality:

MEDIUM

Expert Assessment: Medium

Occurrence Sample Size: Medium

Quality of Occurrences: Medium

Positive Success Rate: Low

Test AUC and Model Gain: Low

Model Evaluation Statistics

Final Model Statistics

Training AUC: 0.773

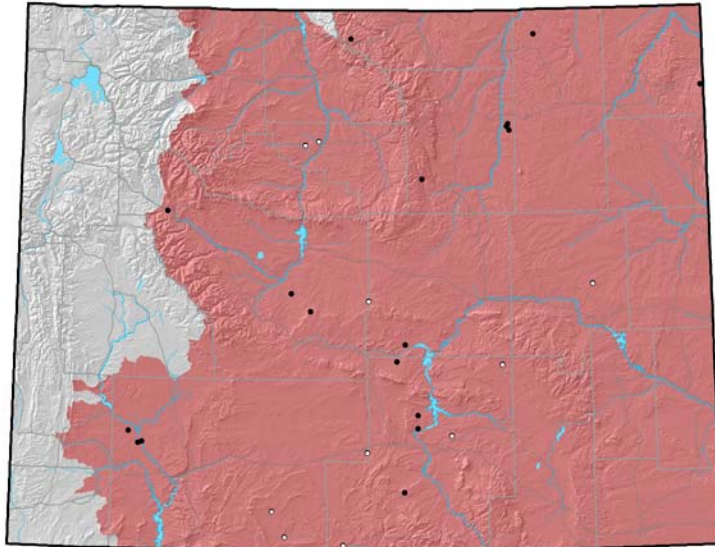
Regularized Training Gain: 0.266

Cross-Validation Statistics

- Average Test AUC: 0.674 ± 0.125
- Upper Bound on Test AUC: 0.691
- Average Test Gain: -0.284 ± 1.313
- Omission Error (fraction of test points omitted during 10-fold cross validation): 0.47 ± 0.36

Occurrence Data for Distribution Model

Occurrence Map



Points Used in Modeling, by Year of Observation

- Pre-1985
- 1985 or Later

Known and Suspected Range

Occurrence Summary Statistics

- Number of Occurrences in AWVED master dataset: 32
- Number of Occurrences used to create distribution model: 28
- Average Point Quality Index (highest quality is 12.00): 5.89 ± 2.13
- Most recent occurrence used: 2008
- Oldest occurrence used: 1935
- Occurrence File:
LOCAL_SAMPLE_POINTS_W_PDOG_2.csv

Comments

This species is ubiquitous in Wyoming and occurs within a variety of habitat types. It is therefore difficult to develop an uniformly-accurate environmental niche model that can be effectively applied across the state.

References

- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010a. Range maps for Wyoming's species of greatest conservation need. Report prepared for the Wyoming Game and Fish Department by the Wyoming Natural Diversity Database, Laramie, Wyoming. January 19, 2010.
- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010b. Range and modeled distribution of Wyoming's species of greatest conservation need. Report prepared by the Wyoming Natural Diversity Database, Laramie Wyoming for the Wyoming Game and Fish Department, Cheyenne, Wyoming and the U.S. Geological Survey, Fort Collins, Colorado. August 20, 2010.

Predictor Variables used in the Distribution Model

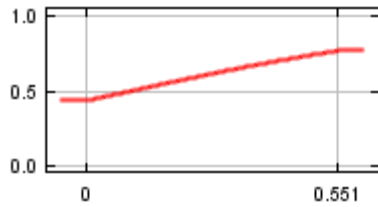
Percent Contribution (PC) to final model

<i>Environmental Variable</i>	<i>PC</i>
Sagebrush Index	37
Deciduous Forest Index	30
Depth to Shallowest Restrictive Layer	21
Potential for Rock Outcrop	8
Annual mean relative humidity	2
Distance to Permanent Water	1

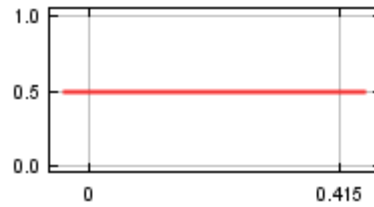
Response Curves

Each curve shows dependence of predicted suitability on input values of a single predictor variable considering correlations with others. Suitability is on the vertical axis (units: probability). Variable values are on the horizontal axis (units based on inputs; see Keinath et al 2010b for details).

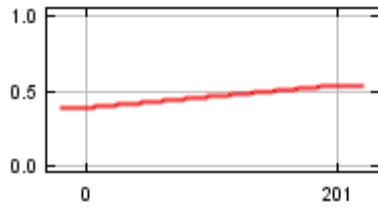
Sagebrush Index



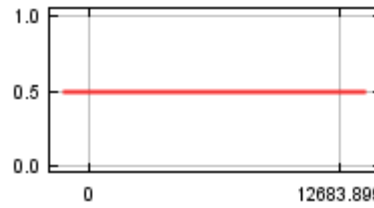
Deciduous Forest Index



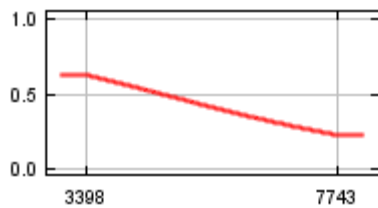
Depth to Shallowest Restrictive Layer



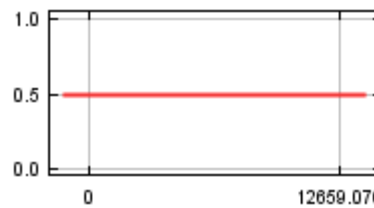
Potential for Rock Outcrop



Annual mean relative humidity



Distance to Permanent Water

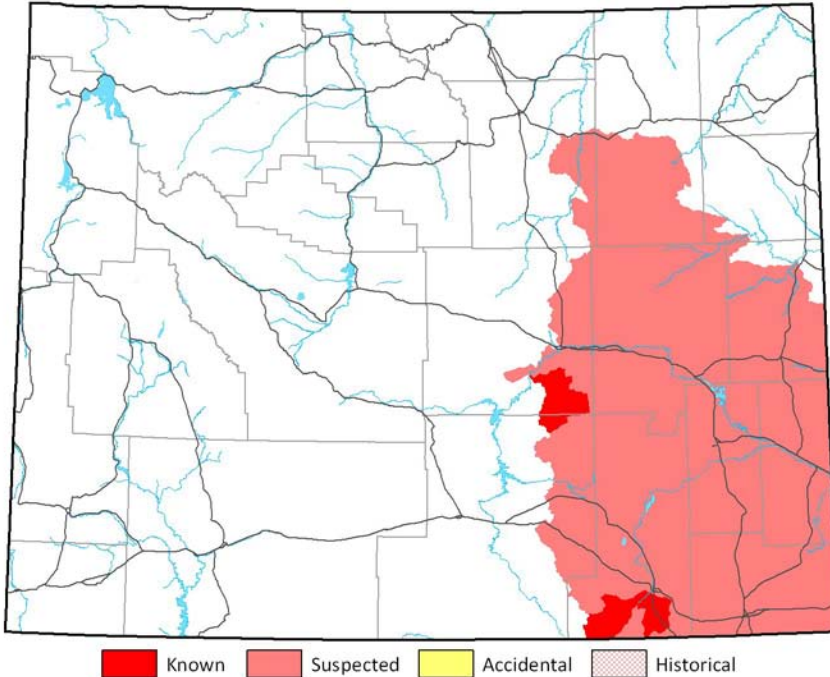


Plains Pocket Mouse (*Perognathus flavescens*) Range Map and Distribution Model Summary

August 20, 2010

This report presents range and distribution of Plains Pocket Mouse (AMAFD01020) in Wyoming (see Keinath et al. 2010b). Similar reports were developed by the Wyoming Natural Diversity Database for terrestrial vertebrate species of conservation need in Wyoming's State Wildlife Action Plan. This effort was supported by the Wyoming Game and Fish Department and the U.S. Geological Survey.

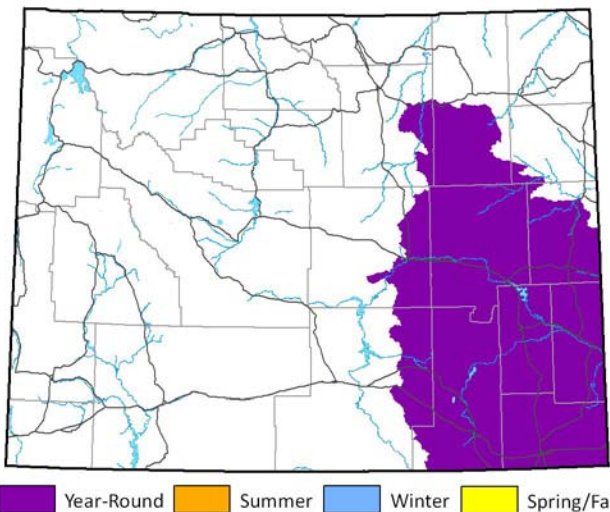
Range Map - Occupancy



Range Notes

- Version: 2010-01-19
- Proportion of range deemed known based on documented occurrences: 0.029
- Details of range map creation noted in Keinath et al. (2010a).

Range Map - Seasonality



Maps, models and report were created by and are available from the Wyoming Natural Diversity Database. (<http://uwadmnweb.uwyo.edu/wyndd/>).

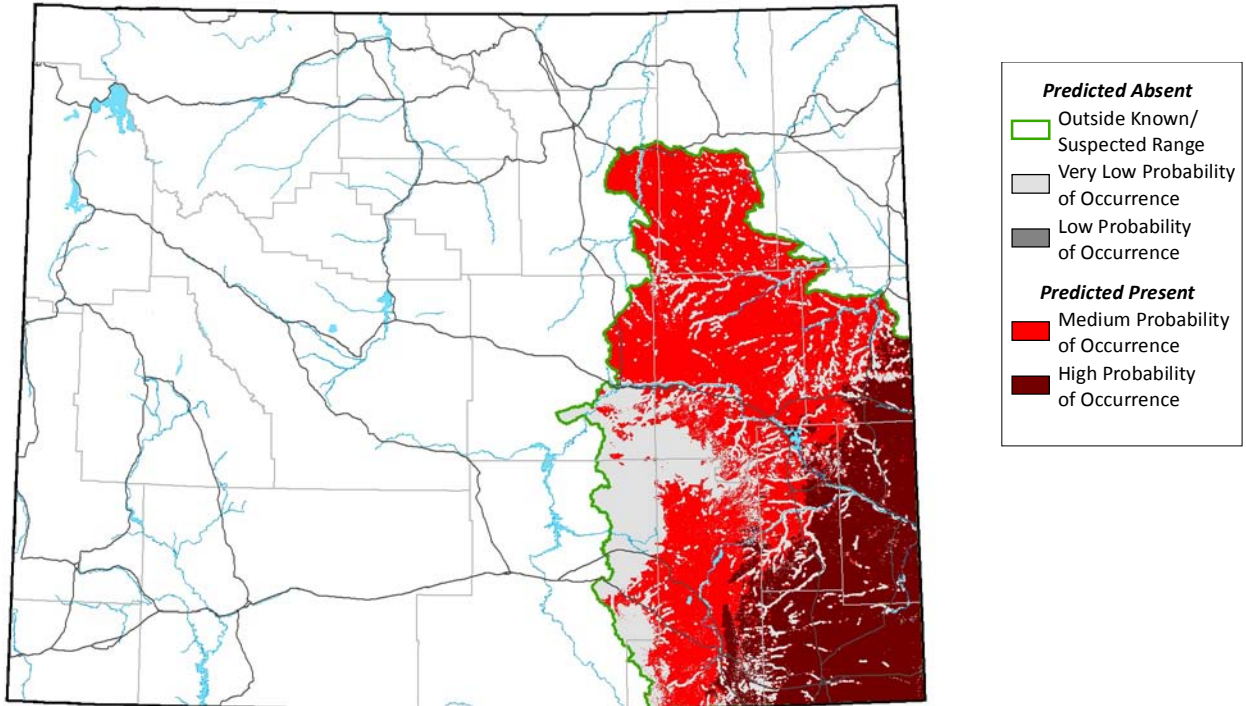
Doug Keinath, Senior Zoologist

Mark Andersen, GIS Specialist

© 2010, WYNDD

Distribution Model (Version: Thu Mar 18 22:29:59 MDT 2010)

Details of distribution model creation are presented in Keinath et al. (2010b)



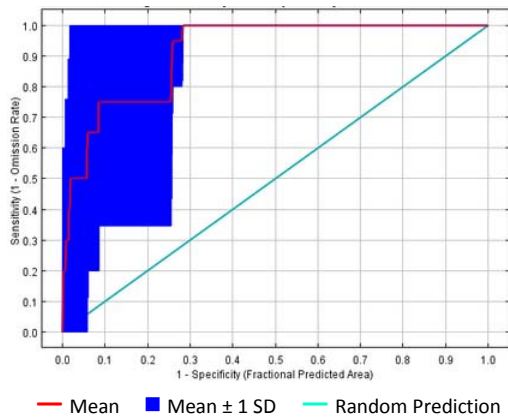
Model Parameters

- Season Modeled: Year-Round
- Algorithm: Maxent version 3.3.1
- Feature Types: Linear, Quadratic
- Binary Threshold Rule: Maximum training sensitivity plus specificity
- Binary Threshold Value: 0.2060560
- High-Probability Threshold Value: 0.5512244
- Low-Probability Threshold Value: 0.2060560

Model Quality Summary

Overall Assessment of Model Quality: HIGH
 Expert Assessment: Medium
 Occurrence Sample Size: Low
 Quality of Occurrences: High
 Positive Success Rate: High
 Test AUC and Model Gain: High

Model Evaluation - ROC Plot



Model Evaluation Statistics

Final Model Statistics

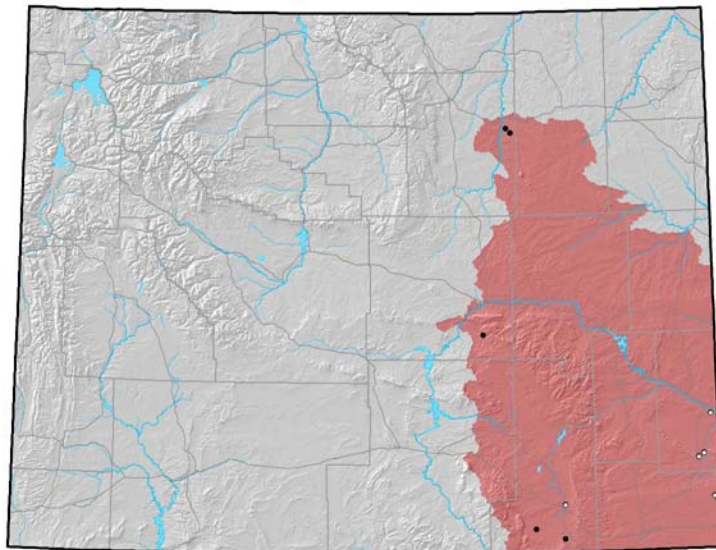
Training AUC: 0.918
 Regularized Training Gain: 1.366

Cross-Validation Statistics

- Average Test AUC: 0.914 ± 0.103
- Upper Bound on Test AUC: 0.897
- Average Test Gain: 1.585 ± 1.262
- Omission Error (fraction of test points omitted during 10-fold cross validation): 0.15 ± 0.34

Occurrence Data for Distribution Model

Occurrence Map



Points Used in Modeling, by Year of Observation

- Pre-1985
- 1985 or Later

Known and Suspected Range

Occurrence Summary Statistics

- Number of Occurrences in AWVED master dataset: 17
- Number of Occurrences used to create distribution model: 11
- Average Point Quality Index (highest quality is 12.00): 7.91 ± 2.21
- Most recent occurrence used: 1994
- Oldest occurrence used: 1965
- Occurrence File:
LOCAL_SAMPLE_POINTS_W_PD OG_2.csv

Comments

Due to timing of range map edits, the distribution model for prairie vole was created before final edits were made to the range map. As a result, several datapoints used in the model fall outside the accepted range of the species. Future versions of the range maps and models should verify these occurrences and modify the range and/or model input accordingly.

References

- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010a. Range maps for Wyoming's species of greatest conservation need. Report prepared for the Wyoming Game and Fish Department by the Wyoming Natural Diversity Database, Laramie, Wyoming. January 19, 2010.
- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010b. Range and modeled distribution of Wyoming's species of greatest conservation need. Report prepared by the Wyoming Natural Diversity Database, Laramie Wyoming for the Wyoming Game and Fish Department, Cheyenne, Wyoming and the U.S. Geological Survey, Fort Collins, Colorado. August 20, 2010.

Predictor Variables used in the Distribution Model

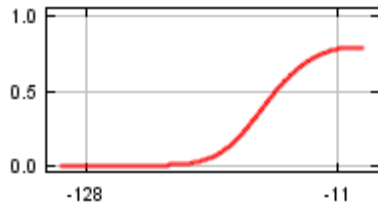
Percent Contribution (PC) to final model

<i>Environmental Variable</i>	<i>PC</i>
Coldest quarter mean temperature	38
Variation in monthly Relative Humidity	19
Variation in monthly radiation	17
Percent Forest Cover	15
Cottonwood Index	12
Warmest quarter mean temperature	0

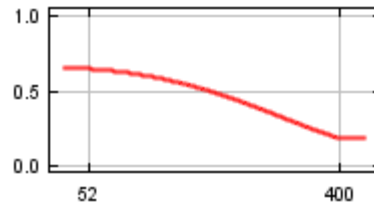
Response Curves

Each curve shows dependence of predicted suitability on input values of a single predictor variable considering correlations with others. Suitability is on the vertical axis (units: probability). Variable values are on the horizontal axis (units based on inputs; see Keinath et al 2010b for details).

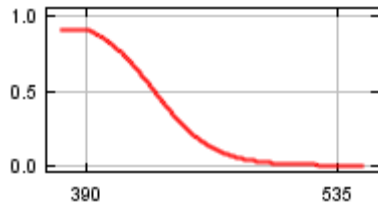
Coldest quarter mean temperature



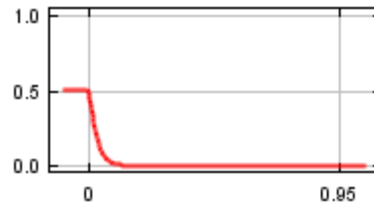
Variation in monthly Relative Humidity



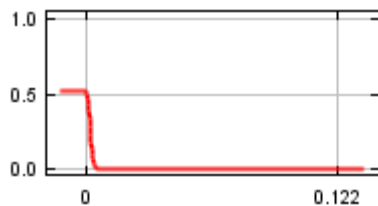
Variation in monthly radiation



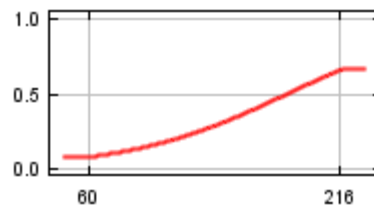
Percent Forest Cover



Cottonwood Index



Warmest quarter mean temperature

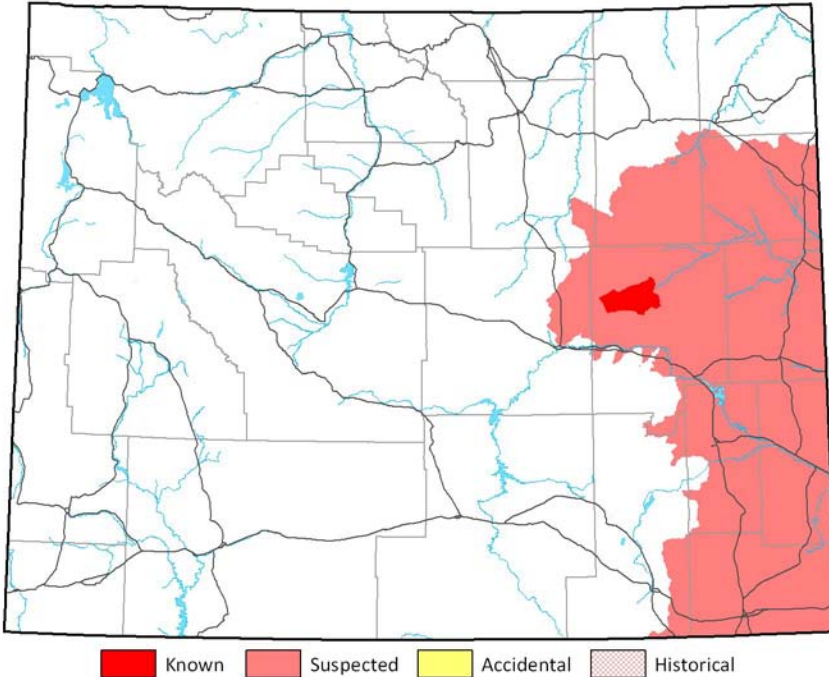


Silky Pocket Mouse (*Perognathus flavus*) Range Map and Distribution Model Summary

August 20, 2010

This report presents range and distribution of Silky Pocket Mouse (AMAFD01030) in Wyoming (see Keinath et al. 2010b). Similar reports were developed by the Wyoming Natural Diversity Database for terrestrial vertebrate species of conservation need in Wyoming's State Wildlife Action Plan. This effort was supported by the Wyoming Game and Fish Department and the U.S. Geological Survey.

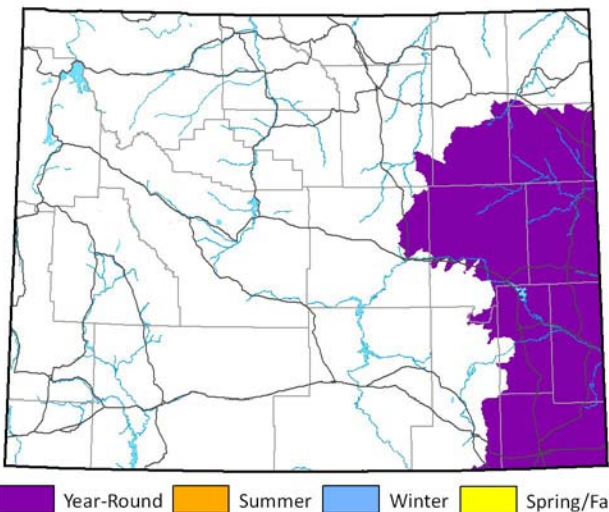
Range Map - Occupancy



Range Notes

- Version: 2010-01-19
- Proportion of range deemed known based on documented occurrences: 0.012
- Details of range map creation noted in Keinath et al. (2010a).

Range Map - Seasonality



Maps, models and report were created by and are available from the Wyoming Natural Diversity Database. (<http://uwadmnweb.uwyo.edu/wyndd/>).

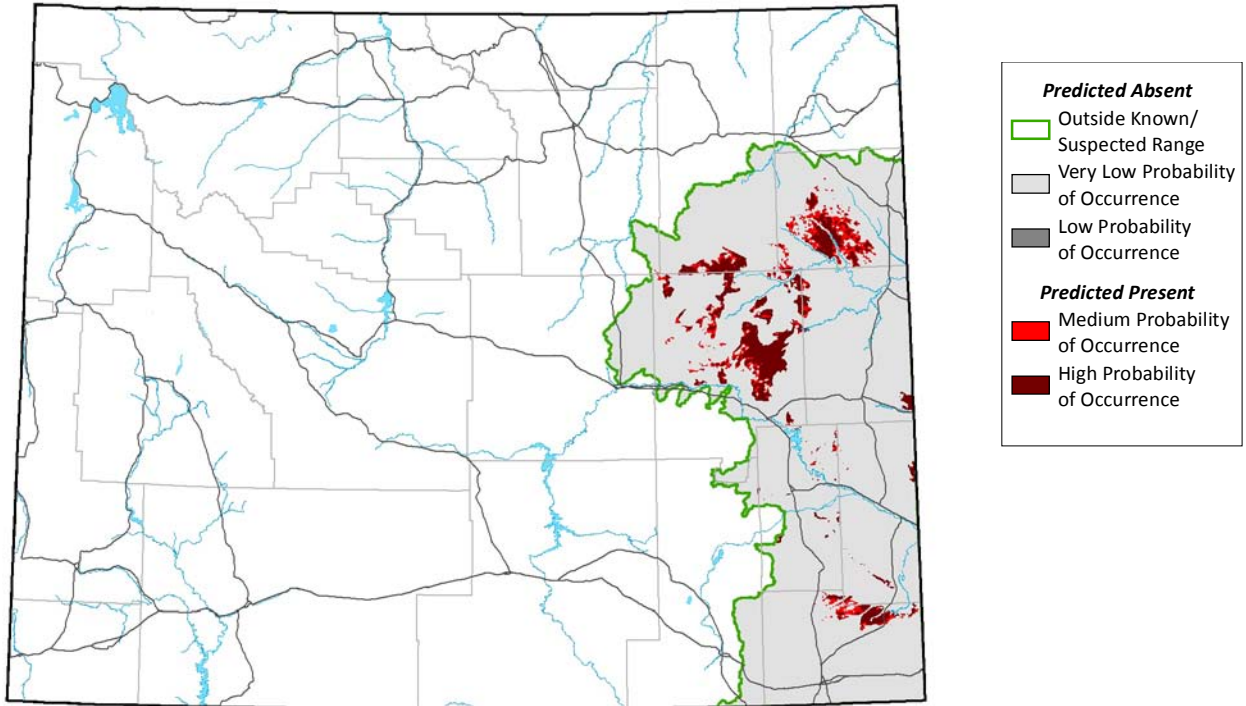
Doug Keinath, Senior Zoologist

Mark Andersen, GIS Specialist

© 2010, WYNDD

Distribution Model (Version: Thu Apr 22 09:37:00 MDT 2010)

Details of distribution model creation are presented in Keinath et al. (2010b)



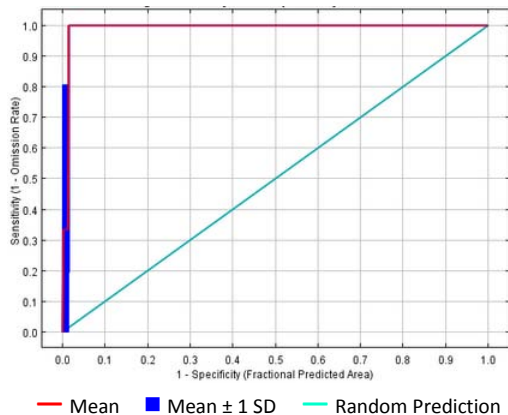
Model Parameters

- Season Modeled: Year-Round
- Algorithm: Maxent version 3.3.1
- Feature Types: Linear
- Binary Threshold Rule: Maximum training sensitivity plus specificity
- Binary Threshold Value: 0.6349950
- High-Probability Threshold Value: 0.6674770
- Low-Probability Threshold Value: 0.6349950

Model Quality Summary

Overall Assessment of Model Quality: LOW
 Expert Assessment: Low
 Occurrence Sample Size: Very Low
 Quality of Occurrences: Low
 Positive Success Rate: Low
 Test AUC and Model Gain: High

Model Evaluation - ROC Plot



Model Evaluation Statistics

Final Model Statistics

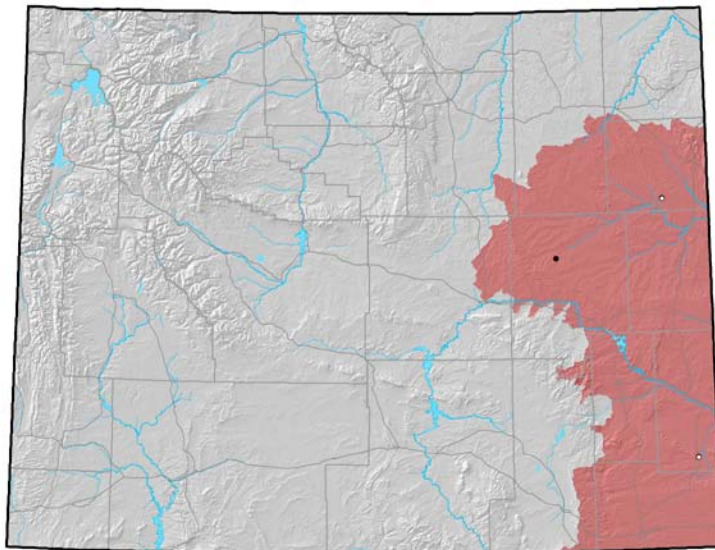
Training AUC: 0.993
 Regularized Training Gain: 2.924

Cross-Validation Statistics

- Average Test AUC: 0.991 ± 0.007
- Upper Bound on Test AUC: 0.976
- Average Test Gain: 1.111 ± 1.820
- Omission Error (fraction of test points omitted during 3-fold cross validation): 0.67 ± 0.58

Occurrence Data for Distribution Model

Occurrence Map



Points Used in Modeling, by Year of Observation

- Pre-1985
- 1985 or Later

Known and Suspected Range

Occurrence Summary Statistics

- Number of Occurrences in AWVED master dataset: 11
- Number of Occurrences used to create distribution model: 3
- Average Point Quality Index (highest quality is 12.00): 4.67 ± 0.58
- Most recent occurrence used: 1991
- Oldest occurrence used: 1910
- Occurrence File:
LOCAL_SAMPLE_POINTS.csv

Comments

The model for this species is based on a small sample size of occurrence locations, which often results in low model quality. Collection of additional, high-quality occurrence locations could greatly improve the modeled distribution for this species.

References

- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010a. Range maps for Wyoming's species of greatest conservation need. Report prepared for the Wyoming Game and Fish Department by the Wyoming Natural Diversity Database, Laramie, Wyoming. January 19, 2010.
- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010b. Range and modeled distribution of Wyoming's species of greatest conservation need. Report prepared by the Wyoming Natural Diversity Database, Laramie Wyoming for the Wyoming Game and Fish Department, Cheyenne, Wyoming and the U.S. Geological Survey, Fort Collins, Colorado. August 20, 2010.

Predictor Variables used in the Distribution Model

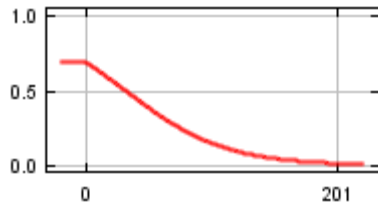
Percent Contribution (PC) to final model

<i>Environmental Variable</i>	<i>PC</i>
Depth to Shallowest Restrictive Layer	33
Pinon-Juniper Index	25
Variation of monthly precipitation	21
Soil texture	19
Bare Ground Index	2
Driest quarter mean temperature	0

Response Curves

Each curve shows dependence of predicted suitability on input values of a single predictor variable considering correlations with others. Suitability is on the vertical axis (units: probability). Variable values are on the horizontal axis (units based on inputs; see Keinath et al 2010b for details).

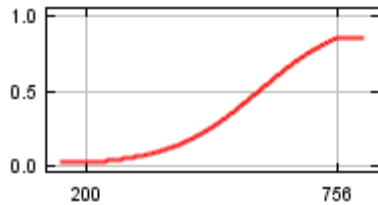
Depth to Shallowest Restrictive Layer



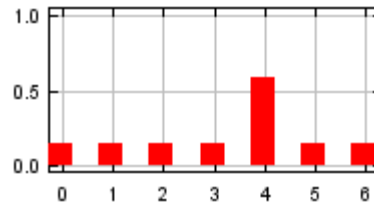
Pinon-Juniper Index



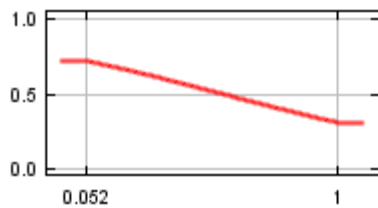
Variation of monthly precipitation



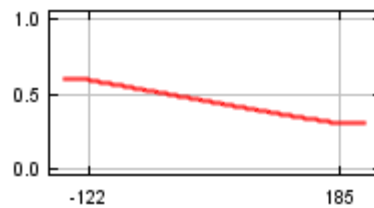
Soil texture



Bare Ground Index



Driest quarter mean temperature

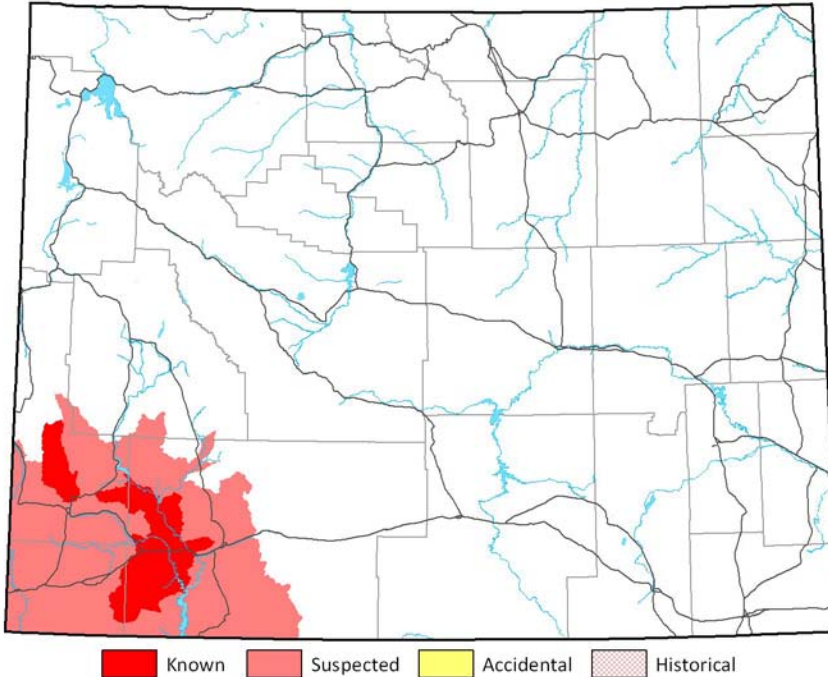


Great Basin Pocket Mouse (*Perognathus parvus*) Range Map and Distribution Model Summary

August 20, 2010

This report presents range and distribution of Great Basin Pocket Mouse (AMAFD01070) in Wyoming (see Keinath et al. 2010b). Similar reports were developed by the Wyoming Natural Diversity Database for terrestrial vertebrate species of conservation need in Wyoming's State Wildlife Action Plan. This effort was supported by the Wyoming Game and Fish Department and the U.S. Geological Survey.

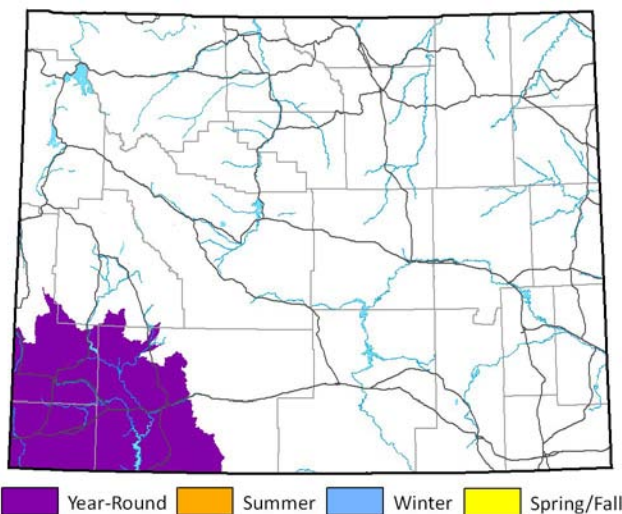
Range Map - Occupancy



Range Notes

- Version: 2010-01-19
- Proportion of range deemed known based on documented occurrences: 0.111
- Details of range map creation noted in Keinath et al. (2010a).

Range Map - Seasonality



Maps, models and report were created by and are available from the Wyoming Natural Diversity Database. (<http://uwadmnweb.uwyo.edu/wyndd/>).

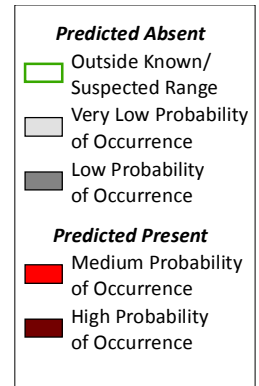
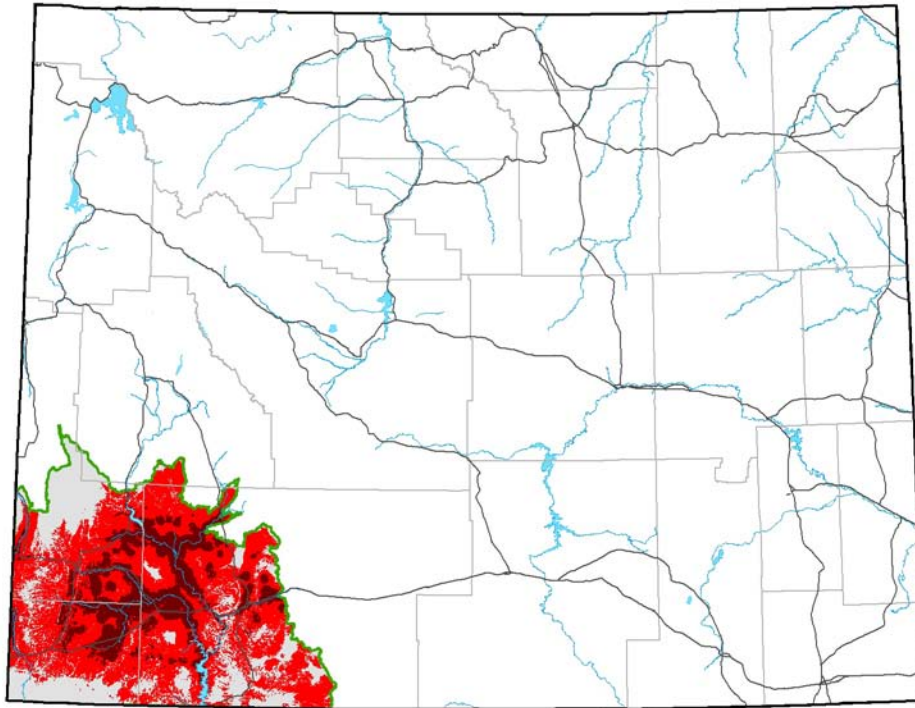
Doug Keinath, Senior Zoologist

Mark Andersen, GIS Specialist

© 2010, WYNDD

Distribution Model (Version: Tue Mar 16 16:59:57 MDT 2010)

Details of distribution model creation are presented in Keinath et al. (2010b)



Model Parameters

- Season Modeled: Year-Round
- Algorithm: Maxent version 3.3.1
- Feature Types: Linear, Product
- Binary Threshold Rule: Maximum training sensitivity plus specificity
- Binary Threshold Value: 0.2359120
- High-Probability Threshold Value: 0.5867772
- Low-Probability Threshold Value: 0.2359120

Model Quality Summary

Overall Assessment of Model Quality:

MEDIUM

- Expert Assessment: Medium
- Occurrence Sample Size: Low
- Quality of Occurrences: Medium
- Positive Success Rate: Very High
- Test AUC and Model Gain: High

Model Evaluation Statistics

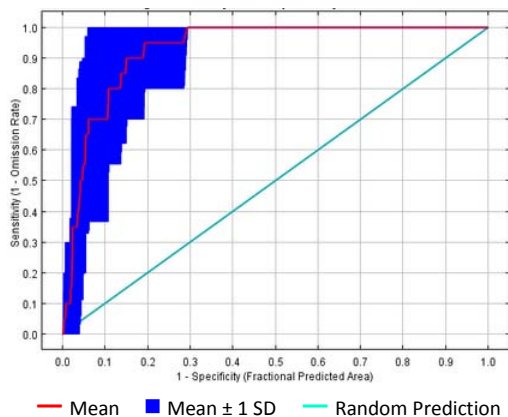
Final Model Statistics

- Training AUC: 0.944
- Regularized Training Gain: 1.539

Cross-Validation Statistics

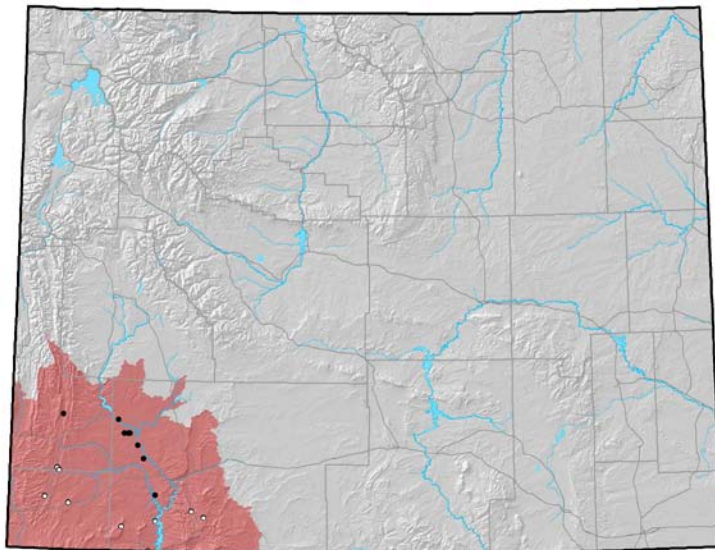
- Average Test AUC: 0.929 ± 0.048
- Upper Bound on Test AUC: 0.920
- Average Test Gain: 1.591 ± 0.582
- Omission Error (fraction of test points omitted during 10-fold cross validation): 0.10 ± 0.21

Model Evaluation - ROC Plot



Occurrence Data for Distribution Model

Occurrence Map



Points Used in Modeling, by Year of Observation

- Pre-1985
- 1985 or Later

Known and Suspected Range

Occurrence Summary Statistics

- Number of Occurrences in AWVED master dataset: 72
- Number of Occurrences used to create distribution model: 17
- Average Point Quality Index (highest quality is 12.00): 6.18 ± 2.48
- Most recent occurrence used: 2005
- Oldest occurrence used: 1935
- Occurrence File:
REVISED_SAMPLE_POINTS_ALL_SPP.csv

Comments

There are no additional comments specific to this species range map or distribution model.

References

- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010a. Range maps for Wyoming's species of greatest conservation need. Report prepared for the Wyoming Game and Fish Department by the Wyoming Natural Diversity Database, Laramie, Wyoming. January 19, 2010.
- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010b. Range and modeled distribution of Wyoming's species of greatest conservation need. Report prepared by the Wyoming Natural Diversity Database, Laramie Wyoming for the Wyoming Game and Fish Department, Cheyenne, Wyoming and the U.S. Geological Survey, Fort Collins, Colorado. August 20, 2010.

Predictor Variables used in the Distribution Model

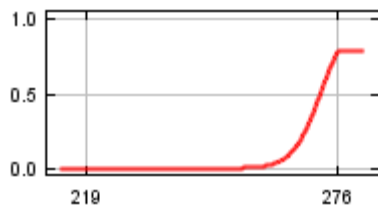
Percent Contribution (PC) to final model

<i>Environmental Variable</i>	<i>PC</i>
Radiation of the lightest month	83
Precipitation of the wettest month	9
Conifer Index	4
Distance to Permanent Water	2
Vector Ruggedness Measure	1
Pinon-Juniper Index	0

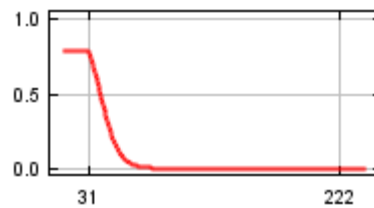
Response Curves

Each curve shows dependence of predicted suitability on input values of a single predictor variable considering correlations with others. Suitability is on the vertical axis (units: probability). Variable values are on the horizontal axis (units based on inputs; see Keinath et al 2010b for details).

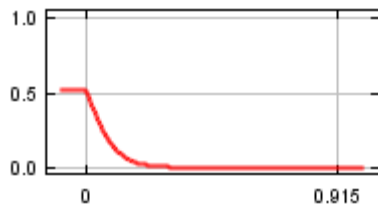
Radiation of the lightest month



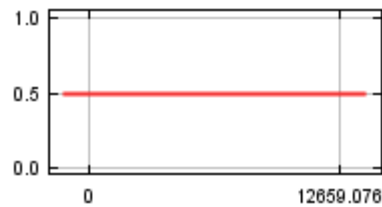
Precipitation of the wettest month



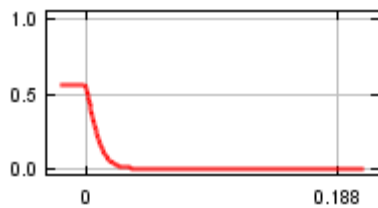
Conifer Index



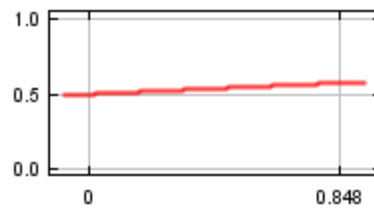
Distance to Permanent Water



Vector Ruggedness Measure



Pinon-Juniper Index

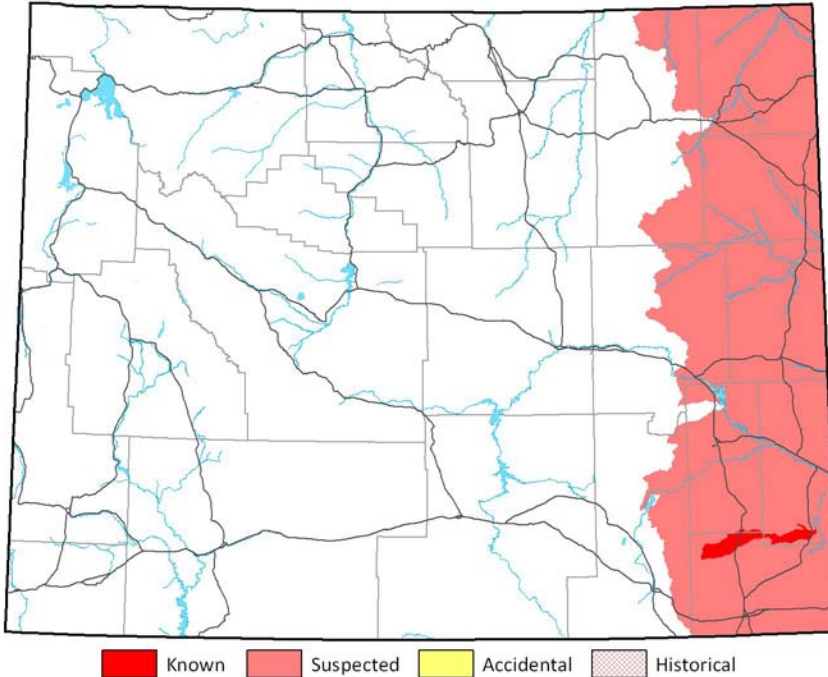


Hispid Pocket Mouse (*Chaetodipus hispidus*) Range Map and Distribution Model Summary

August 20, 2010

This report presents range and distribution of Hispid Pocket Mouse (AMAFD05050) in Wyoming (see Keinath et al. 2010b). Similar reports were developed by the Wyoming Natural Diversity Database for terrestrial vertebrate species of conservation need in Wyoming's State Wildlife Action Plan. This effort was supported by the Wyoming Game and Fish Department and the U.S. Geological Survey.

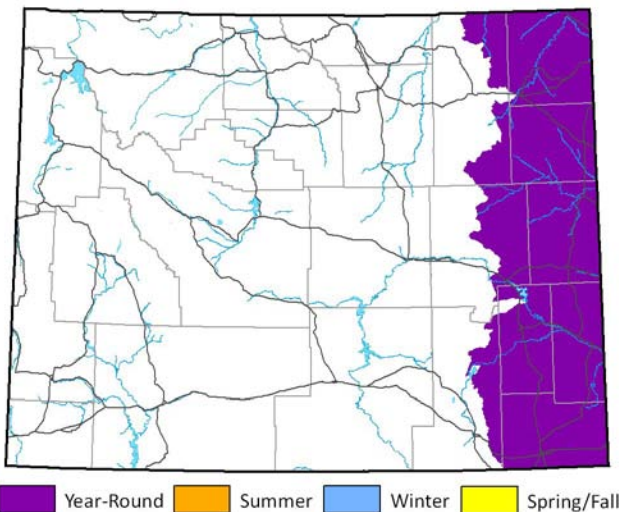
Range Map - Occupancy



Range Notes

- Version: 2010-01-19
- Proportion of range deemed known based on documented occurrences: 0.011
- Details of range map creation noted in Keinath et al. (2010a).

Range Map - Seasonality



Maps, models and report were created by and are available from the Wyoming Natural Diversity Database. (<http://uwadmnweb.uwyo.edu/wyndd/>).

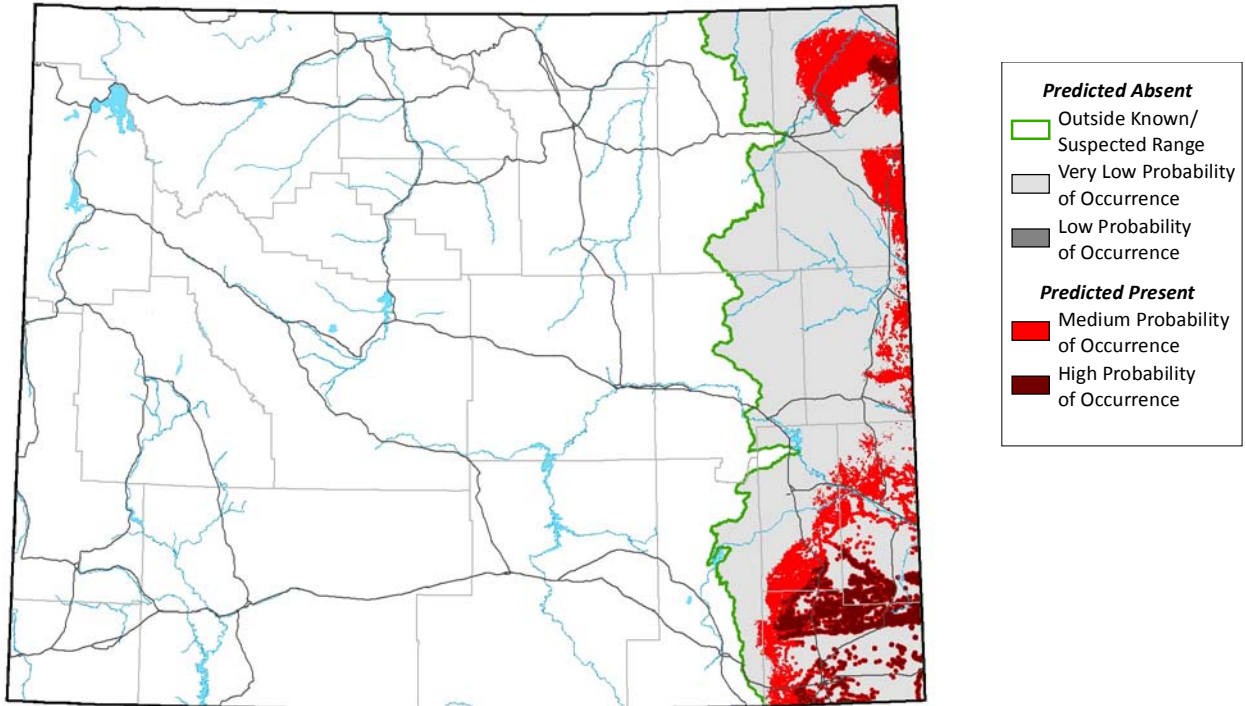
Doug Keinath, Senior Zoologist

Mark Andersen, GIS Specialist

© 2010, WYNDD

Distribution Model (Version: Fri Dec 04 16:49:46 MST 2009)

Details of distribution model creation are presented in Keinath et al. (2010b)



Model Parameters

- Season Modeled: Year-Round
- Algorithm: Maxent version 3.3.1
- Feature Types: Linear, Quadratic
- Binary Threshold Rule: Maximum training sensitivity plus specificity
- Binary Threshold Value: 0.2619050
- High-Probability Threshold Value: 0.6031450
- Low-Probability Threshold Value: 0.2619047

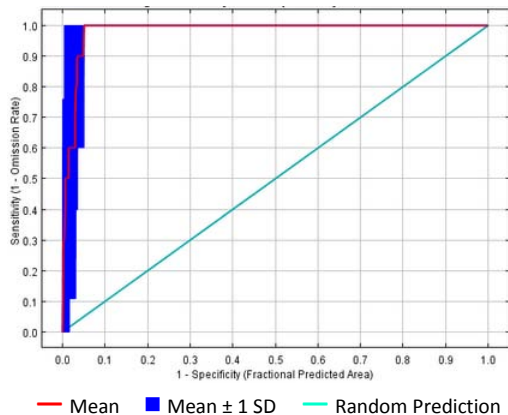
Model Quality Summary

Overall Assessment of Model Quality:

MEDIUM

- Expert Assessment: Medium
- Occurrence Sample Size: Low
- Quality of Occurrences: Low
- Positive Success Rate: Medium
- Test AUC and Model Gain: High

Model Evaluation - ROC Plot



Model Evaluation Statistics

Final Model Statistics

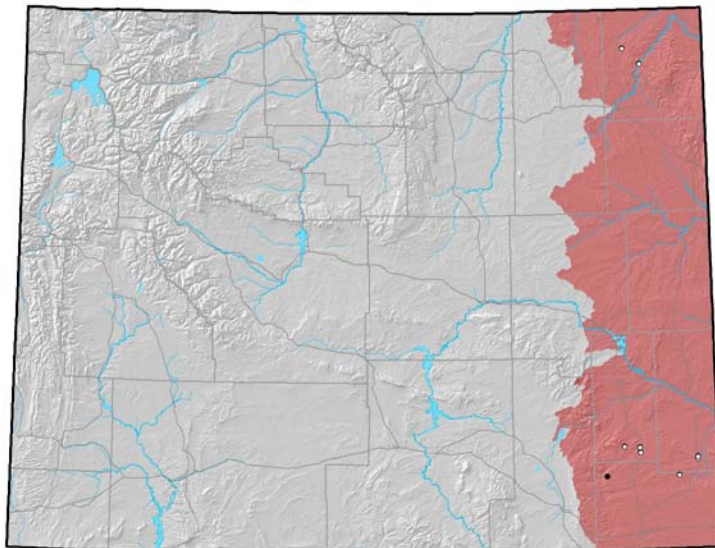
- Training AUC: 0.990
- Regularized Training Gain: 2.891

Cross-Validation Statistics

- Average Test AUC: 0.983 ± 0.017
- Upper Bound on Test AUC: 0.974
- Average Test Gain: 3.012 ± 1.076
- Omission Error (fraction of test points omitted during 10-fold cross validation): 0.30 ± 0.48

Occurrence Data for Distribution Model

Occurrence Map



Points Used in Modeling, by Year of Observation

- Pre-1985
- 1985 or Later

■ Known and Suspected Range

Occurrence Summary Statistics

- Number of Occurrences in AWVED master dataset: 26
- Number of Occurrences used to create distribution model: 10
- Average Point Quality Index (highest quality is 12.00): 5.40 ± 2.22
- Most recent occurrence used: 1999
- Oldest occurrence used: 1909
- Occurrence File:
LOCAL_SAMPLE_POINTS.csv

Comments

There are no additional comments specific to this species range map or distribution model.

References

- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010a. Range maps for Wyoming's species of greatest conservation need. Report prepared for the Wyoming Game and Fish Department by the Wyoming Natural Diversity Database, Laramie, Wyoming. January 19, 2010.
- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010b. Range and modeled distribution of Wyoming's species of greatest conservation need. Report prepared by the Wyoming Natural Diversity Database, Laramie Wyoming for the Wyoming Game and Fish Department, Cheyenne, Wyoming and the U.S. Geological Survey, Fort Collins, Colorado. August 20, 2010.

Predictor Variables used in the Distribution Model

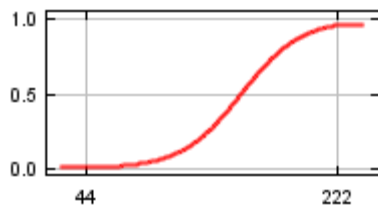
Percent Contribution (PC) to final model

<i>Environmental Variable</i>	<i>PC</i>
Precipitation of the warmest quarter	42
Wettest quarter mean temperature	31
Coldest month mean minimum temperature	14
Potential for Rock Outcrop	10
Variation in monthly Relative Humidity	3
Coldest quarter mean temperature	0

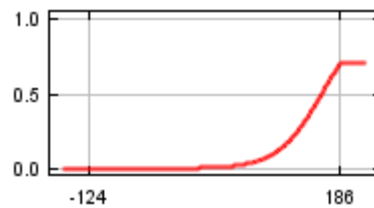
Response Curves

Each curve shows dependence of predicted suitability on input values of a single predictor variable considering correlations with others. Suitability is on the vertical axis (units: probability). Variable values are on the horizontal axis (units based on inputs; see Keinath et al 2010b for details).

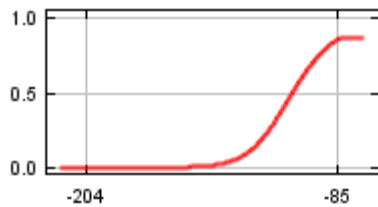
Precipitation of the warmest quarter



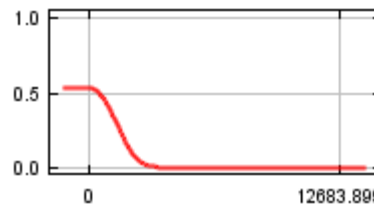
Wettest quarter mean temperature



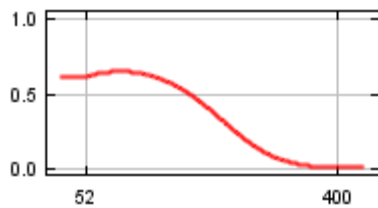
Coldest month mean minimum temperature



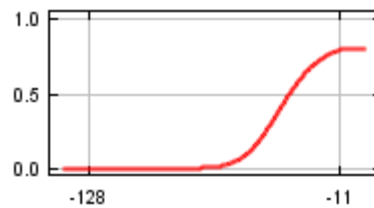
Potential for Rock Outcrop



Variation in monthly Relative Humidity



Coldest quarter mean temperature

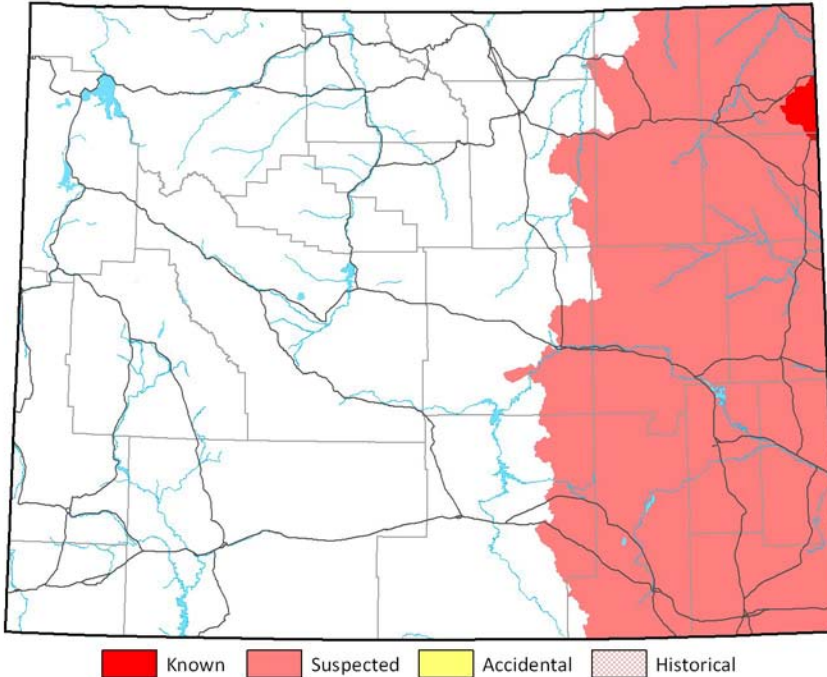


Plains Harvest Mouse (*Reithrodontomys montanus*) Range Map and Distribution Model Summary

August 20, 2010

This report presents range and distribution of Plains Harvest Mouse (AMAFF02010) in Wyoming (see Keinath et al. 2010b). Similar reports were developed by the Wyoming Natural Diversity Database for terrestrial vertebrate species of conservation need in Wyoming's State Wildlife Action Plan. This effort was supported by the Wyoming Game and Fish Department and the U.S. Geological Survey.

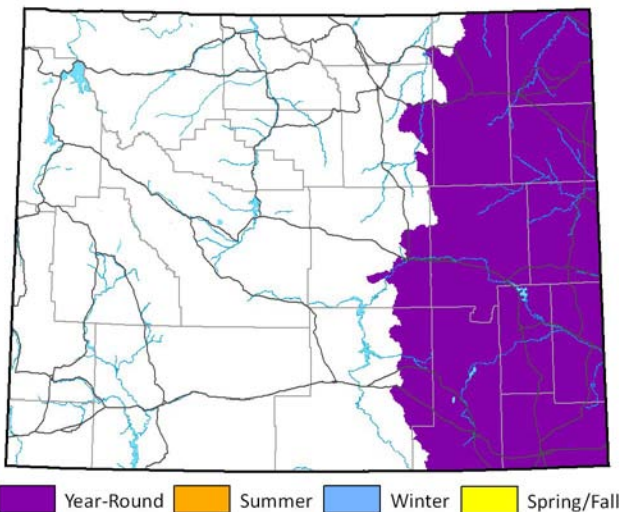
Range Map - Occupancy



Range Notes

- Version: 2010-01-19
- Proportion of range deemed known based on documented occurrences: 0.007
- Details of range map creation noted in Keinath et al. (2010a).

Range Map - Seasonality



Maps, models and report were created by and are available from the Wyoming Natural Diversity Database. (<http://uwadmnweb.uwyo.edu/wyndd/>).

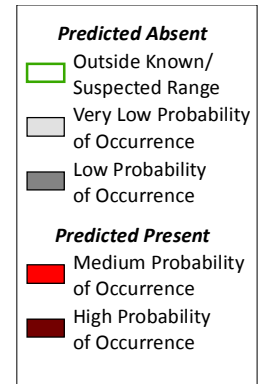
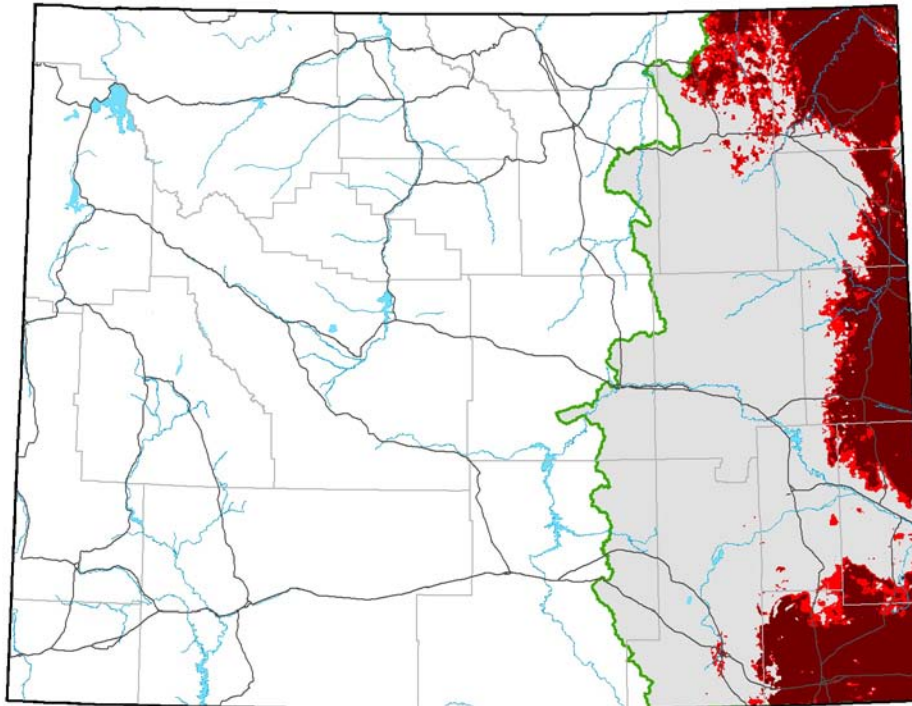
Doug Keinath, Senior Zoologist

Mark Andersen, GIS Specialist

© 2010, WYNDD

Distribution Model (Version: Wed Dec 09 09:13:05 MST 2009)

Details of distribution model creation are presented in Keinath et al. (2010b)



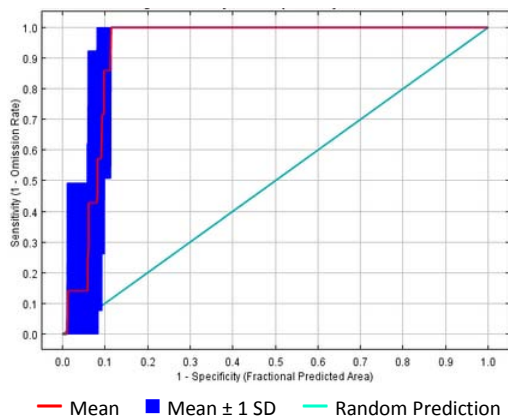
Model Parameters

- Season Modeled: Year-Round
- Algorithm: Maxent version 3.3.1
- Feature Types: Linear
- Binary Threshold Rule: Maximum training sensitivity plus specificity
- Binary Threshold Value: 0.4996330
- High-Probability Threshold Value: 0.5672503
- Low-Probability Threshold Value: 0.4996330

Model Quality Summary

Overall Assessment of Model Quality: LOW
 Expert Assessment: Low
 Occurrence Sample Size: Low
 Quality of Occurrences: Medium
 Positive Success Rate: Low
 Test AUC and Model Gain: Low

Model Evaluation - ROC Plot



Model Evaluation Statistics

Final Model Statistics

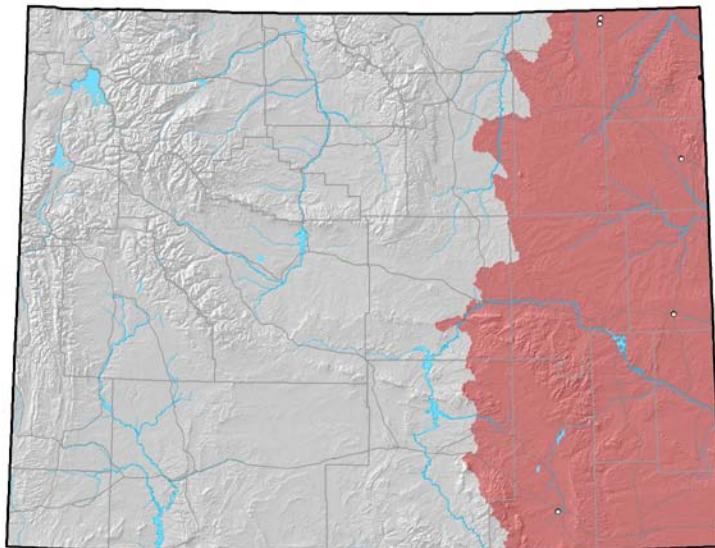
Training AUC: 0.960
 Regularized Training Gain: 1.302

Cross-Validation Statistics

- Average Test AUC: 0.648 ± 0.448
- Upper Bound on Test AUC: 0.890
- Average Test Gain: 0.910 ± 0.755
- Omission Error (fraction of test points omitted during 7-fold cross validation): 0.43 ± 0.53

Occurrence Data for Distribution Model

Occurrence Map



Points Used in Modeling, by Year of Observation

- Pre-1985
- 1985 or Later

Known and Suspected Range

Occurrence Summary Statistics

- Number of Occurrences in AWVED master dataset: 11
- Number of Occurrences used to create distribution model: 7
- Average Point Quality Index (highest quality is 12.00): 6.43 ± 3.10
- Most recent occurrence used: 1990
- Oldest occurrence used: 1949
- Occurrence File:
LOCAL_SAMPLE_POINTS.csv

Comments

The model for this species is based on a small sample size of occurrence locations, which often results in low model quality. Collection of additional, high-quality occurrence locations could greatly improve the modeled distribution for this species.

References

- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010a. Range maps for Wyoming's species of greatest conservation need. Report prepared for the Wyoming Game and Fish Department by the Wyoming Natural Diversity Database, Laramie, Wyoming. January 19, 2010.
- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010b. Range and modeled distribution of Wyoming's species of greatest conservation need. Report prepared by the Wyoming Natural Diversity Database, Laramie Wyoming for the Wyoming Game and Fish Department, Cheyenne, Wyoming and the U.S. Geological Survey, Fort Collins, Colorado. August 20, 2010.

Predictor Variables used in the Distribution Model

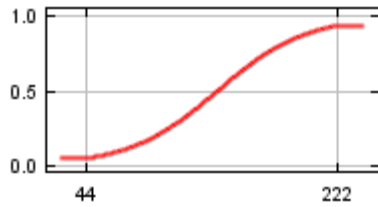
Percent Contribution (PC) to final model

<i>Environmental Variable</i>	<i>PC</i>
Precipitation of the warmest quarter	42
Wettest quarter mean temperature	32
Interannual variation in annual frost days	17
Sagebrush Index	6
Pinon-Juniper Index	2
Soil - Fraction Sand	1

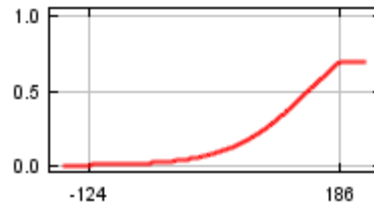
Response Curves

Each curve shows dependence of predicted suitability on input values of a single predictor variable considering correlations with others. Suitability is on the vertical axis (units: probability). Variable values are on the horizontal axis (units based on inputs; see Keinath et al 2010b for details).

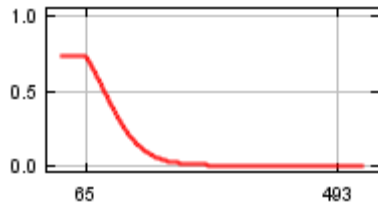
Precipitation of the warmest quarter



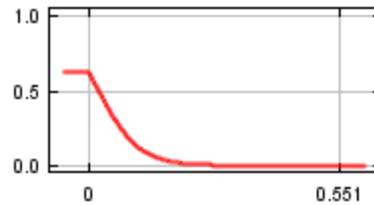
Wettest quarter mean temperature



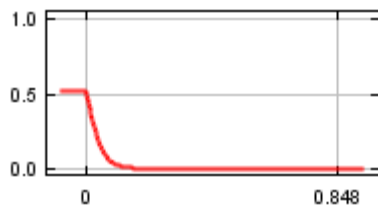
Interannual variation in annual frost days



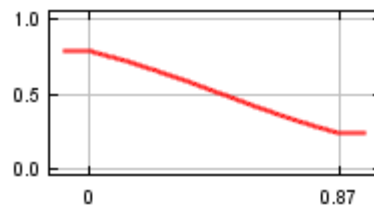
Sagebrush Index



Pinon-Juniper Index



Soil - Fraction Sand

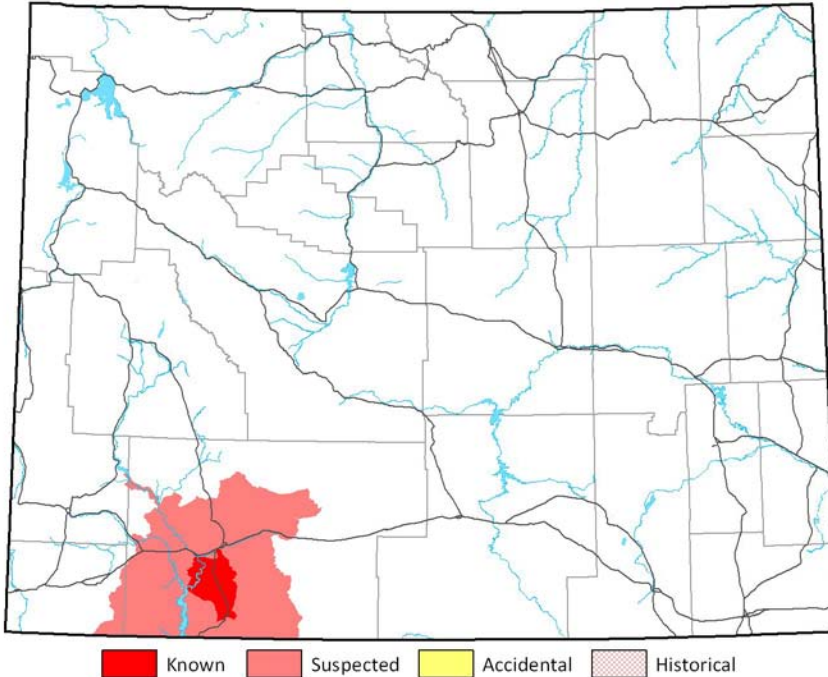


Canyon Mouse (*Peromyscus crinitus*) Range Map and Distribution Model Summary

August 20, 2010

This report presents range and distribution of Canyon Mouse (AMAFF03090) in Wyoming (see Keinath et al. 2010b). Similar reports were developed by the Wyoming Natural Diversity Database for terrestrial vertebrate species of conservation need in Wyoming's State Wildlife Action Plan. This effort was supported by the Wyoming Game and Fish Department and the U.S. Geological Survey.

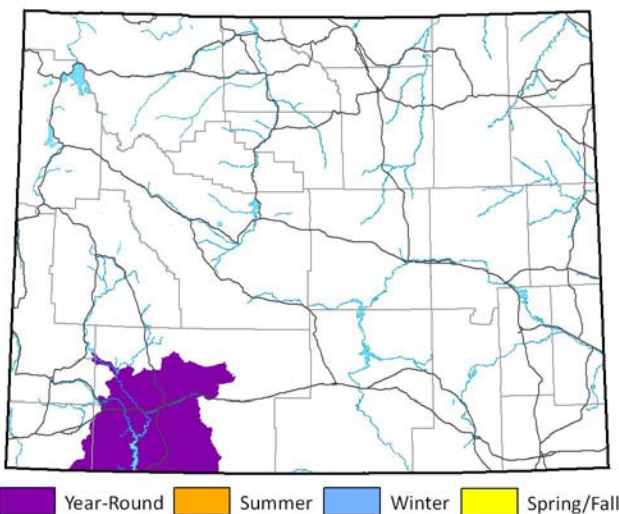
Range Map - Occupancy



Range Notes

- Version: 2010-01-19
- Proportion of range deemed known based on documented occurrences: 0.105
- Details of range map creation noted in Keinath et al. (2010a).

Range Map - Seasonality



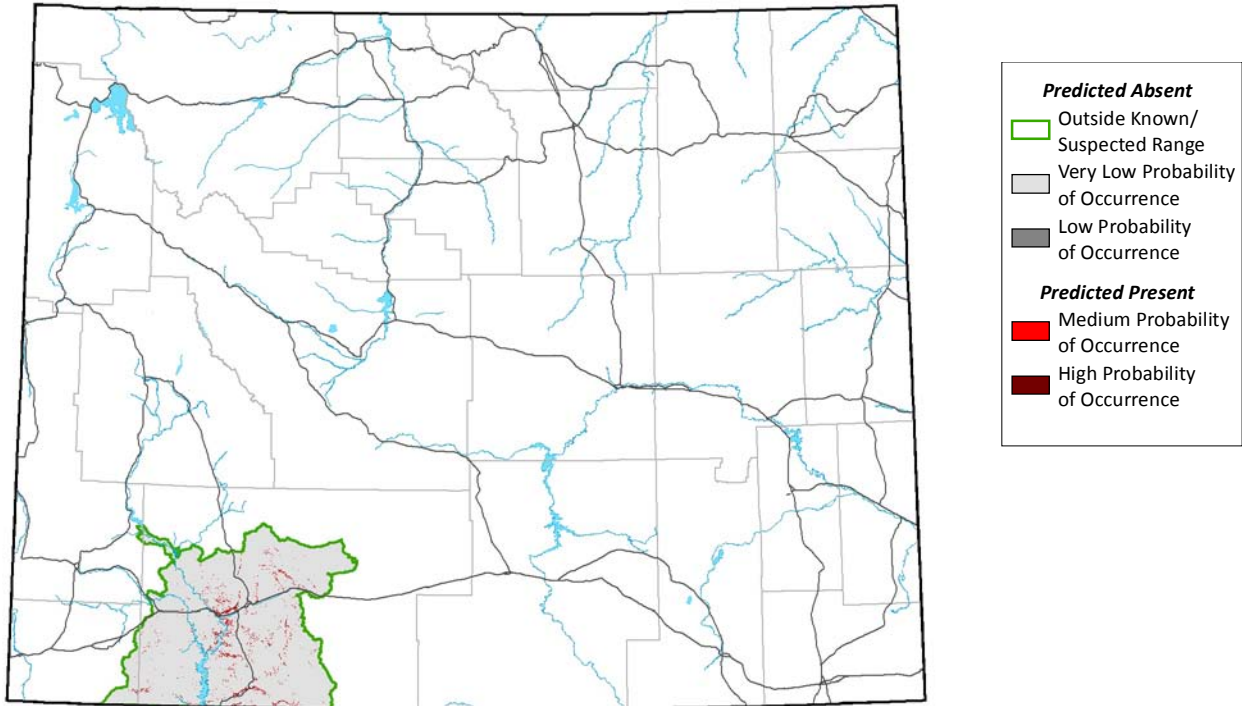
Maps, models and report were created by and are available from the Wyoming Natural Diversity Database. (<http://uwadmnweb.uwyo.edu/wyndd/>).

Doug Keinath, Senior Zoologist
Mark Andersen, GIS Specialist

© 2010, WYNDD

Distribution Model (Version: Wed Apr 21 09:34:10 MDT 2010)

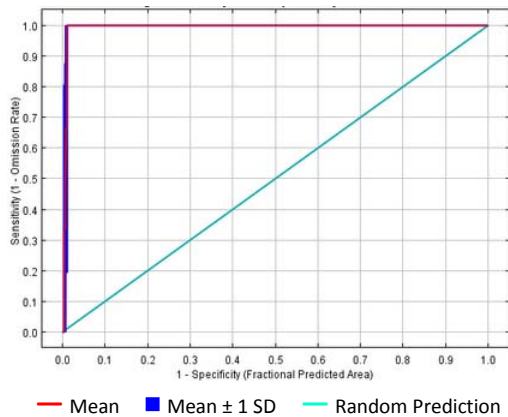
Details of distribution model creation are presented in Keinath et al. (2010b)



Model Parameters

- Season Modeled: Year-Round
- Algorithm: Maxent version 3.3.1
- Feature Types: Linear
- Binary Threshold Rule: Maximum training sensitivity plus specificity
- Binary Threshold Value: 0.4731585
- High-Probability Threshold Value: 0.7063487
- Low-Probability Threshold Value: 0.4731585

Model Evaluation - ROC Plot



Model Quality Summary

Overall Assessment of Model Quality: LOW
 Expert Assessment: Low
 Occurrence Sample Size: Very Low
 Quality of Occurrences: Low
 Positive Success Rate: Low
 Test AUC and Model Gain: Low

Model Evaluation Statistics

Final Model Statistics

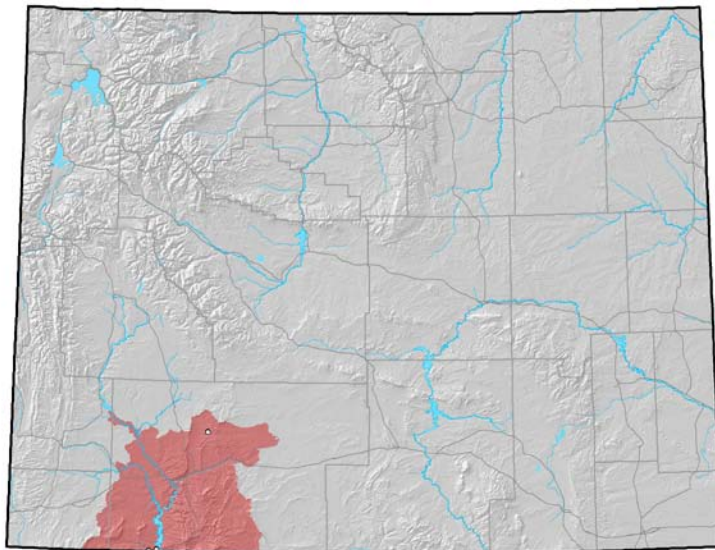
Training AUC: 0.998
 Regularized Training Gain: 3.121

Cross-Validation Statistics

- Average Test AUC: 0.298 ± 0.480
- Upper Bound on Test AUC: 0.944
- Average Test Gain: 0.786 ± 1.283
- Omission Error (fraction of test points omitted during 3-fold cross validation): 0.67 ± 0.58

Occurrence Data for Distribution Model

Occurrence Map



Points Used in Modeling, by Year of Observation

- Pre-1985
- 1985 or Later

Known and Suspected Range

Occurrence Summary Statistics

- Number of Occurrences in AWVED master dataset: 6
- Number of Occurrences used to create distribution model: 3
- Average Point Quality Index (highest quality is 12.00): 4.67 ± 1.15
- Most recent occurrence used: 1980
- Oldest occurrence used: 1911
- Occurrence File:
LOCAL_SAMPLE_POINTS.csv

Comments

The model for this species is based on a small sample size of occurrence locations, which often results in low model quality. Collection of additional, high-quality occurrence locations could greatly improve the modeled distribution for this species.

References

- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010a. Range maps for Wyoming's species of greatest conservation need. Report prepared for the Wyoming Game and Fish Department by the Wyoming Natural Diversity Database, Laramie, Wyoming. January 19, 2010.
- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010b. Range and modeled distribution of Wyoming's species of greatest conservation need. Report prepared by the Wyoming Natural Diversity Database, Laramie Wyoming for the Wyoming Game and Fish Department, Cheyenne, Wyoming and the U.S. Geological Survey, Fort Collins, Colorado. August 20, 2010.

Predictor Variables used in the Distribution Model

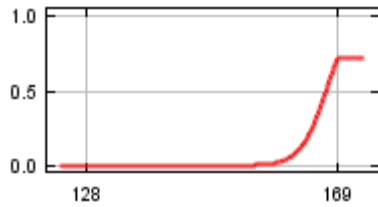
Percent Contribution (PC) to final model

<i>Environmental Variable</i>	<i>PC</i>
Annual total radiation	52
Degree Slope	38
Soil texture	10
Bare Ground Index	0

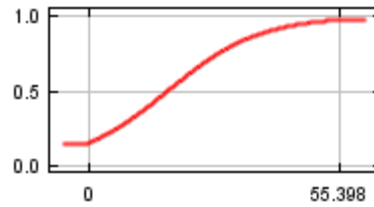
Response Curves

Each curve shows dependence of predicted suitability on input values of a single predictor variable considering correlations with others. Suitability is on the vertical axis (units: probability). Variable values are on the horizontal axis (units based on inputs; see Keinath et al 2010b for details).

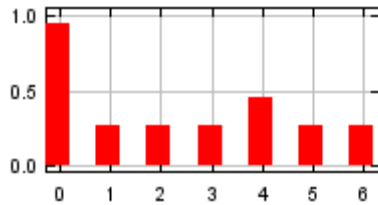
Annual total radiation



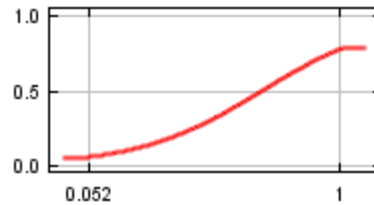
Degree Slope



Soil texture



Bare Ground Index

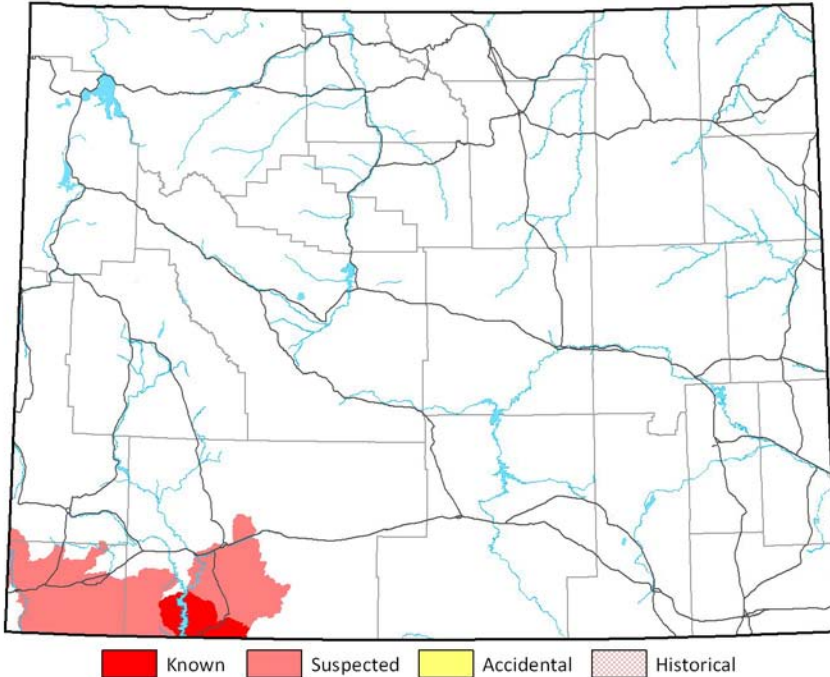


Pinyon Mouse (*Peromyscus truei*) Range Map and Distribution Model Summary

August 20, 2010

This report presents range and distribution of Pinyon Mouse (AMAFF03130) in Wyoming (see Keinath et al. 2010b). Similar reports were developed by the Wyoming Natural Diversity Database for terrestrial vertebrate species of conservation need in Wyoming's State Wildlife Action Plan. This effort was supported by the Wyoming Game and Fish Department and the U.S. Geological Survey.

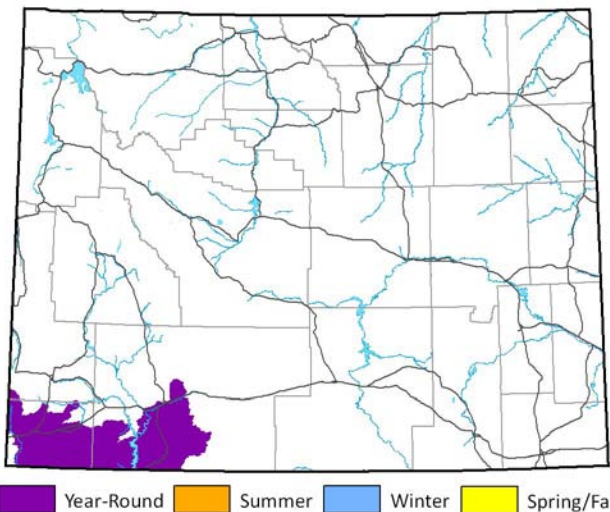
Range Map - Occupancy



Range Notes

- Version: 2010-01-19
- Proportion of range deemed known based on documented occurrences: 0.105
- Details of range map creation noted in Keinath et al. (2010a).

Range Map - Seasonality



Maps, models and report were created by and are available from the Wyoming Natural Diversity Database. (<http://uwadmnweb.uwyo.edu/wyndd/>).

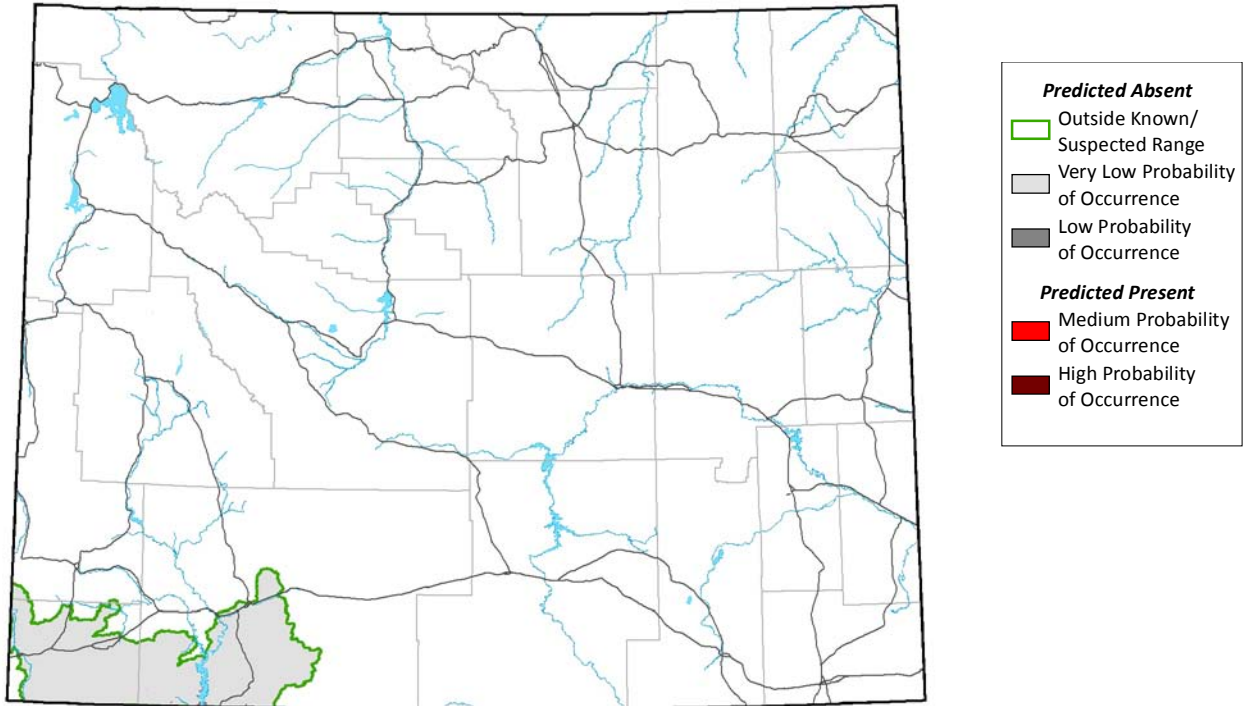
Doug Keinath, Senior Zoologist

Mark Andersen, GIS Specialist

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Distribution Model (Version: Fri Dec 04 22:48:45 MST 2009)

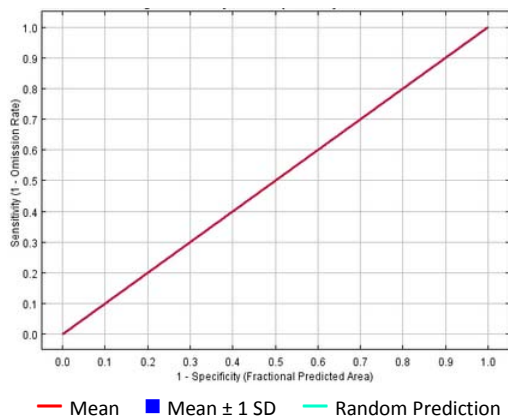
Details of distribution model creation are presented in Keinath et al. (2010b)



Model Parameters

- Season Modeled: Year-Round
- Algorithm: Maxent version 3.3.1
- Feature Types: Linear
- Binary Threshold Rule: Maximum training sensitivity plus specificity
- Binary Threshold Value: 0.5468120
- High-Probability Threshold Value: 0.6493307
- Low-Probability Threshold Value: 0.5468120

Model Evaluation - ROC Plot



Model Quality Summary

Overall Assessment of Model Quality: LOW
 Expert Assessment: Low
 Occurrence Sample Size: Very Low
 Quality of Occurrences: Low
 Positive Success Rate: Very High
 Test AUC and Model Gain: Low

Model Evaluation Statistics

Final Model Statistics

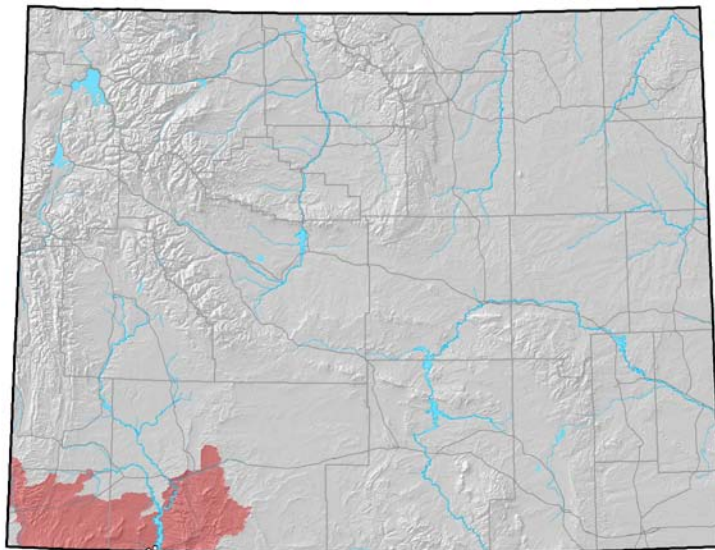
Training AUC: 0.999
 Regularized Training Gain: 5.386

Cross-Validation Statistics

- Average Test AUC: 0.100 ± 0.211
- Upper Bound on Test AUC: 0.995
- Average Test Gain: 0.000 ± 0.000
- Omission Error (fraction of test points omitted during 2-fold cross validation): 0.00 ± 0.00

Occurrence Data for Distribution Model

Occurrence Map



Points Used in Modeling, by Year of Observation

- Pre-1985
- 1985 or Later

■ Known and Suspected Range

Occurrence Summary Statistics

- Number of Occurrences in AWVED master dataset: 6
- Number of Occurrences used to create distribution model: 2
- Average Point Quality Index (highest quality is 12.00): 4.00 ± 0.00
- Most recent occurrence used: 1911
- Oldest occurrence used: 1911
- Occurrence File:
LOCAL_SAMPLE_POINTS.csv

Comments

The model for this species is based on a small sample size of occurrence locations, which often results in low model quality. Collection of additional, high-quality occurrence locations could greatly improve the modeled distribution for this species.

References

- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010a. Range maps for Wyoming's species of greatest conservation need. Report prepared for the Wyoming Game and Fish Department by the Wyoming Natural Diversity Database, Laramie, Wyoming. January 19, 2010.
- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010b. Range and modeled distribution of Wyoming's species of greatest conservation need. Report prepared by the Wyoming Natural Diversity Database, Laramie Wyoming for the Wyoming Game and Fish Department, Cheyenne, Wyoming and the U.S. Geological Survey, Fort Collins, Colorado. August 20, 2010.

Predictor Variables used in the Distribution Model

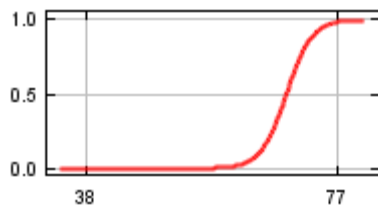
Percent Contribution (PC) to final model

<i>Environmental Variable</i>	<i>PC</i>
Radiation of the darkest month	36
Distance to Permanent Water	25
Relative Humidity of most humid month	20
Hottest month mean maximum temperature	10
Variation of monthly precipitation	8
Precipitation of the wettest month	0

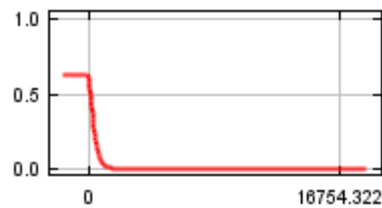
Response Curves

Each curve shows dependence of predicted suitability on input values of a single predictor variable considering correlations with others. Suitability is on the vertical axis (units: probability). Variable values are on the horizontal axis (units based on inputs; see Keinath et al 2010b for details).

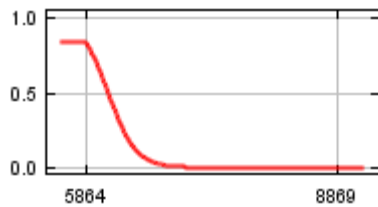
Radiation of the darkest month



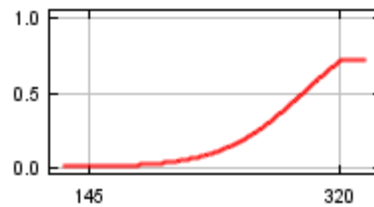
Distance to Permanent Water



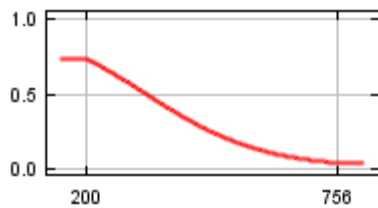
Relative Humidity of most humid month



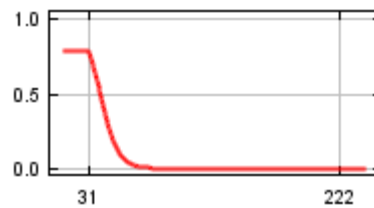
Hottest month mean maximum temperature



Variation of monthly precipitation



Precipitation of the wettest month

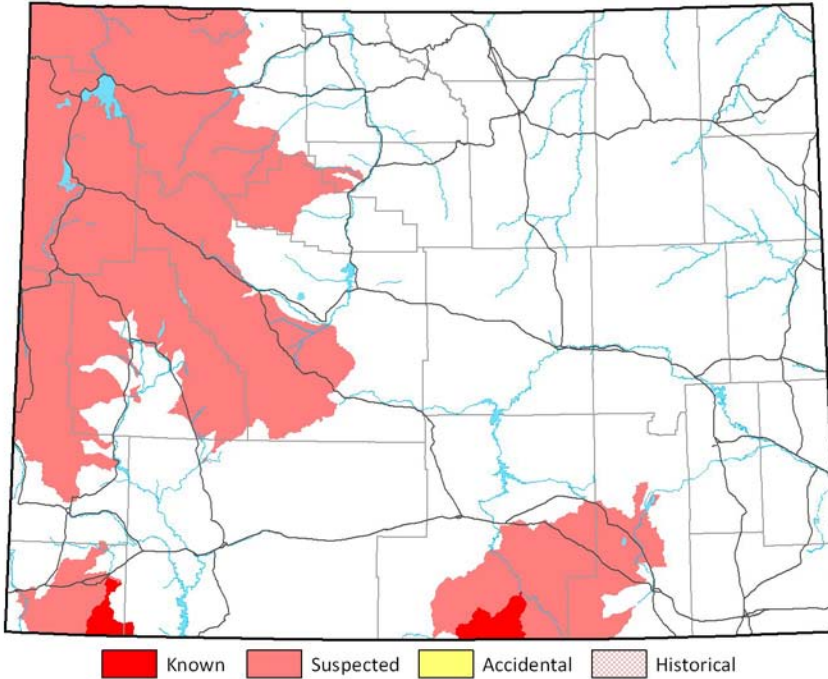


Western Heather Vole (*Phenacomys intermedius*) Range Map and Distribution Model Summary

August 20, 2010

This report presents range and distribution of Western Heather Vole (AMAFF10010) in Wyoming (see Keinath et al. 2010b). Similar reports were developed by the Wyoming Natural Diversity Database for terrestrial vertebrate species of conservation need in Wyoming's State Wildlife Action Plan. This effort was supported by the Wyoming Game and Fish Department and the U.S. Geological Survey.

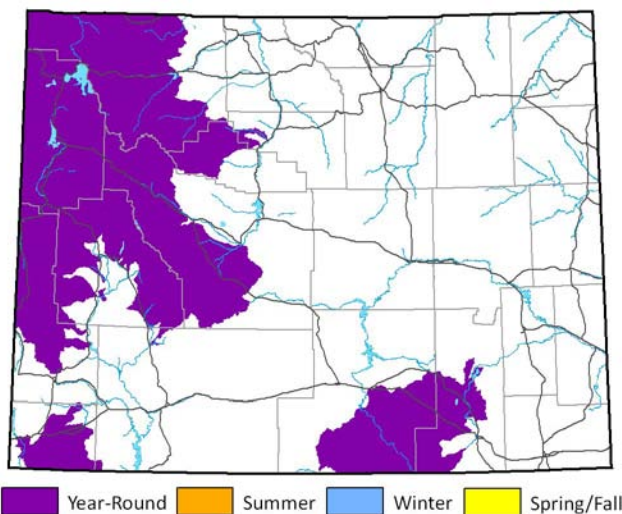
Range Map - Occupancy



Range Notes

- Version: 2010-01-19
- Proportion of range deemed known based on documented occurrences: 0.034
- Details of range map creation noted in Keinath et al. (2010a).

Range Map - Seasonality



Maps, models and report were created by and are available from the Wyoming Natural Diversity Database. (<http://uwadmnweb.uwyo.edu/wyndd/>).

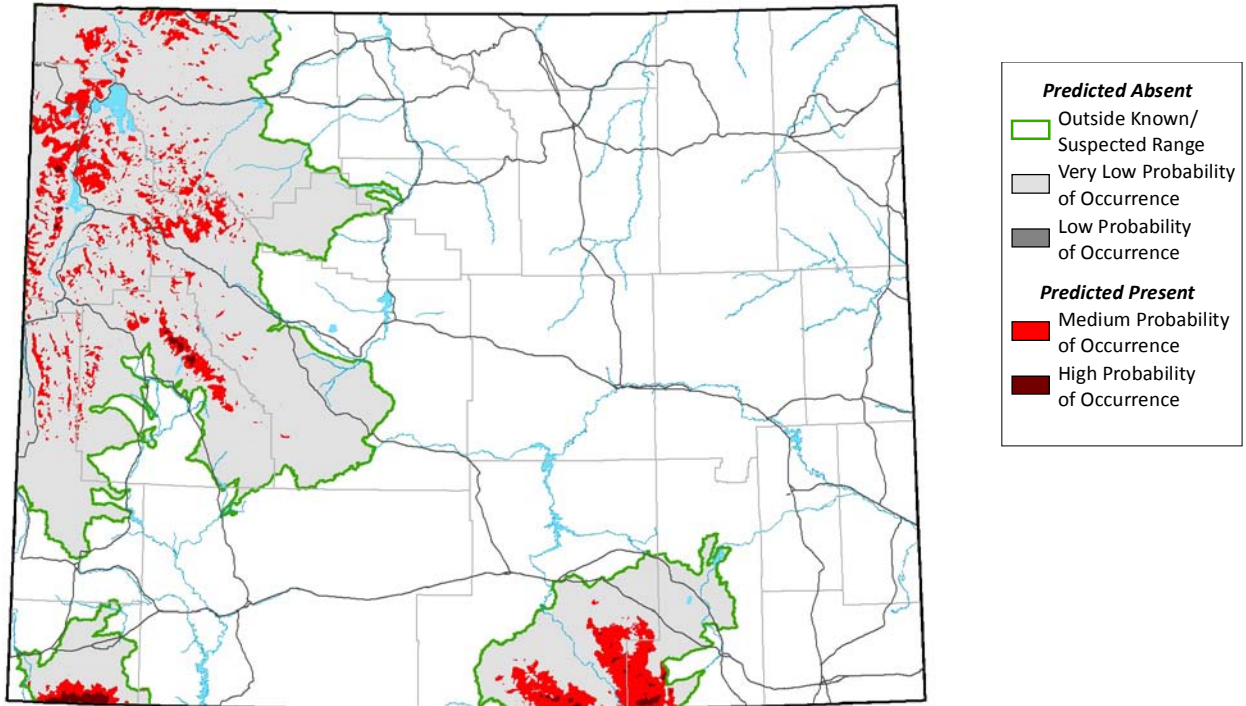
Doug Keinath, Senior Zoologist

Mark Andersen, GIS Specialist

© 2010, WYNDD

Distribution Model (Version: Sat Dec 05 00:45:28 MST 2009)

Details of distribution model creation are presented in Keinath et al. (2010b)



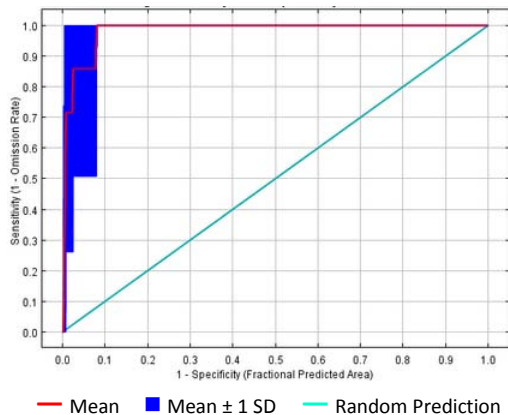
Model Parameters

- Season Modeled: Year-Round
- Algorithm: Maxent version 3.3.1
- Feature Types: Linear
- Binary Threshold Rule: Maximum training sensitivity plus specificity
- Binary Threshold Value: 0.2757700
- High-Probability Threshold Value: 0.7471587
- Low-Probability Threshold Value: 0.2757700

Model Quality Summary

Overall Assessment of Model Quality: LOW
 Expert Assessment: Low
 Occurrence Sample Size: Low
 Quality of Occurrences: Low
 Positive Success Rate: High
 Test AUC and Model Gain: Low

Model Evaluation - ROC Plot



Model Evaluation Statistics

Final Model Statistics

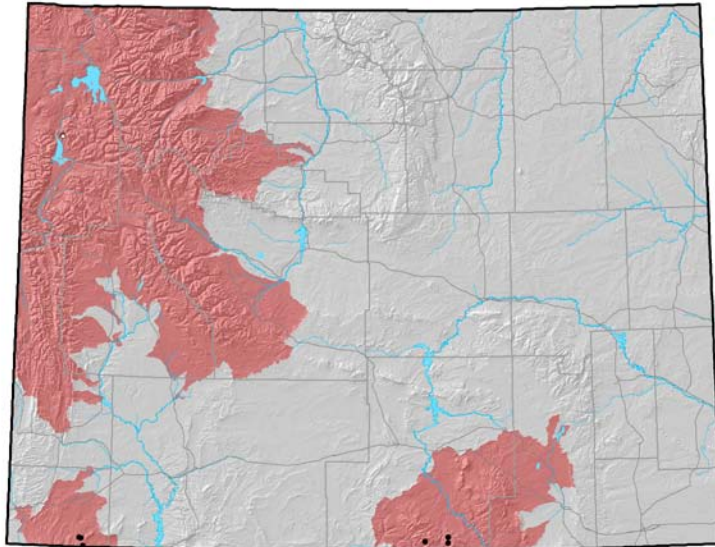
Training AUC: 0.988
 Regularized Training Gain: 2.441

Cross-Validation Statistics

- Average Test AUC: 0.687 ± 0.475
- Upper Bound on Test AUC: 0.954
- Average Test Gain: 1.925 ± 1.689
- Omission Error (fraction of test points omitted during 7-fold cross validation): 0.14 ± 0.38

Occurrence Data for Distribution Model

Occurrence Map



Points Used in Modeling, by Year of Observation

- Pre-1985
- 1985 or Later

Known and Suspected Range

Occurrence Summary Statistics

- Number of Occurrences in AWVED master dataset: 10
- Number of Occurrences used to create distribution model: 7
- Average Point Quality Index (highest quality is 12.00): 5.29 ± 0.76
- Most recent occurrence used: 1990
- Oldest occurrence used: 1928
- Occurrence File:
LOCAL_SAMPLE_POINTS.csv

Comments

The model for this species is based on a small sample size of occurrence locations, which often results in low model quality. Collection of additional, high-quality occurrence locations could greatly improve the modeled distribution for this species.

References

- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010a. Range maps for Wyoming's species of greatest conservation need. Report prepared for the Wyoming Game and Fish Department by the Wyoming Natural Diversity Database, Laramie, Wyoming. January 19, 2010.
- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010b. Range and modeled distribution of Wyoming's species of greatest conservation need. Report prepared by the Wyoming Natural Diversity Database, Laramie Wyoming for the Wyoming Game and Fish Department, Cheyenne, Wyoming and the U.S. Geological Survey, Fort Collins, Colorado. August 20, 2010.

Predictor Variables used in the Distribution Model

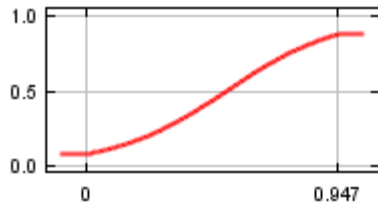
Percent Contribution (PC) to final model

<i>Environmental Variable</i>	<i>PC</i>
Forest Cover Index	38
Precipitation of the driest month	22
Radiation of the darkest month	21
Variation in monthly Relative Humidity	11
Herbaceous Cover Index	8
Elevation	0

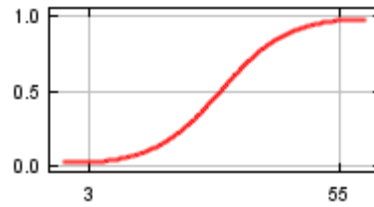
Response Curves

Each curve shows dependence of predicted suitability on input values of a single predictor variable considering correlations with others. Suitability is on the vertical axis (units: probability). Variable values are on the horizontal axis (units based on inputs; see Keinath et al 2010b for details).

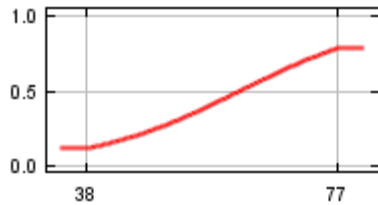
Forest Cover Index



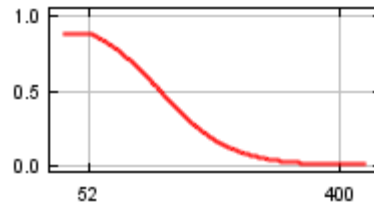
Precipitation of the driest month



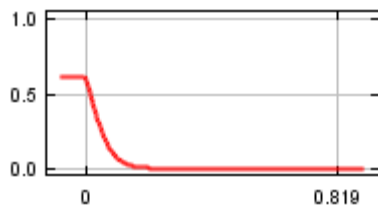
Radiation of the darkest month



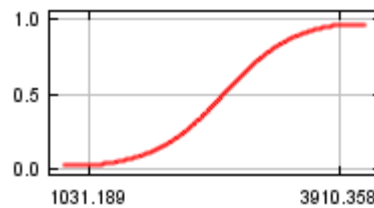
Variation in monthly Relative Humidity



Herbaceous Cover Index



Elevation

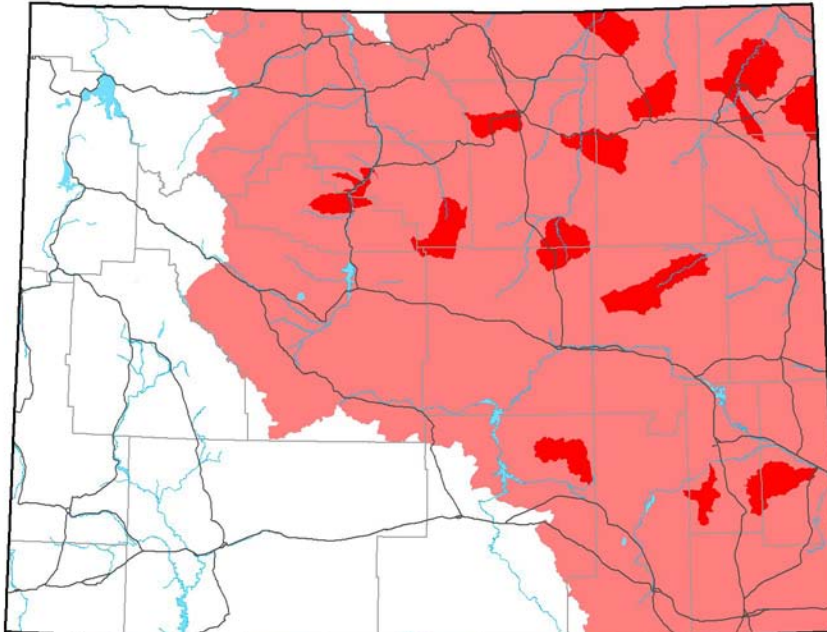


Prairie Vole (*Microtus ochrogaster*) Range Map and Distribution Model Summary

August 20, 2010

This report presents range and distribution of Prairie Vole (AMAFF11140) in Wyoming (see Keinath et al. 2010b). Similar reports were developed by the Wyoming Natural Diversity Database for terrestrial vertebrate species of conservation need in Wyoming's State Wildlife Action Plan. This effort was supported by the Wyoming Game and Fish Department and the U.S. Geological Survey.

Range Map - Occupancy

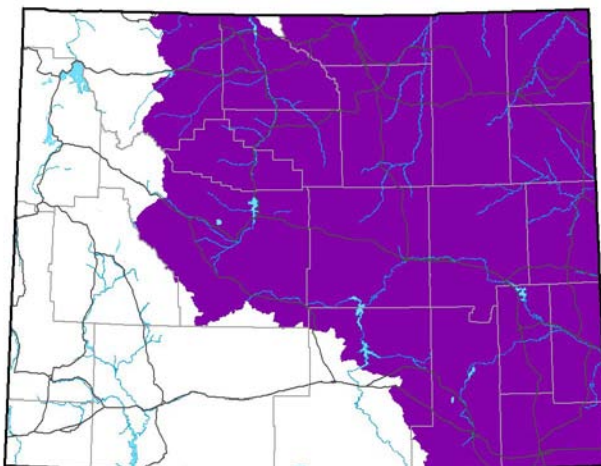


■ Known ■ Suspected ■ Accidental ■ Historical

Range Notes

- Version: 2010-01-19
- Proportion of range deemed known based on documented occurrences: 0.060
- Details of range map creation noted in Keinath et al. (2010a).

Range Map - Seasonality



■ Year-Round ■ Summer ■ Winter ■ Spring/Fall

Maps, models and report were created by and are available from the Wyoming Natural Diversity Database. (<http://uwadmnweb.uwyo.edu/wyndd/>).

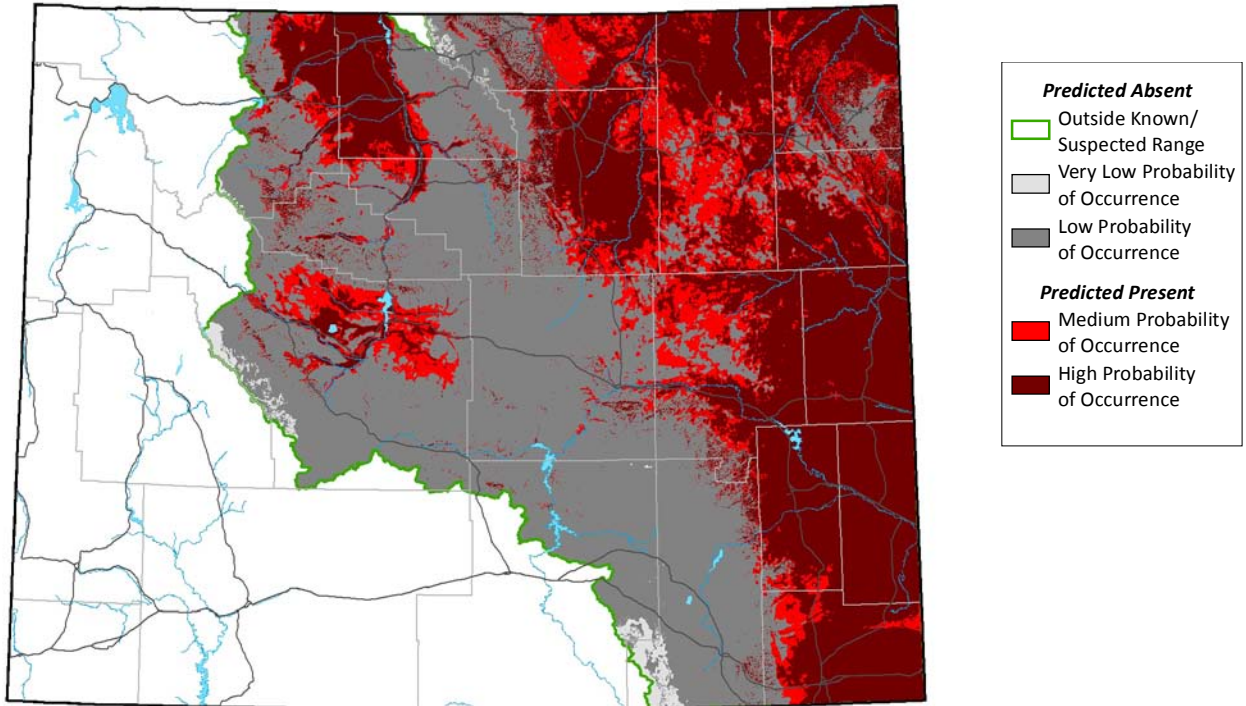
Doug Keinath, Senior Zoologist

Mark Andersen, GIS Specialist

© 2010, WYNDD

Distribution Model (Version: Wed Apr 21 09:37:50 MDT 2010)

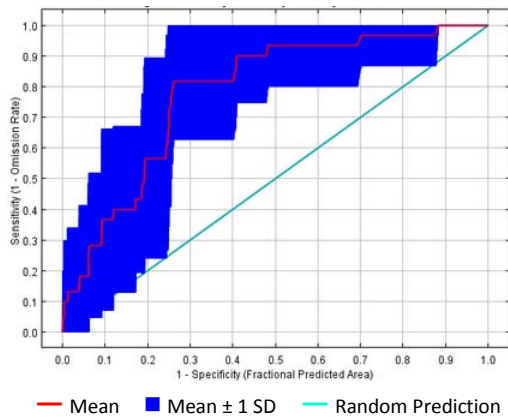
Details of distribution model creation are presented in Keinath et al. (2010b)



Model Parameters

- Season Modeled: Year-Round
- Algorithm: Maxent version 3.3.1
- Feature Types: Linear, Product
- Binary Threshold Rule: Maximum training sensitivity plus specificity
- Binary Threshold Value: 0.4823450
- High-Probability Threshold Value: 0.5410240
- Low-Probability Threshold Value: 0.1370944

Model Evaluation - ROC Plot



Model Quality Summary

Overall Assessment of Model Quality:

MEDIUM

- Expert Assessment: Medium
- Occurrence Sample Size: Medium
- Quality of Occurrences: Low
- Positive Success Rate: Low
- Test AUC and Model Gain: Medium

Model Evaluation Statistics

Final Model Statistics

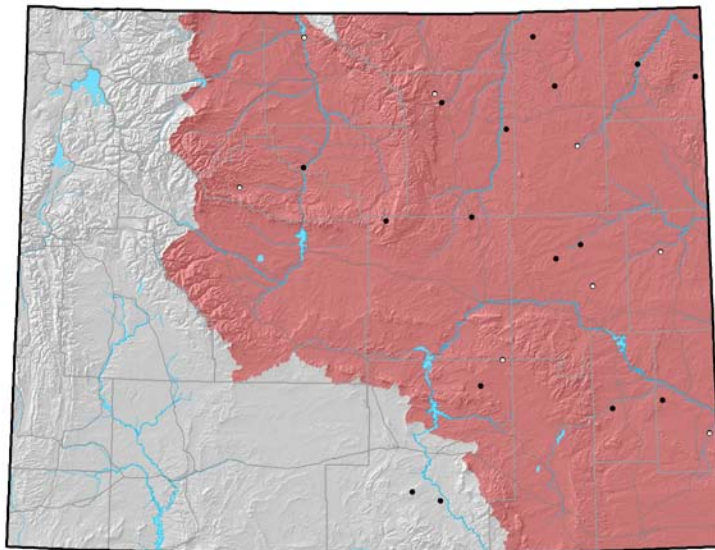
- Training AUC: 0.806
- Regularized Training Gain: 0.512

Cross-Validation Statistics

- Average Test AUC: 0.784 ± 0.122
- Upper Bound on Test AUC: 0.764
- Average Test Gain: 0.519 ± 0.569
- Omission Error (fraction of test points omitted during 10-fold cross validation): 0.32 ± 0.34

Occurrence Data for Distribution Model

Occurrence Map



Points Used in Modeling, by Year of Observation

- Pre-1985
- 1985 or Later

Known and Suspected Range

Occurrence Summary Statistics

- Number of Occurrences in AWVED master dataset: 33
- Number of Occurrences used to create distribution model: 24
- Average Point Quality Index (highest quality is 12.00): 5.75 ± 1.39
- Most recent occurrence used: 2008
- Oldest occurrence used: 1958
- Occurrence File:
LOCAL_SAMPLE_POINTS.csv

Comments

Due to timing of range map edits, the distribution model for prairie vole was created before final edits were made to the range map. As a result, several datapoints used in the model fall outside the accepted range of the species. Future versions of the range maps and models should verify these occurrences and modify the range and/or model input accordingly.

References

- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010a. Range maps for Wyoming's species of greatest conservation need. Report prepared for the Wyoming Game and Fish Department by the Wyoming Natural Diversity Database, Laramie, Wyoming. January 19, 2010.
- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010b. Range and modeled distribution of Wyoming's species of greatest conservation need. Report prepared by the Wyoming Natural Diversity Database, Laramie Wyoming for the Wyoming Game and Fish Department, Cheyenne, Wyoming and the U.S. Geological Survey, Fort Collins, Colorado. August 20, 2010.

Predictor Variables used in the Distribution Model

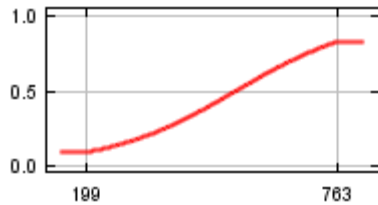
Percent Contribution (PC) to final model

<i>Environmental Variable</i>	<i>PC</i>
Variation of monthly precipitation	65
Wettest quarter mean temperature	25
Percent Forest Cover	4
Herbaceous Cover Index	3
Sagebrush Index	2
Soil texture	2

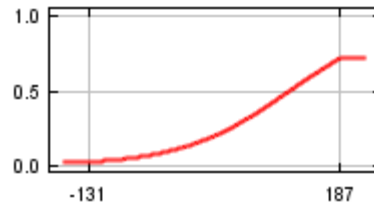
Response Curves

Each curve shows dependence of predicted suitability on input values of a single predictor variable considering correlations with others. Suitability is on the vertical axis (units: probability). Variable values are on the horizontal axis (units based on inputs; see Keinath et al 2010b for details).

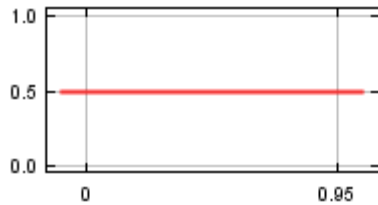
Variation of monthly precipitation



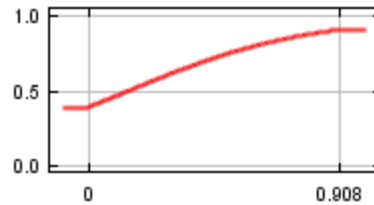
Wettest quarter mean temperature



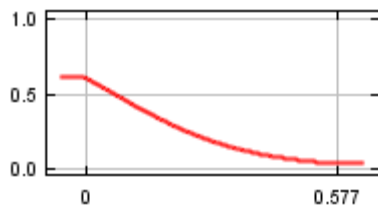
Percent Forest Cover



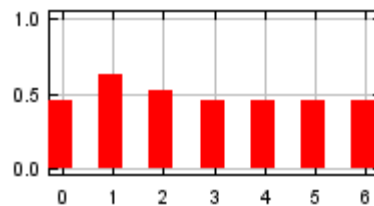
Herbaceous Cover Index



Sagebrush Index



Soil texture

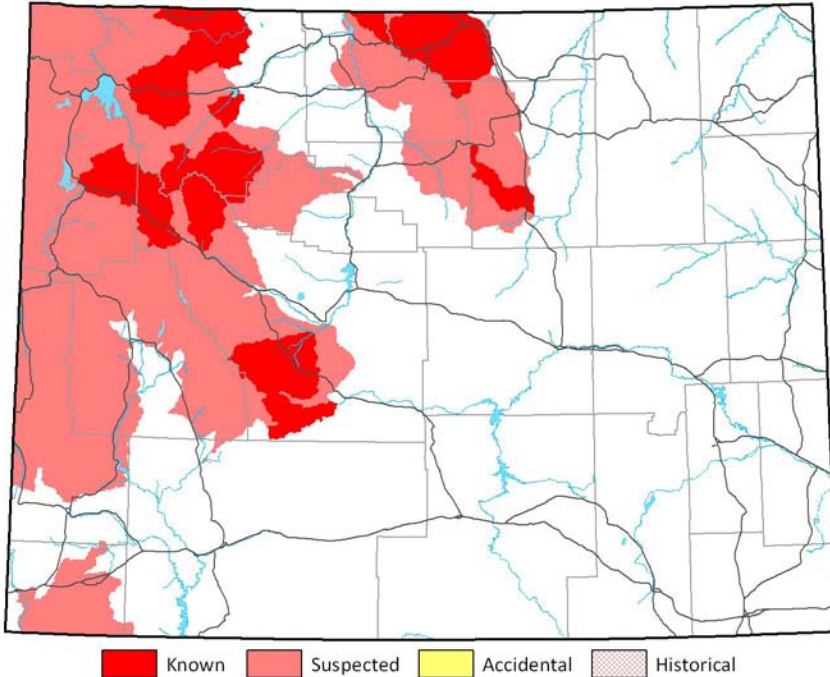


Water Vole (*Microtus richardsoni*) Range Map and Distribution Model Summary

August 20, 2010

This report presents range and distribution of Water Vole (AMAFF11190) in Wyoming (see Keinath et al. 2010b). Similar reports were developed by the Wyoming Natural Diversity Database for terrestrial vertebrate species of conservation need in Wyoming's State Wildlife Action Plan. This effort was supported by the Wyoming Game and Fish Department and the U.S. Geological Survey.

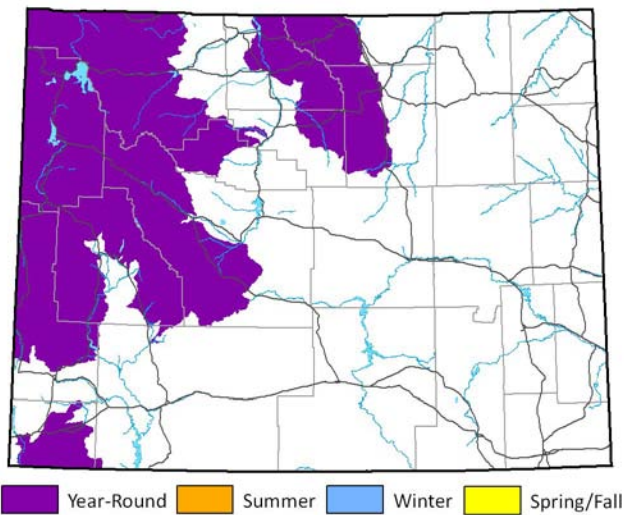
Range Map - Occupancy



Range Notes

- Version: 2010-01-19
- Proportion of range deemed known based on documented occurrences: 0.184
- Details of range map creation noted in Keinath et al. (2010a).

Range Map - Seasonality



Maps, models and report were created by and are available from the Wyoming Natural Diversity Database. (<http://uwadmnweb.uwyo.edu/wyndd/>).

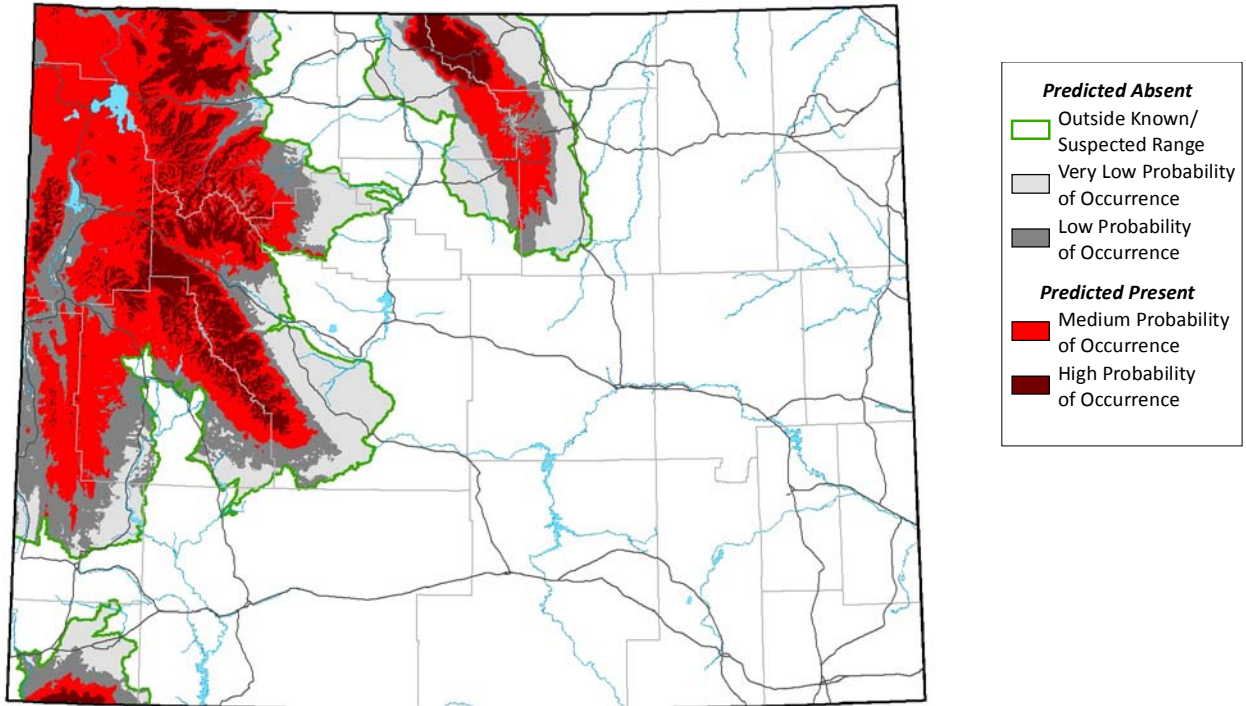
Doug Keinath, Senior Zoologist

Mark Andersen, GIS Specialist

© 2010, WYNDD

Distribution Model (Version: Tue Apr 20 14:24:55 MDT 2010)

Details of distribution model creation are presented in Keinath et al. (2010b)



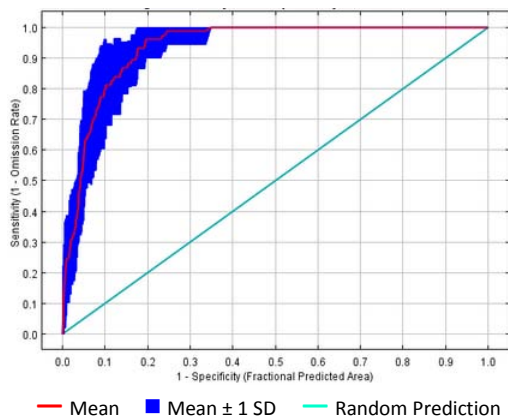
Model Parameters

- Season Modeled: Year-Round
- Algorithm: Maxent version 3.3.1
- Feature Types: Linear, Quadratic, Hinge
- Binary Threshold Rule: Maximum training sensitivity plus specificity
- Binary Threshold Value: 0.1678980
- High-Probability Threshold Value: 0.5264298
- Low-Probability Threshold Value: 0.0283135

Model Quality Summary

Overall Assessment of Model Quality: HIGH
 Expert Assessment: Medium
 Occurrence Sample Size: Medium-High
 Quality of Occurrences: Medium
 Positive Success Rate: High
 Test AUC and Model Gain: High

Model Evaluation - ROC Plot



Model Evaluation Statistics

Final Model Statistics

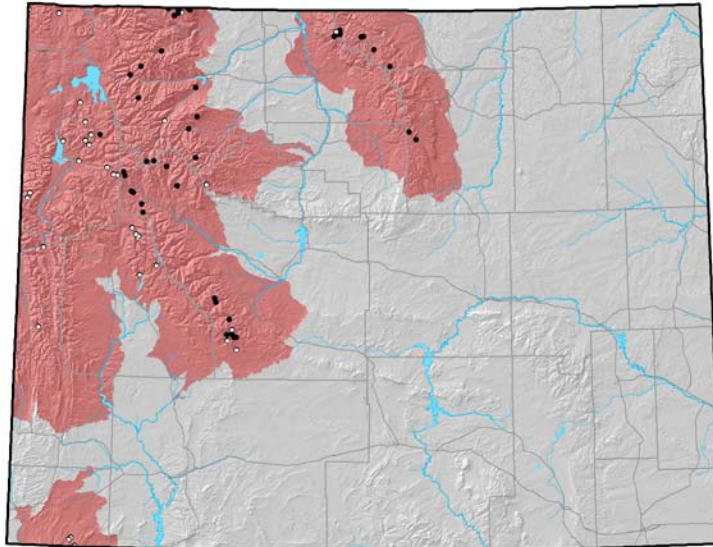
Training AUC: 0.945
 Regularized Training Gain: 1.832

Cross-Validation Statistics

- Average Test AUC: 0.936 ± 0.019
- Upper Bound on Test AUC: 0.932
- Average Test Gain: 1.786 ± 0.378
- Omission Error (fraction of test points omitted during 10-fold cross validation): 0.14 ± 0.14

Occurrence Data for Distribution Model

Occurrence Map



Points Used in Modeling, by Year of Observation

- Pre-1985
- 1985 or Later

Known and Suspected Range

Occurrence Summary Statistics

- Number of Occurrences in AWVED master dataset: 110
- Number of Occurrences used to create distribution model: 77
- Average Point Quality Index (highest quality is 12.00): 6.06 ± 2.36
- Most recent occurrence used: 2006
- Oldest occurrence used: 1893
- Occurrence File:
LOCAL_SAMPLE_POINTS.csv

Comments

This species uses aspects of wetlands (e.g., dense emergent vegetation) for which statewide data are not available or reliable. This often results in low model quality because key habitat features are not mappable across the state. Great improvements in our ability to model this species distribution could be obtained by improving wetland maps. Qualitative expert review of this model suggests that the binary version may over-predict the distribution of this species in Wyoming.

References

- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010a. Range maps for Wyoming's species of greatest conservation need. Report prepared for the Wyoming Game and Fish Department by the Wyoming Natural Diversity Database, Laramie, Wyoming. January 19, 2010.
- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010b. Range and modeled distribution of Wyoming's species of greatest conservation need. Report prepared by the Wyoming Natural Diversity Database, Laramie Wyoming for the Wyoming Game and Fish Department, Cheyenne, Wyoming and the U.S. Geological Survey, Fort Collins, Colorado. August 20, 2010.

Predictor Variables used in the Distribution Model

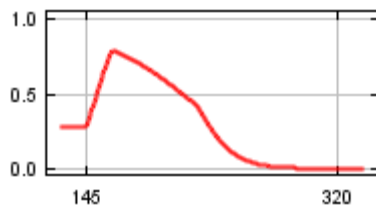
Percent Contribution (PC) to final model

<i>Environmental Variable</i>	<i>PC</i>
Hottest month mean maximum temperature	68
Conifer Index	12
Isothermality (T2/T5)	11
Annual number of Frost Days	5
Elevation	3
Variation in monthly Relative Humidity	1

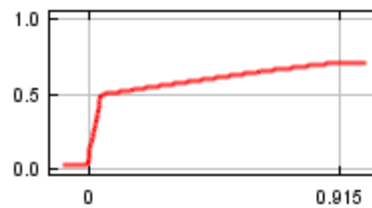
Response Curves

Each curve shows dependence of predicted suitability on input values of a single predictor variable considering correlations with others. Suitability is on the vertical axis (units: probability). Variable values are on the horizontal axis (units based on inputs; see Keinath et al 2010b for details).

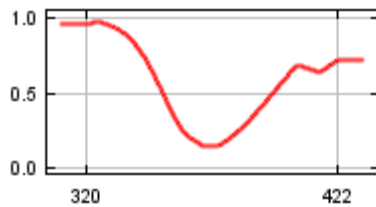
Hottest month mean maximum temperature



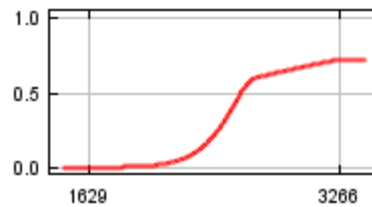
Conifer Index



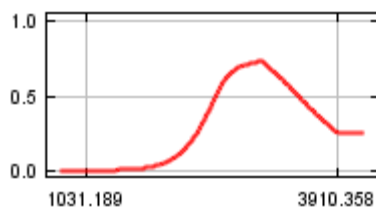
Isothermality (T2/T5)



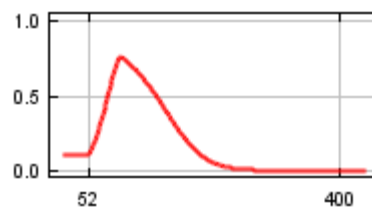
Annual number of Frost Days



Elevation



Variation in monthly Relative Humidity

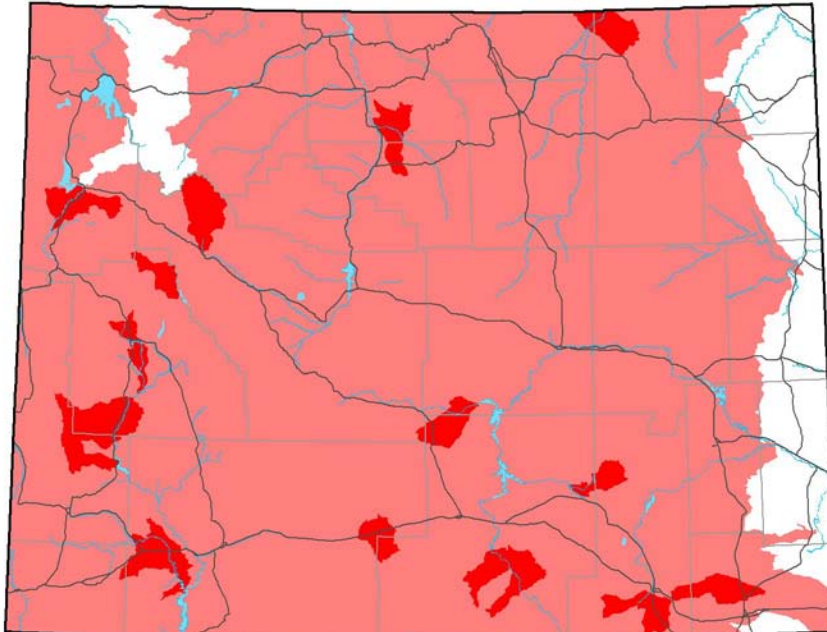


Sagebrush Vole (*Lemmiscus curtatus*) Range Map and Distribution Model Summary

August 20, 2010

This report presents range and distribution of Sagebrush Vole (AMAFF13010) in Wyoming (see Keinath et al. 2010b). Similar reports were developed by the Wyoming Natural Diversity Database for terrestrial vertebrate species of conservation need in Wyoming's State Wildlife Action Plan. This effort was supported by the Wyoming Game and Fish Department and the U.S. Geological Survey.

Range Map - Occupancy

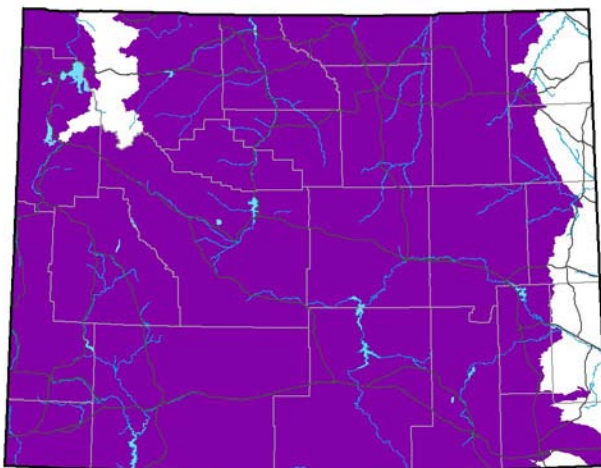


Known Suspected Accidental Historical

Range Notes

- Version: 2010-01-19
- Proportion of range deemed known based on documented occurrences: 0.046
- Details of range map creation noted in Keinath et al. (2010a).

Range Map - Seasonality



Year-Round Summer Winter Spring/Fall

Maps, models and report were created by and are available from the Wyoming Natural Diversity Database. (<http://uwadmnweb.uwyo.edu/wyndd/>).

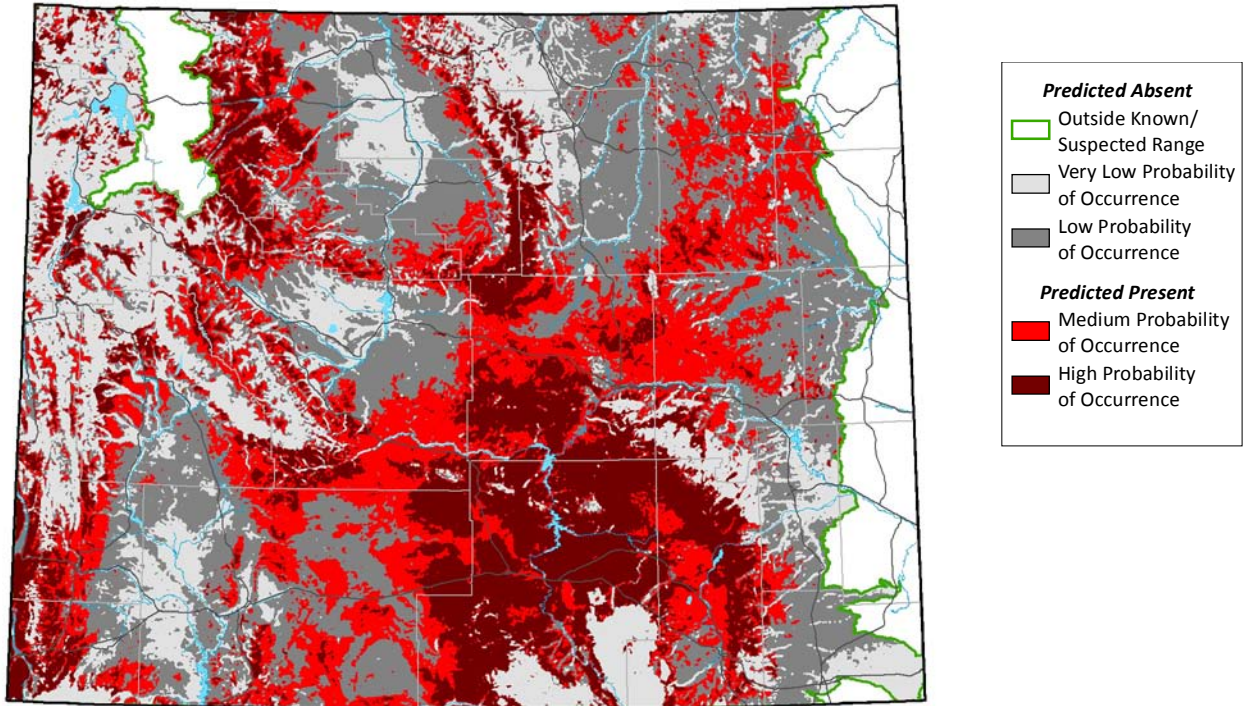
Doug Keinath, Senior Zoologist

Mark Andersen, GIS Specialist

© 2010, WYNDD

Distribution Model (Version: Wed Mar 17 14:58:31 MDT 2010)

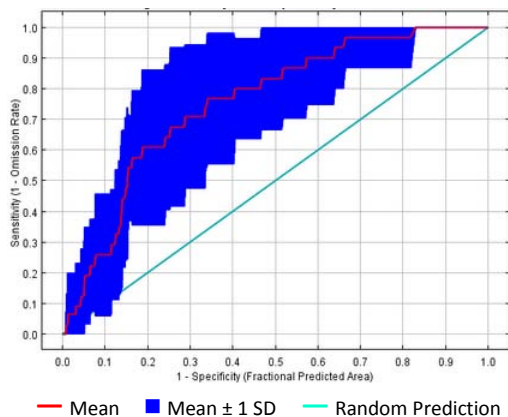
Details of distribution model creation are presented in Keinath et al. (2010b)



Model Parameters

- Season Modeled: Year-Round
- Algorithm: Maxent version 3.3.1
- Feature Types: Linear, Product
- Binary Threshold Rule: Maximum training sensitivity plus specificity
- Binary Threshold Value: 0.4186330
- High-Probability Threshold Value: 0.5489823
- Low-Probability Threshold Value: 0.2829428

Model Evaluation - ROC Plot



Model Quality Summary

Overall Assessment of Model Quality:

MEDIUM

- Expert Assessment: Medium
- Occurrence Sample Size: Medium
- Quality of Occurrences: Low
- Positive Success Rate: Low
- Test AUC and Model Gain: Medium

Model Evaluation Statistics

Final Model Statistics

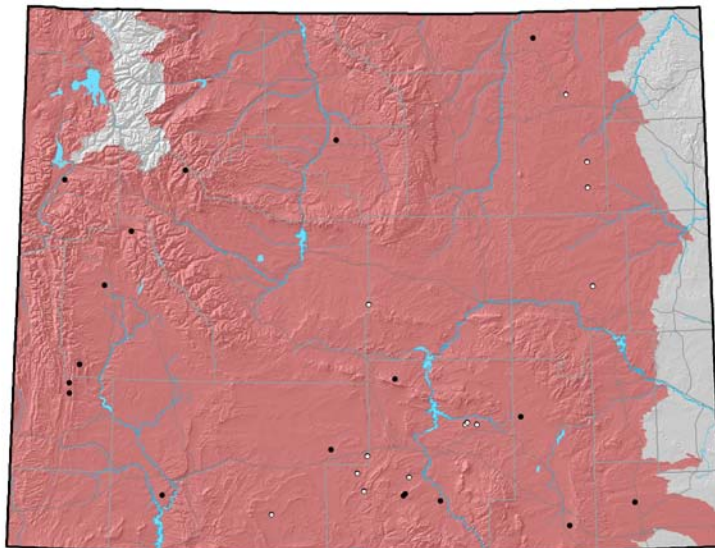
- Training AUC: 0.811
- Regularized Training Gain: 0.414

Cross-Validation Statistics

- Average Test AUC: 0.757 ± 0.104
- Upper Bound on Test AUC: 0.741
- Average Test Gain: 0.350 ± 0.353
- Omission Error (fraction of test points omitted during 10-fold cross validation): 0.33 ± 0.27

Occurrence Data for Distribution Model

Occurrence Map



Points Used in Modeling, by Year of Observation

- Pre-1985
- 1985 or Later

Known and Suspected Range

Occurrence Summary Statistics

- Number of Occurrences in AWVED master dataset: 53
- Number of Occurrences used to create distribution model: 31
- Average Point Quality Index (highest quality is 12.00): 5.71 ± 2.42
- Most recent occurrence used: 2008
- Oldest occurrence used: 1939
- Occurrence File:
LOCAL_SAMPLE_POINTS_W_PD OG_2.csv

Comments

This is a sagebrush obligate species for which model quality would likely improve if an accurate statewide estimate of sagebrush structure (i.e., density and/or height) were available. Qualitative expert review of this model suggests that the binary version may over-predict the distribution of this species in Wyoming.

References

- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010a. Range maps for Wyoming's species of greatest conservation need. Report prepared for the Wyoming Game and Fish Department by the Wyoming Natural Diversity Database, Laramie, Wyoming. January 19, 2010.
- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010b. Range and modeled distribution of Wyoming's species of greatest conservation need. Report prepared by the Wyoming Natural Diversity Database, Laramie Wyoming for the Wyoming Game and Fish Department, Cheyenne, Wyoming and the U.S. Geological Survey, Fort Collins, Colorado. August 20, 2010.

Predictor Variables used in the Distribution Model

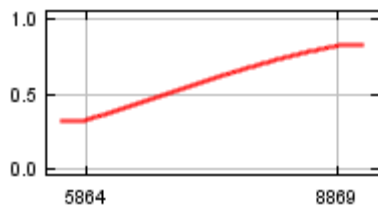
Percent Contribution (PC) to final model

<i>Environmental Variable</i>	<i>PC</i>
Relative Humidity of most humid month	36
Sagebrush Index	22
Annual mean relative humidity	21
Deciduous Forest Index	18
Distance to Permanent Water	1
Pinon-Juniper Index	1

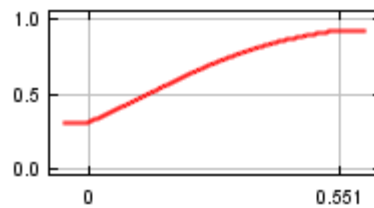
Response Curves

Each curve shows dependence of predicted suitability on input values of a single predictor variable considering correlations with others. Suitability is on the vertical axis (units: probability). Variable values are on the horizontal axis (units based on inputs; see Keinath et al 2010b for details).

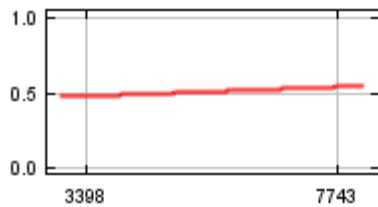
Relative Humidity of most humid month



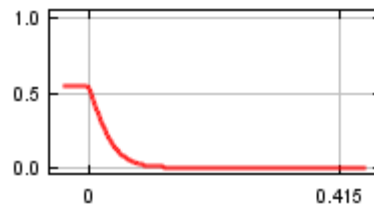
Sagebrush Index



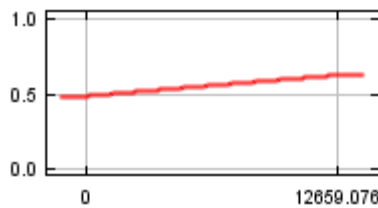
Annual mean relative humidity



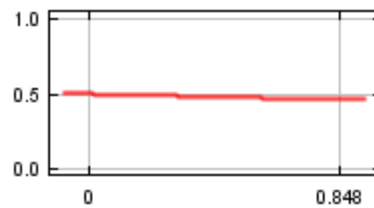
Deciduous Forest Index



Distance to Permanent Water



Pinon-Juniper Index

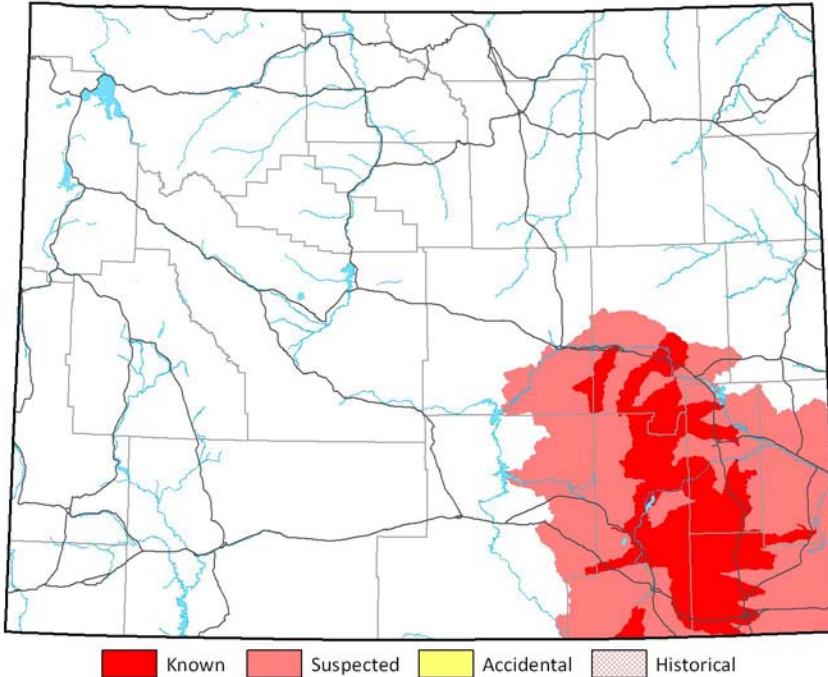


Preble's Meadow Jumping Mouse (*Zapus hudsonius preblei*) Range Map and Distribution Model Summary

August 20, 2010

This report presents range and distribution of Preble's Meadow Jumping Mouse (AMAFH01011) in Wyoming (see Keinath et al. 2010b). Similar reports were developed by the Wyoming Natural Diversity Database for terrestrial vertebrate species of conservation need in Wyoming's State Wildlife Action Plan. This effort was supported by the Wyoming Game and Fish Department and the U.S. Geological Survey.

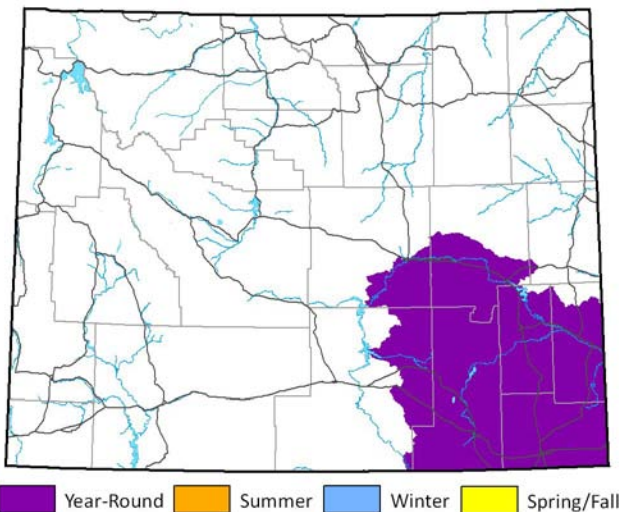
Range Map - Occupancy



Range Notes

- Version: 2010-01-19
- Proportion of range deemed known based on documented occurrences: 0.218
- Details of range map creation noted in Keinath et al. (2010a).

Range Map - Seasonality



Maps, models and report were created by and are available from the Wyoming Natural Diversity Database. (<http://uwadmnweb.uwyo.edu/wyndd/>).

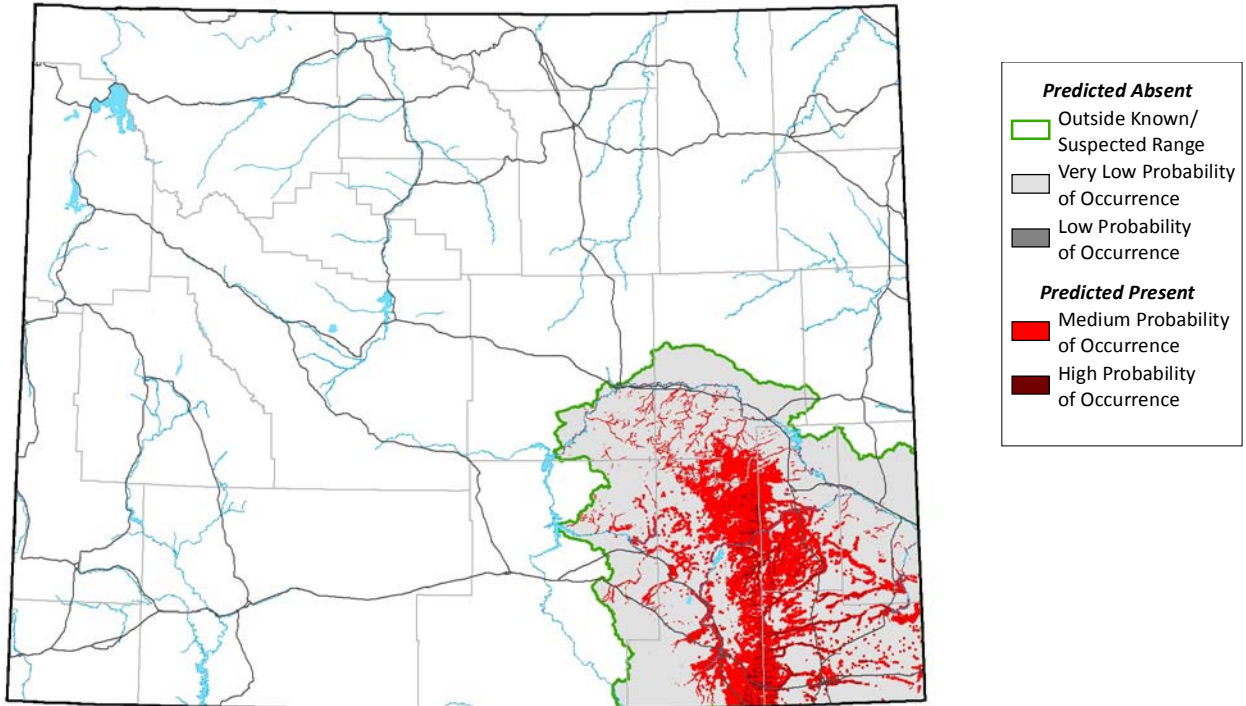
Doug Keinath, Senior Zoologist

Mark Andersen, GIS Specialist

© 2010, WYNDD

Distribution Model (Version: Wed Apr 21 11:17:20 MDT 2010)

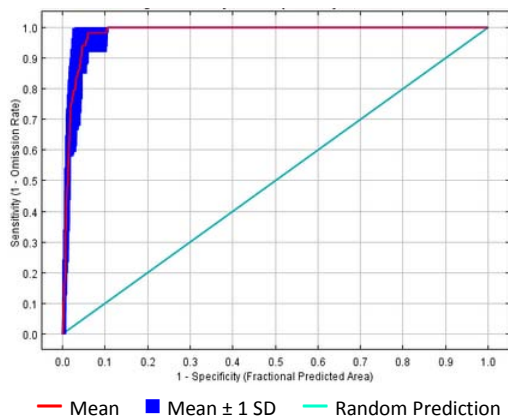
Details of distribution model creation are presented in Keinath et al. (2010b)



Model Parameters

- Season Modeled: Year-Round
- Algorithm: Maxent version 3.3.1
- Feature Types: Linear, Quadratic, Hinge
- Binary Threshold Rule: Maximum training sensitivity plus specificity
- Binary Threshold Value: 0.0877550
- High-Probability Threshold Value: 0.6173694
- Low-Probability Threshold Value: 0.0877550

Model Evaluation - ROC Plot



Model Quality Summary

Overall Assessment of Model Quality: HIGH

- Expert Assessment: High
- Occurrence Sample Size: Medium
- Quality of Occurrences: High
- Positive Success Rate: Very High
- Test AUC and Model Gain: High

Model Evaluation Statistics

Final Model Statistics

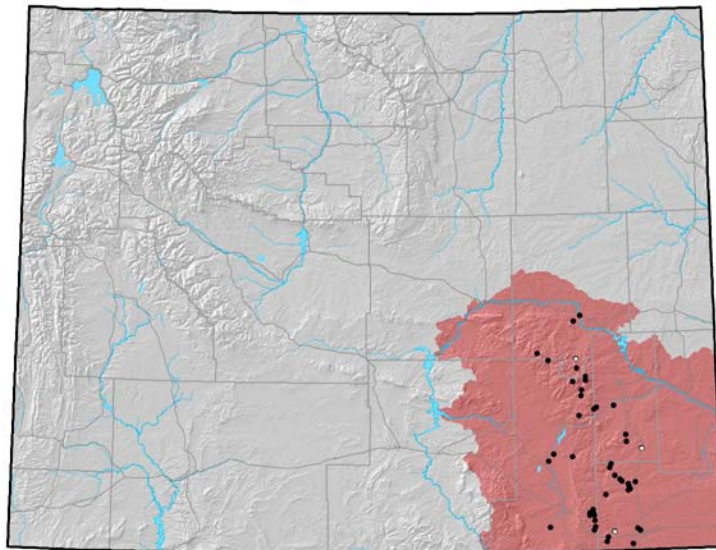
- Training AUC: 0.987
- Regularized Training Gain: 2.951

Cross-Validation Statistics

- Average Test AUC: 0.982 ± 0.009
- Upper Bound on Test AUC: 0.972
- Average Test Gain: 2.896 ± 0.585
- Omission Error (fraction of test points omitted during 10-fold cross validation): 0.04 ± 0.08

Occurrence Data for Distribution Model

Occurrence Map



Points Used in Modeling, by Year of Observation

- Pre-1985
- 1985 or Later

■ Known and Suspected Range

Occurrence Summary Statistics

- Number of Occurrences in AWVED master dataset: 401
- Number of Occurrences used to create distribution model: 48
- Average Point Quality Index (highest quality is 12.00): 10.44 ± 2.40
- Most recent occurrence used: 2004
- Oldest occurrence used: 1888
- Occurrence File:
AMAFH01011_REFILTERED_V2.csv

Comments

This species uses aspects of wetlands (e.g., dense emergent vegetation) for which statewide data are not available or reliable. This often results in low model quality because key habitat features are not mappable across the state. Great improvements in our ability to model this species distribution could be obtained by improving wetland maps. Conclusive identification of this species is difficult unless the observer is experienced with the species. We suspect numerous occurrences could be in error, thus resulting in lower than expected model quality. The lack of supporting data provided with many occurrences (notably those from the Wildlife Observation System) makes it impossible to assess the accuracy of such observations. Supplementation/replacement of the existing data set with high-quality occurrence locations could greatly improve the modeled distribution for this species.

References

- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010a. Range maps for Wyoming's species of greatest conservation need. Report prepared for the Wyoming Game and Fish Department by the Wyoming Natural Diversity Database, Laramie, Wyoming. January 19, 2010.
- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010b. Range and modeled distribution of Wyoming's species of greatest conservation need. Report prepared by the Wyoming Natural Diversity Database, Laramie Wyoming for the Wyoming Game and Fish Department, Cheyenne, Wyoming and the U.S. Geological Survey, Fort Collins, Colorado. August 20, 2010.

Predictor Variables used in the Distribution Model

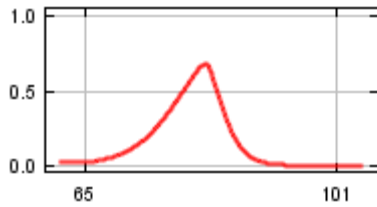
Percent Contribution (PC) to final model

<i>Environmental Variable</i>	<i>PC</i>
Standard deviation of monthly temperature	23
Prevalence of Flowing Water within 300 meters	21
Variation of monthly precipitation	20
Variation in monthly radiation	19
Coldest month mean minimum temperature	10
Conifer Index	8

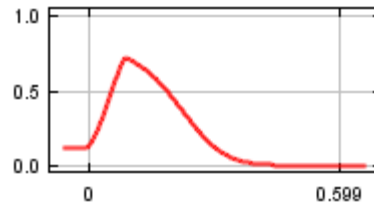
Response Curves

Each curve shows dependence of predicted suitability on input values of a single predictor variable considering correlations with others. Suitability is on the vertical axis (units: probability). Variable values are on the horizontal axis (units based on inputs; see Keinath et al 2010b for details).

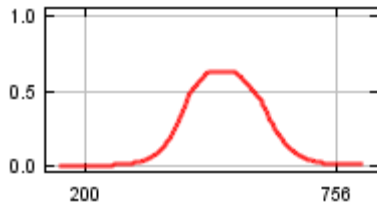
Standard deviation of monthly temperature



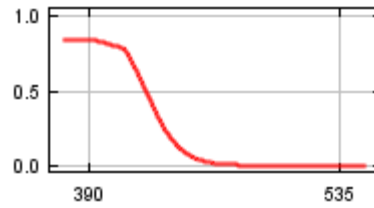
Prevalence of Flowing Water within 300 meters



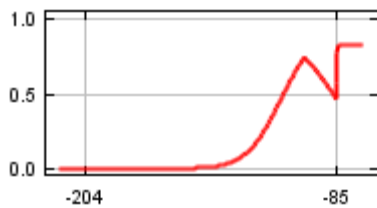
Variation of monthly precipitation



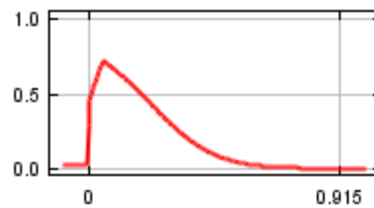
Variation in monthly radiation



Coldest month mean minimum temperature



Conifer Index

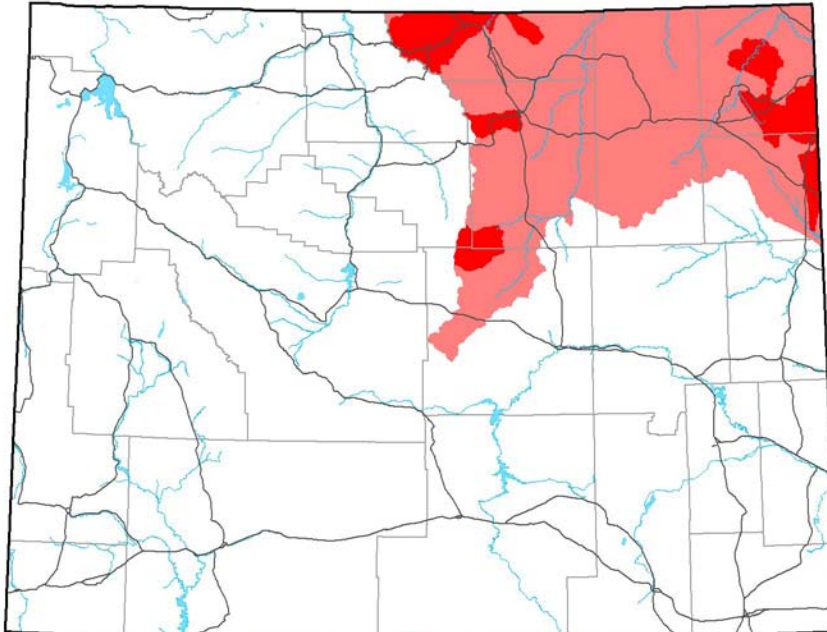


Bear Lodge Meadow Jumping Mouse (*Zapus hudsonius campestris*) Range Map and Distribution Model Summary

August 20, 2010

This report presents range and distribution of Bear Lodge Meadow Jumping Mouse (AMAFH01013) in Wyoming (see Keinath et al. 2010b). Similar reports were developed by the Wyoming Natural Diversity Database for terrestrial vertebrate species of conservation need in Wyoming's State Wildlife Action Plan. This effort was supported by the Wyoming Game and Fish Department and the U.S. Geological Survey.

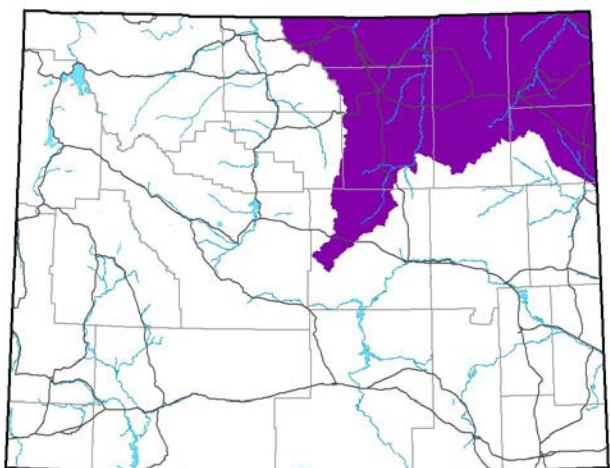
Range Map - Occupancy



Range Notes

- Version: 2010-01-19
- Proportion of range deemed known based on documented occurrences: 0.138
- Details of range map creation noted in Keinath et al. (2010a).

Range Map - Seasonality



Maps, models and report were created by and are available from the Wyoming Natural Diversity Database. (<http://uwadmnweb.uwyo.edu/wyndd/>).

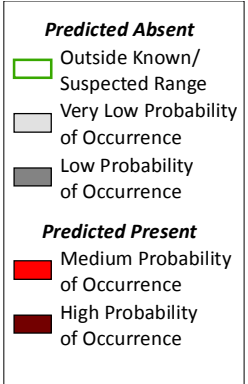
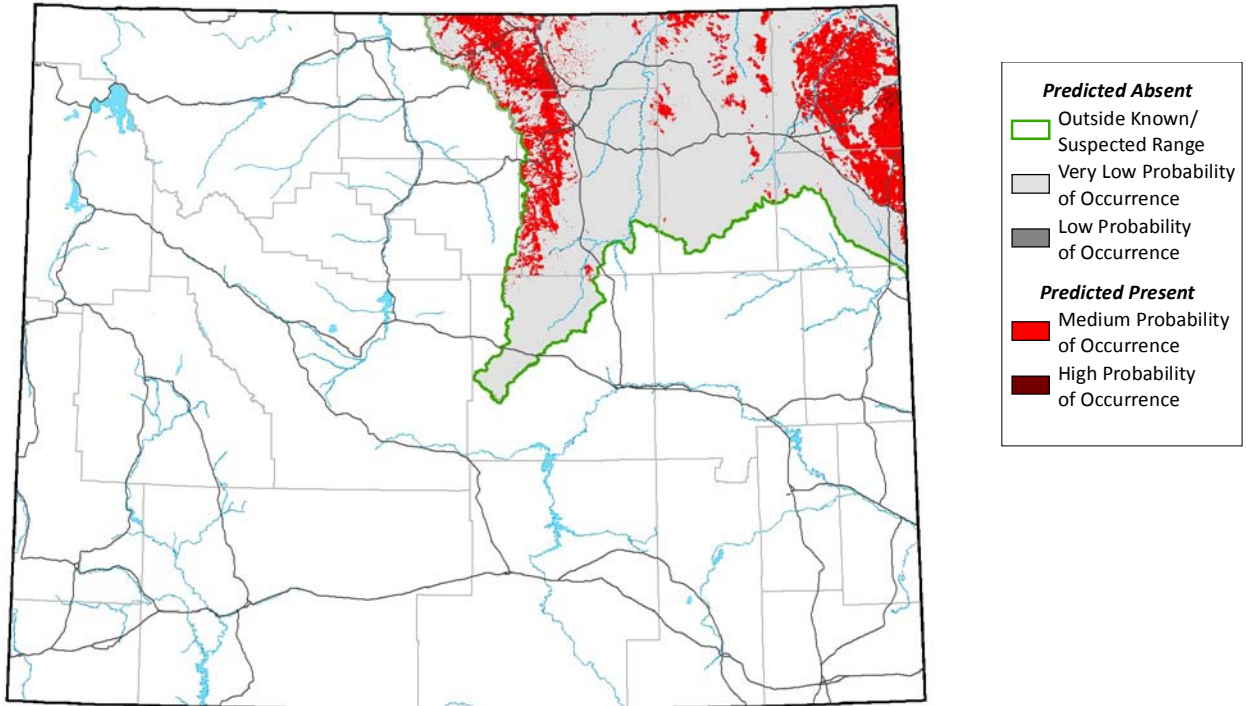
Doug Keinath, Senior Zoologist

Mark Andersen, GIS Specialist

© 2010, WYNDD

Distribution Model (Version: Tue Apr 06 10:46:47 MDT 2010)

Details of distribution model creation are presented in Keinath et al. (2010b)



Model Parameters

- Season Modeled: Year-Round
- Algorithm: Maxent version 3.3.1
- Feature Types: Linear, Quadratic, Hinge
- Binary Threshold Rule: Maximum training sensitivity plus specificity
- Binary Threshold Value: 0.0552740
- High-Probability Threshold Value: 0.7308462
- Low-Probability Threshold Value: 0.0552740

Model Quality Summary

Overall Assessment of Model Quality:

MEDIUM

- Expert Assessment: Medium
- Occurrence Sample Size: Low
- Quality of Occurrences: Medium
- Positive Success Rate: Very High
- Test AUC and Model Gain: High

Model Evaluation Statistics

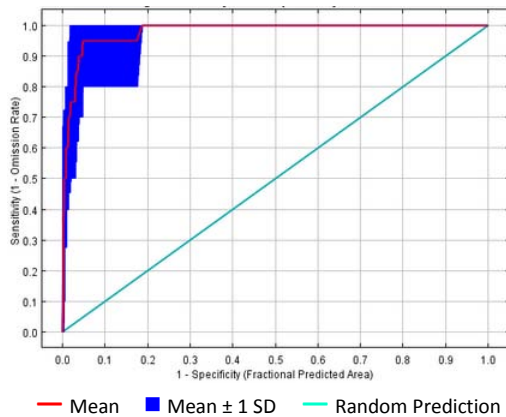
Final Model Statistics

- Training AUC: 0.990
- Regularized Training Gain: 3.136

Cross-Validation Statistics

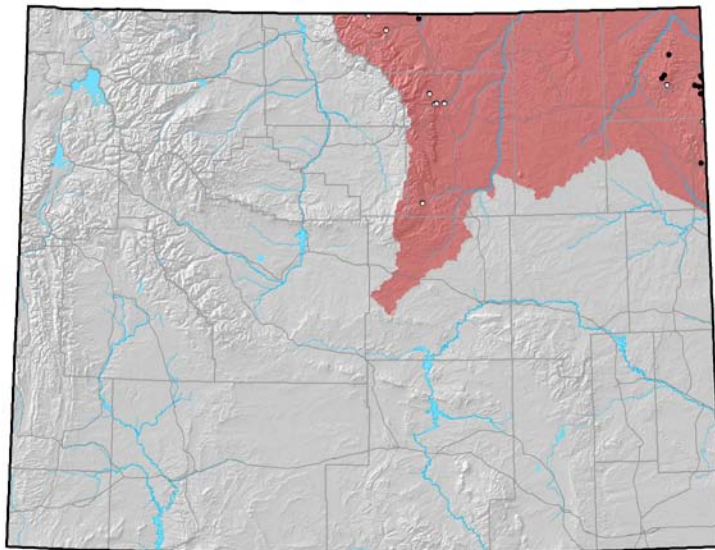
- Average Test AUC: 0.980 ± 0.026
- Upper Bound on Test AUC: 0.971
- Average Test Gain: 3.185 ± 1.043
- Omission Error (fraction of test points omitted during 10-fold cross validation): 0.10 ± 0.21

Model Evaluation - ROC Plot



Occurrence Data for Distribution Model

Occurrence Map



Points Used in Modeling, by Year of Observation

- Pre-1985
- 1985 or Later

■ Known and Suspected Range

Occurrence Summary Statistics

- Number of Occurrences in AWVED master dataset: 128
- Number of Occurrences used to create distribution model: 20
- Average Point Quality Index (highest quality is 12.00): 6.05 ± 3.53
- Most recent occurrence used: 2002
- Oldest occurrence used: 1947
- Occurrence File:
DRAFT_3_SAGE_WATER_RERUNS.csv

Comments

Conclusive identification of this species is difficult unless the observer is experienced with the species. We suspect numerous occurrences could be in error, thus resulting in lower than expected model quality. The lack of supporting data provided with many occurrences (notably those from the Wildlife Observation System) makes it impossible to assess the accuracy of such observations. Supplementation/replacement of the existing data set with high-quality occurrence locations could greatly improve the modeled distribution for this species.

References

- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010a. Range maps for Wyoming's species of greatest conservation need. Report prepared for the Wyoming Game and Fish Department by the Wyoming Natural Diversity Database, Laramie, Wyoming. January 19, 2010.
- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010b. Range and modeled distribution of Wyoming's species of greatest conservation need. Report prepared by the Wyoming Natural Diversity Database, Laramie Wyoming for the Wyoming Game and Fish Department, Cheyenne, Wyoming and the U.S. Geological Survey, Fort Collins, Colorado. August 20, 2010.

Predictor Variables used in the Distribution Model

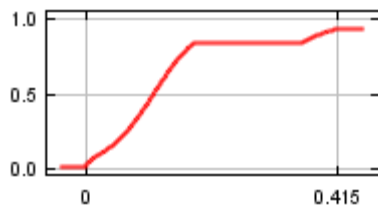
Percent Contribution (PC) to final model

<i>Environmental Variable</i>	<i>PC</i>
Deciduous Forest Index	35
Radiation of the lightest month	23
Conifer Index	20
Wettest quarter mean temperature	9
Distance to Water	7
Vector Ruggedness Measure	6

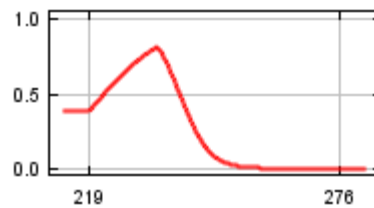
Response Curves

Each curve shows dependence of predicted suitability on input values of a single predictor variable considering correlations with others. Suitability is on the vertical axis (units: probability). Variable values are on the horizontal axis (units based on inputs; see Keinath et al 2010b for details).

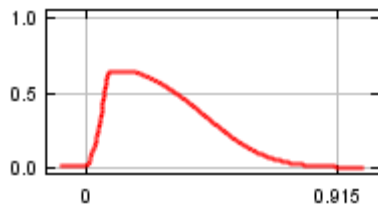
Deciduous Forest Index



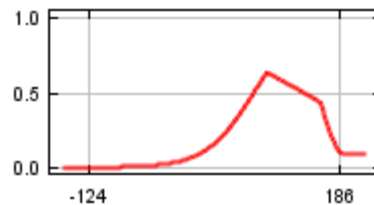
Radiation of the lightest month



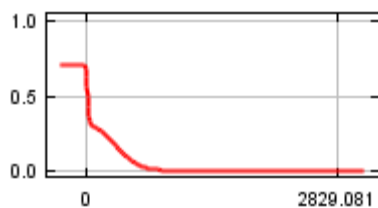
Conifer Index



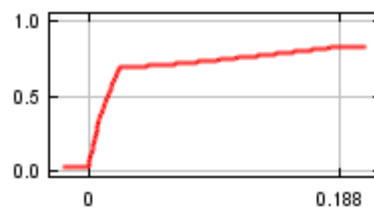
Wettest quarter mean temperature



Distance to Water



Vector Ruggedness Measure

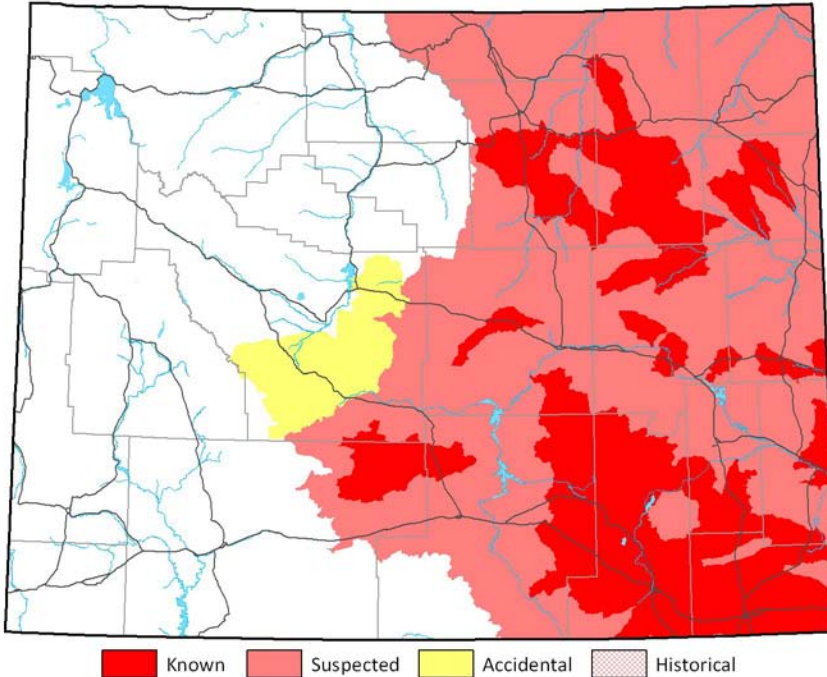


Swift Fox (*Vulpes velox*) Range Map and Distribution Model Summary

August 20, 2010

This report presents range and distribution of Swift Fox (AMAJA03030) in Wyoming (see Keinath et al. 2010b). Similar reports were developed by the Wyoming Natural Diversity Database for terrestrial vertebrate species of conservation need in Wyoming's State Wildlife Action Plan. This effort was supported by the Wyoming Game and Fish Department and the U.S. Geological Survey.

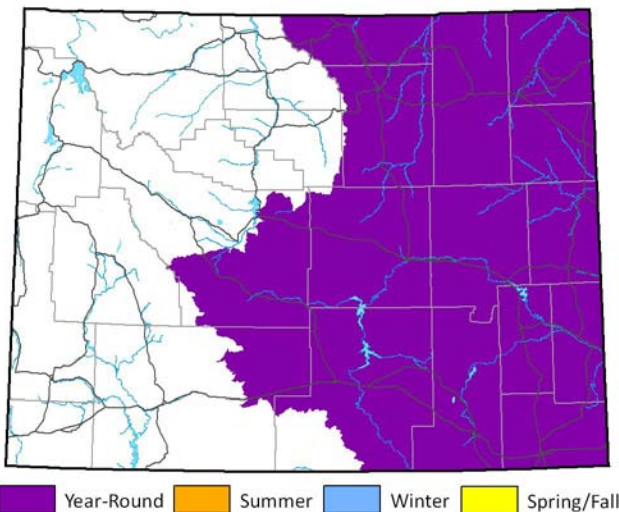
Range Map - Occupancy



Range Notes

- Version: 2010-01-19
- Proportion of range deemed known based on documented occurrences: 0.287
- Details of range map creation noted in Keinath et al. (2010a).

Range Map - Seasonality



Maps, models and report were created by and are available from the Wyoming Natural Diversity Database. (<http://uwadmnweb.uwyo.edu/wyndd/>).

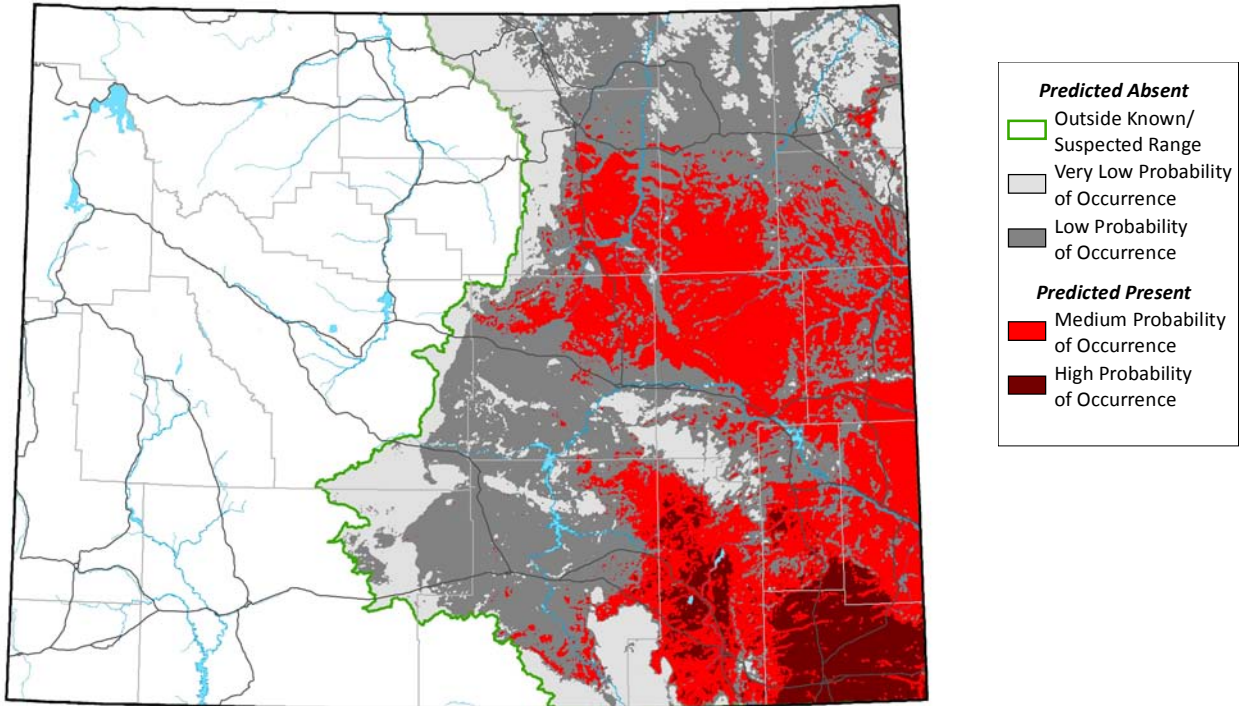
Doug Keinath, Senior Zoologist

Mark Andersen, GIS Specialist

© 2010, WYNDD

Distribution Model (Version: Mon Dec 21 15:05:58 MST 2009)

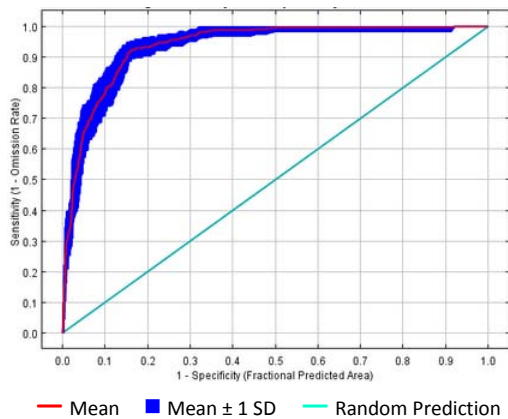
Details of distribution model creation are presented in Keinath et al. (2010b)



Model Parameters

- Season Modeled: Year-Round
- Algorithm: Maxent version 3.3.1
- Feature Types: Linear, Product, Quadratic, Hinge, Threshold
- Binary Threshold Rule: Maximum training sensitivity plus specificity
- Binary Threshold Value: 0.1810570
- High-Probability Threshold Value: 0.5874712
- Low-Probability Threshold Value: 0.0102643

Model Evaluation - ROC Plot



Model Quality Summary

Overall Assessment of Model Quality: HIGH

- Expert Assessment: High
- Occurrence Sample Size: High
- Quality of Occurrences: Medium
- Positive Success Rate: High
- Test AUC and Model Gain: High

Model Evaluation Statistics

Final Model Statistics

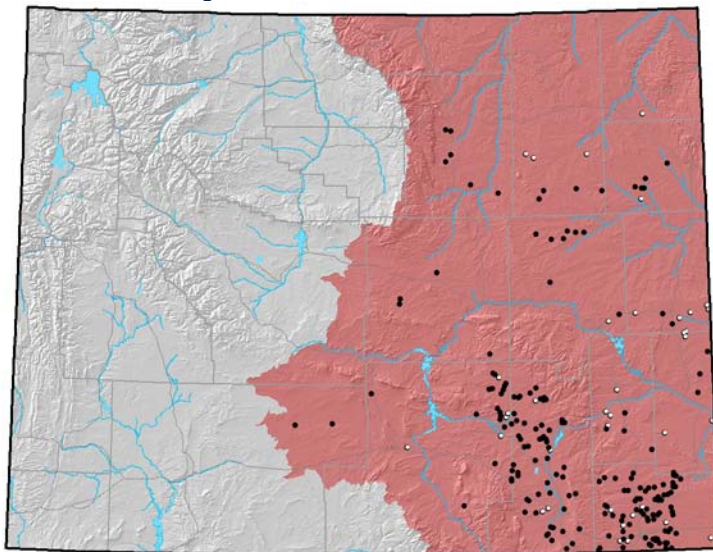
- Training AUC: 0.949
- Regularized Training Gain: 1.892

Cross-Validation Statistics

- Average Test AUC: 0.936 ± 0.017
- Upper Bound on Test AUC: 0.938
- Average Test Gain: 1.841 ± 0.348
- Omission Error (fraction of test points omitted during 10-fold cross validation): 0.13 ± 0.06

Occurrence Data for Distribution Model

Occurrence Map



Points Used in Modeling, by Year of Observation

- Pre-1985
- 1985 or Later

Known and Suspected Range

Occurrence Summary Statistics

- Number of Occurrences in AWVED master dataset: 492
- Number of Occurrences used to create distribution model: 223
- Average Point Quality Index (highest quality is 12.00): 6.64 ± 1.68
- Most recent occurrence used: 2008
- Oldest occurrence used: 1965
- Occurrence File:
LARGE_AREA_SAMPLE_POINTS_ALL.CSV

Comments

There are no additional comments specific to this species range map or distribution model.

References

- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010a. Range maps for Wyoming's species of greatest conservation need. Report prepared for the Wyoming Game and Fish Department by the Wyoming Natural Diversity Database, Laramie, Wyoming. January 19, 2010.
- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010b. Range and modeled distribution of Wyoming's species of greatest conservation need. Report prepared by the Wyoming Natural Diversity Database, Laramie Wyoming for the Wyoming Game and Fish Department, Cheyenne, Wyoming and the U.S. Geological Survey, Fort Collins, Colorado. August 20, 2010.

Predictor Variables used in the Distribution Model

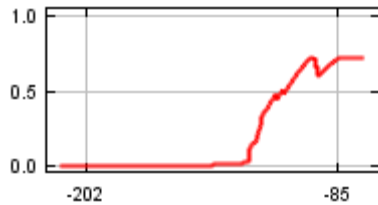
Percent Contribution (PC) to final model

<i>Environmental Variable</i>	<i>PC</i>
Coldest month mean minimum temperature	38
Variation in monthly radiation	17
Pinon-Juniper Index	16
Standard deviation of monthly temperature	11
Forest Cover Index	11
Precipitation of the warmest quarter	7

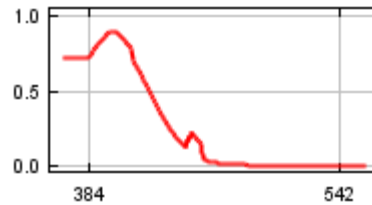
Response Curves

Each curve shows dependence of predicted suitability on input values of a single predictor variable considering correlations with others. Suitability is on the vertical axis (units: probability). Variable values are on the horizontal axis (units based on inputs; see Keinath et al 2010b for details).

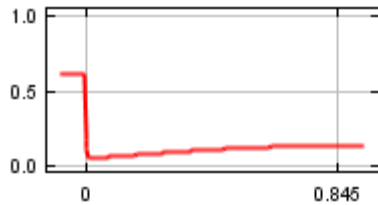
Coldest month mean minimum temperature



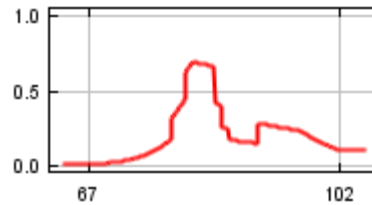
Variation in monthly radiation



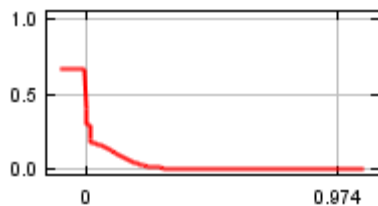
Pinon-Juniper Index



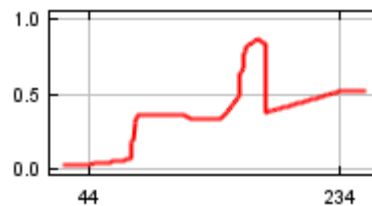
Standard deviation of monthly temperature



Forest Cover Index



Precipitation of the warmest quarter

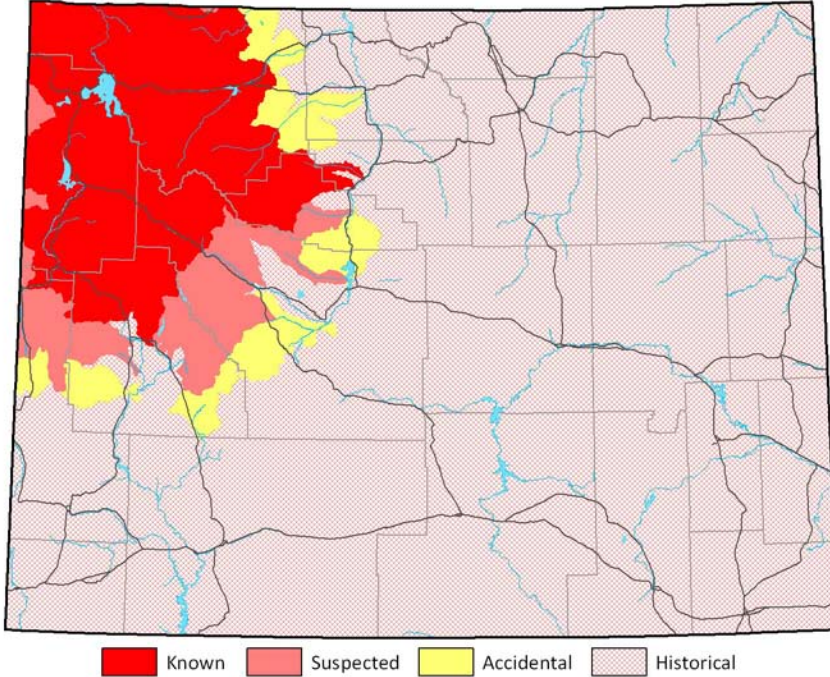


Grizzly Bear (*Ursus arctos*) Range Map and Distribution Model Summary

August 20, 2010

This report presents range and distribution of Grizzly Bear (AMAJB01020) in Wyoming (see Keinath et al. 2010b). Similar reports were developed by the Wyoming Natural Diversity Database for terrestrial vertebrate species of conservation need in Wyoming's State Wildlife Action Plan. This effort was supported by the Wyoming Game and Fish Department and the U.S. Geological Survey.

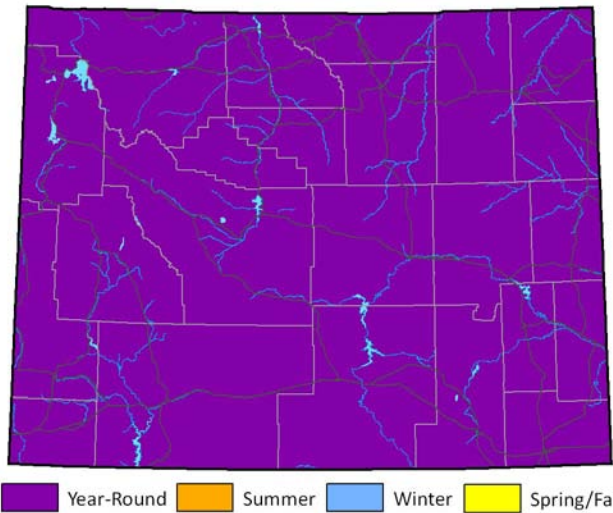
Range Map - Occupancy



Range Notes

- Version: 2010-01-19
- Proportion of range deemed known based on documented occurrences: 0.707
- Details of range map creation noted in Keinath et al. (2010a).

Range Map - Seasonality



Maps, models and report were created by and are available from the Wyoming Natural Diversity Database. (<http://uwadmnweb.uwyo.edu/wyndd/>).

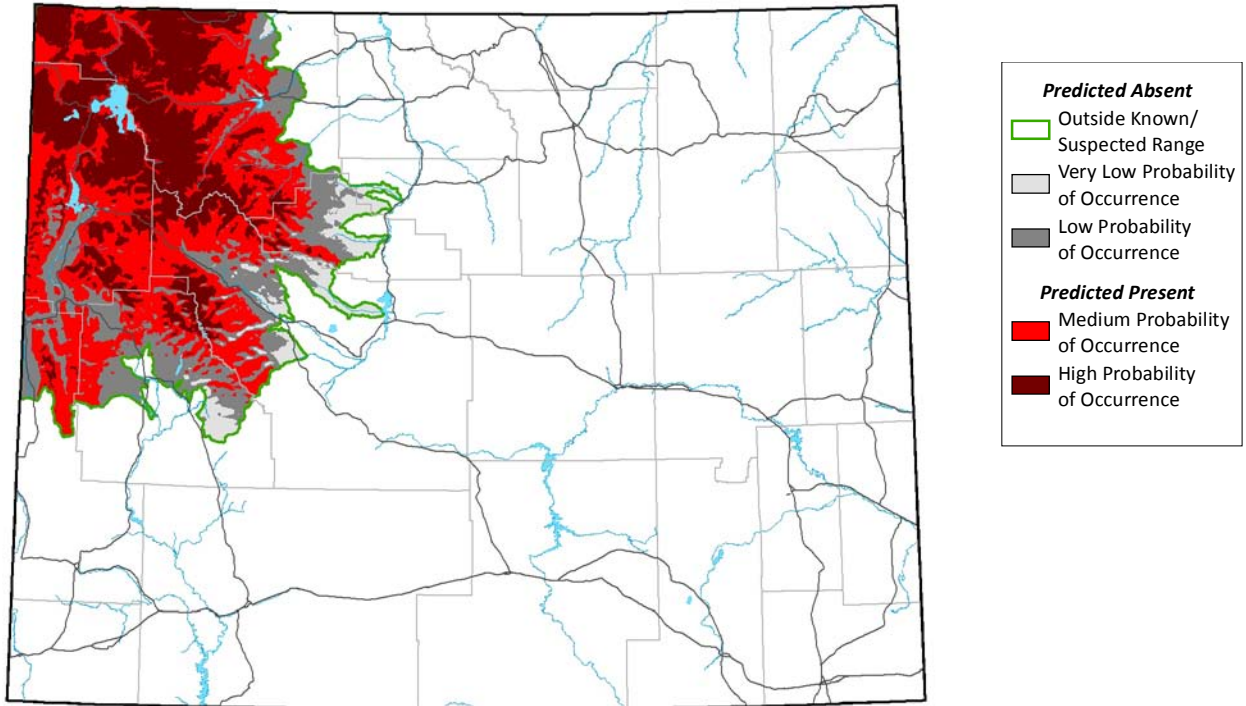
Doug Keinath, Senior Zoologist

Mark Andersen, GIS Specialist

© 2010, WYNDD

Distribution Model (Version: Mon Jan 04 14:02:25 MST 2010)

Details of distribution model creation are presented in Keinath et al. (2010b)



Model Parameters

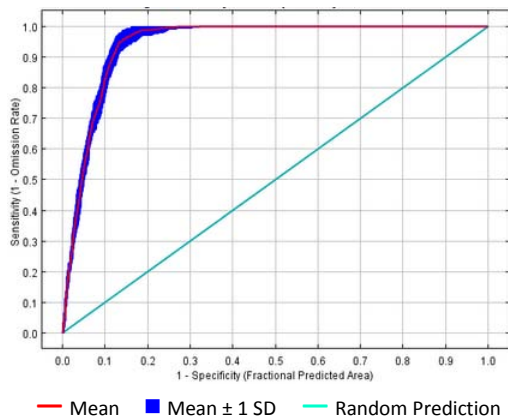
- Season Modeled: Year-Round
- Algorithm: Maxent version 3.3.1
- Feature Types: Linear, Product, Quadratic, Hinge, Threshold
- Binary Threshold Rule: Maximum training sensitivity plus specificity
- Binary Threshold Value: 0.1865550
- High-Probability Threshold Value: 0.5546613
- Low-Probability Threshold Value: 0.0080316

Model Quality Summary

Overall Assessment of Model Quality: HIGH

- Expert Assessment: High
- Occurrence Sample Size: High
- Quality of Occurrences: Medium
- Positive Success Rate: Very High
- Test AUC and Model Gain: High

Model Evaluation - ROC Plot



Model Evaluation Statistics

Final Model Statistics

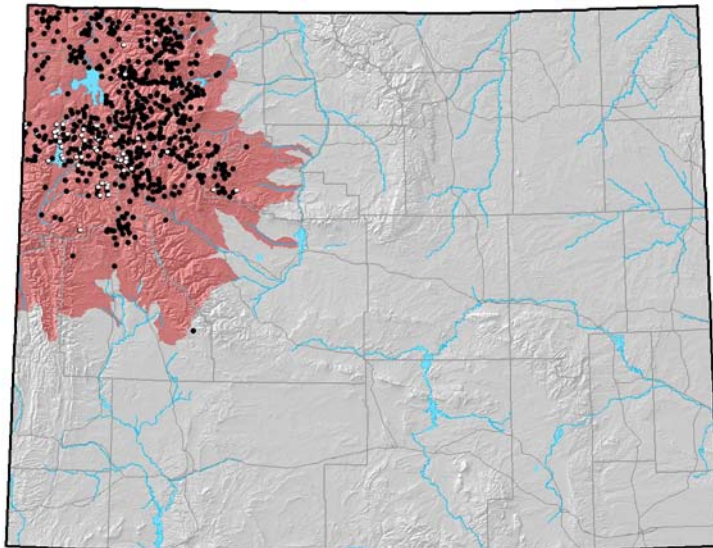
- Training AUC: 0.947
- Regularized Training Gain: 1.876

Cross-Validation Statistics

- Average Test AUC: 0.943 ± 0.004
- Upper Bound on Test AUC: 0.942
- Average Test Gain: 1.879 ± 0.087
- Omission Error (fraction of test points omitted during 10-fold cross validation): 0.04 ± 0.03

Occurrence Data for Distribution Model

Occurrence Map



Points Used in Modeling, by Year of Observation

- Pre-1985
- 1985 or Later

■ Known and Suspected Range

Occurrence Summary Statistics

- Number of Occurrences in AWVED master dataset: 1,747
- Number of Occurrences used to create distribution model: 639
- Average Point Quality Index (highest quality is 12.00): 7.07 ± 1.22
- Most recent occurrence used: 2007
- Oldest occurrence used: 1950
- Occurrence File:
LARGE_AREA_SAMPLE_POINTS_ALL.CSV

Comments

There are no additional comments specific to this species range map or distribution model.

References

- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010a. Range maps for Wyoming's species of greatest conservation need. Report prepared for the Wyoming Game and Fish Department by the Wyoming Natural Diversity Database, Laramie, Wyoming. January 19, 2010.
- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010b. Range and modeled distribution of Wyoming's species of greatest conservation need. Report prepared by the Wyoming Natural Diversity Database, Laramie Wyoming for the Wyoming Game and Fish Department, Cheyenne, Wyoming and the U.S. Geological Survey, Fort Collins, Colorado. August 20, 2010.

Predictor Variables used in the Distribution Model

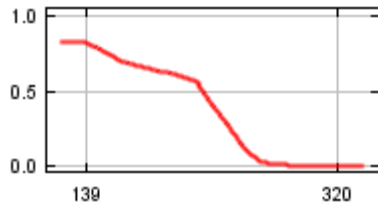
Percent Contribution (PC) to final model

<i>Environmental Variable</i>	<i>PC</i>
Hottest month mean maximum temperature	36
Radiation of the darkest month	20
Relative Humidity of least humid month	13
Annual Relative Humidity Range	13
Precipitation of the driest quarter	10
Variation in monthly Relative Humidity	8

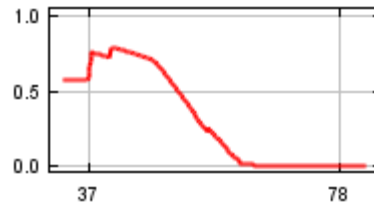
Response Curves

Each curve shows dependence of predicted suitability on input values of a single predictor variable considering correlations with others. Suitability is on the vertical axis (units: probability). Variable values are on the horizontal axis (units based on inputs; see Keinath et al 2010b for details).

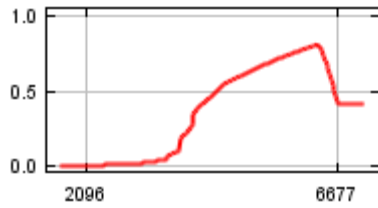
Hottest month mean maximum temperature



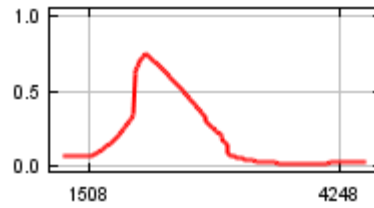
Radiation of the darkest month



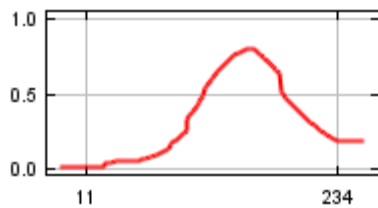
Relative Humidity of least humid month



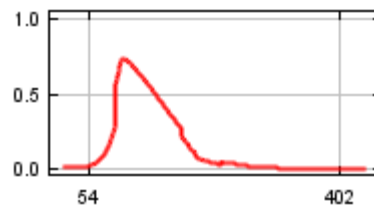
Annual Relative Humidity Range



Precipitation of the driest quarter



Variation in monthly Relative Humidity

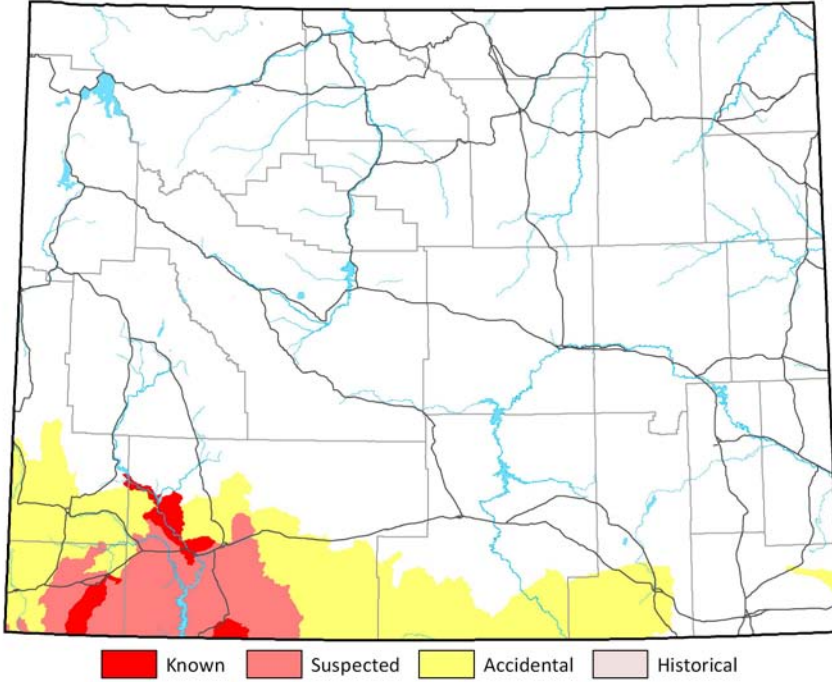


Ringtail (*Bassariscus astutus*) Range Map and Distribution Model Summary

August 20, 2010

This report presents range and distribution of Ringtail (AMAJE01010) in Wyoming (see Keinath et al. 2010b). Similar reports were developed by the Wyoming Natural Diversity Database for terrestrial vertebrate species of conservation need in Wyoming's State Wildlife Action Plan. This effort was supported by the Wyoming Game and Fish Department and the U.S. Geological Survey.

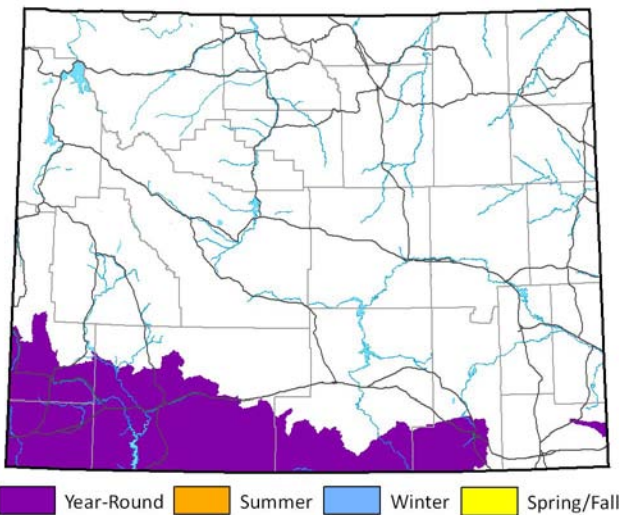
Range Map - Occupancy



Range Notes

- Version: 2010-01-19
- Proportion of range deemed known based on documented occurrences: 0.150
- Details of range map creation noted in Keinath et al. (2010a).

Range Map - Seasonality



Maps, models and report were created by and are available from the Wyoming Natural Diversity Database. (<http://uwadmnweb.uwyo.edu/wyndd/>).

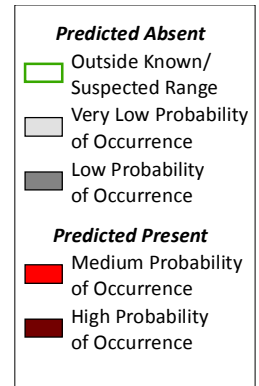
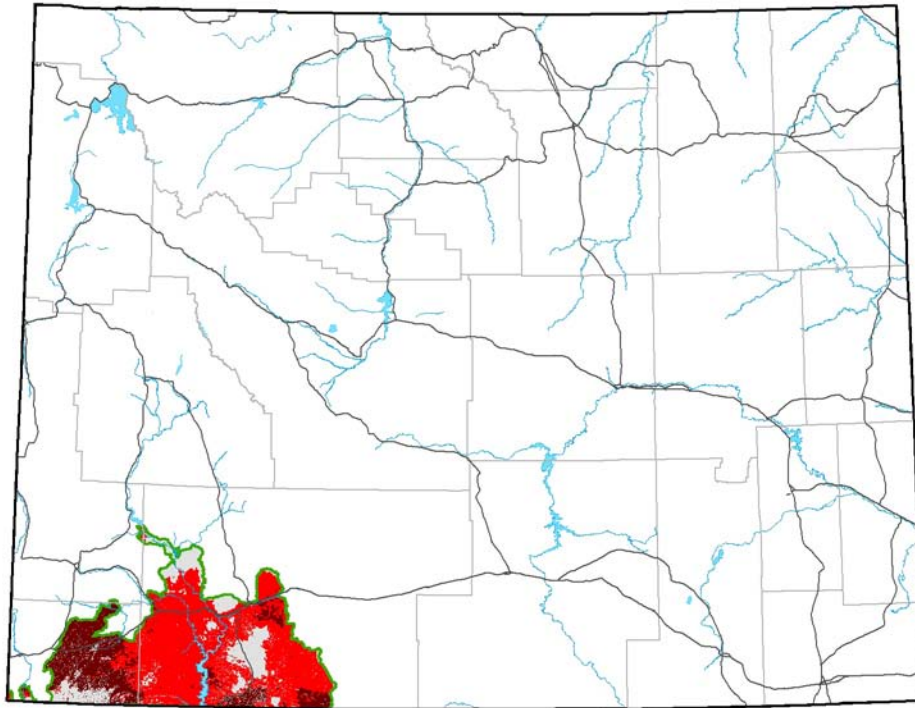
Doug Keinath, Senior Zoologist

Mark Andersen, GIS Specialist

© 2010, WYNDD

Distribution Model (Version: Mon Apr 05 08:48:31 MDT 2010)

Details of distribution model creation are presented in Keinath et al. (2010b)



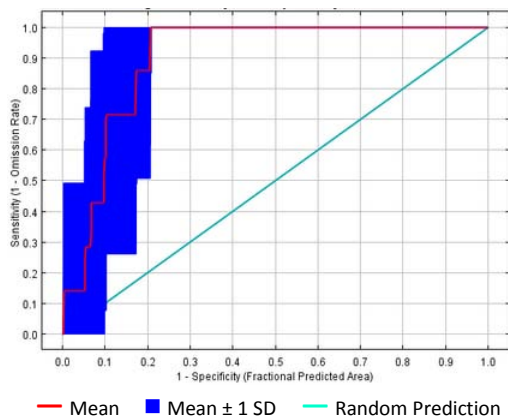
Model Parameters

- Season Modeled: Year-Round
- Algorithm: Maxent version 3.3.1
- Feature Types: Linear
- Binary Threshold Rule: Maximum training sensitivity plus specificity
- Binary Threshold Value: 0.4432950
- High-Probability Threshold Value: 0.5805604
- Low-Probability Threshold Value: 0.4432950

Model Quality Summary

Overall Assessment of Model Quality: LOW
 Expert Assessment: Low
 Occurrence Sample Size: Low
 Quality of Occurrences: Medium
 Positive Success Rate: Medium
 Test AUC and Model Gain: Low

Model Evaluation - ROC Plot



Model Evaluation Statistics

Final Model Statistics

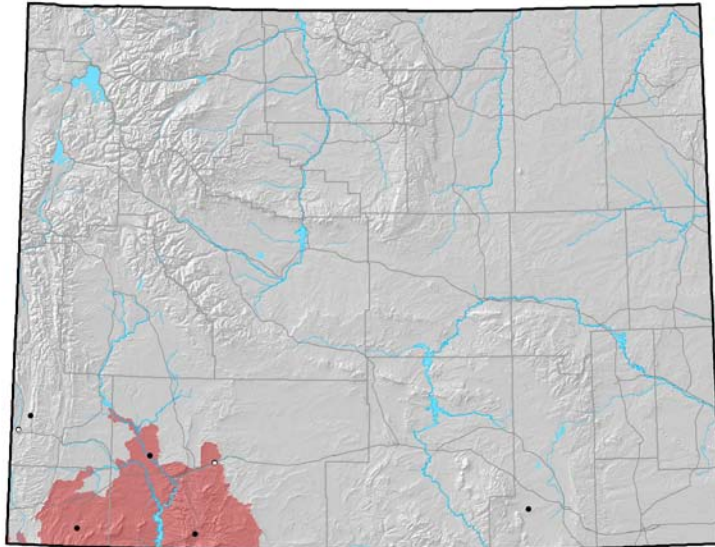
Training AUC: 0.946
 Regularized Training Gain: 1.261

Cross-Validation Statistics

- Average Test AUC: 0.630 ± 0.438
- Upper Bound on Test AUC: 0.894
- Average Test Gain: 0.861 ± 0.813
- Omission Error (fraction of test points omitted during 7-fold cross validation): 0.29 ± 0.49

Occurrence Data for Distribution Model

Occurrence Map



Points Used in Modeling, by Year of Observation

- Pre-1985
- 1985 or Later

Known and Suspected Range

Occurrence Summary Statistics

- Number of Occurrences in AWVED master dataset: 12
- Number of Occurrences used to create distribution model: 7
- Average Point Quality Index (highest quality is 12.00): 7.14 ± 2.04
- Most recent occurrence used: 2006
- Oldest occurrence used: 1957
- Occurrence File:
DRAFT_3_SAGE_WATER_RERUNS.csv

Comments

The model for this species is based on a small sample size of occurrence locations, which often results in low model quality. Collection of additional, high-quality occurrence locations could greatly improve the modeled distribution for this species.

References

- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010a. Range maps for Wyoming's species of greatest conservation need. Report prepared for the Wyoming Game and Fish Department by the Wyoming Natural Diversity Database, Laramie, Wyoming. January 19, 2010.
- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010b. Range and modeled distribution of Wyoming's species of greatest conservation need. Report prepared by the Wyoming Natural Diversity Database, Laramie Wyoming for the Wyoming Game and Fish Department, Cheyenne, Wyoming and the U.S. Geological Survey, Fort Collins, Colorado. August 20, 2010.

Predictor Variables used in the Distribution Model

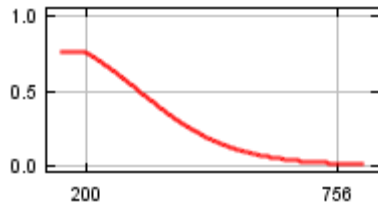
Percent Contribution (PC) to final model

<i>Environmental Variable</i>	<i>PC</i>
Variation of monthly precipitation	35
Annual precipitation range (P3 – P2)	29
Annual total radiation	17
Percent Forest Cover	17
Isothermality (T2/T5)	2
Deciduous Forest Index	1

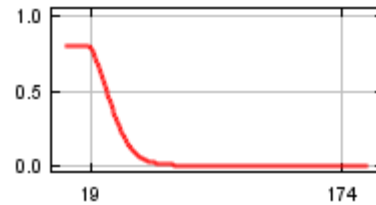
Response Curves

Each curve shows dependence of predicted suitability on input values of a single predictor variable considering correlations with others. Suitability is on the vertical axis (units: probability). Variable values are on the horizontal axis (units based on inputs; see Keinath et al 2010b for details).

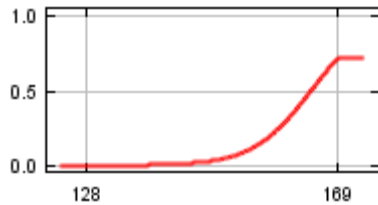
Variation of monthly precipitation



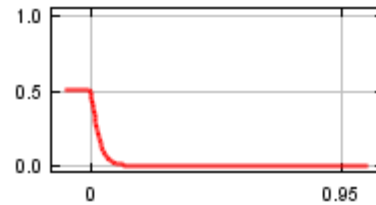
Annual precipitation range (P3 – P2)



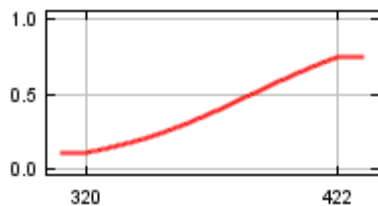
Annual total radiation



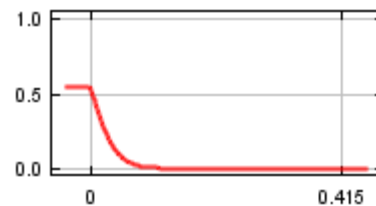
Percent Forest Cover



Isothermality (T2/T5)



Deciduous Forest Index

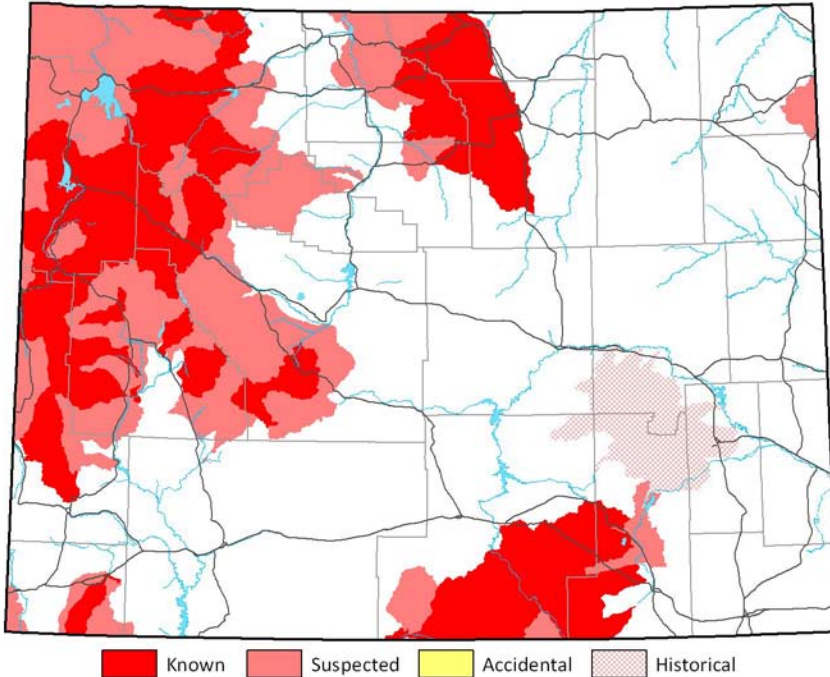


Marten (*Martes americana*) Range Map and Distribution Model Summary

August 20, 2010

This report presents range and distribution of Marten (AMAJF01010) in Wyoming (see Keinath et al. 2010b). Similar reports were developed by the Wyoming Natural Diversity Database for terrestrial vertebrate species of conservation need in Wyoming's State Wildlife Action Plan. This effort was supported by the Wyoming Game and Fish Department and the U.S. Geological Survey.

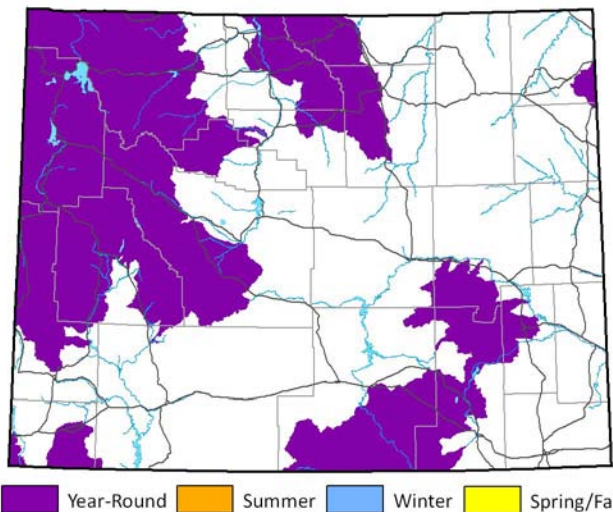
Range Map - Occupancy



Range Notes

- Version: 2010-01-19
- Proportion of range deemed known based on documented occurrences: 0.448
- Details of range map creation noted in Keinath et al. (2010a).

Range Map - Seasonality



Maps, models and report were created by and are available from the Wyoming Natural Diversity Database. (<http://uwadmnweb.uwyo.edu/wyndd/>).

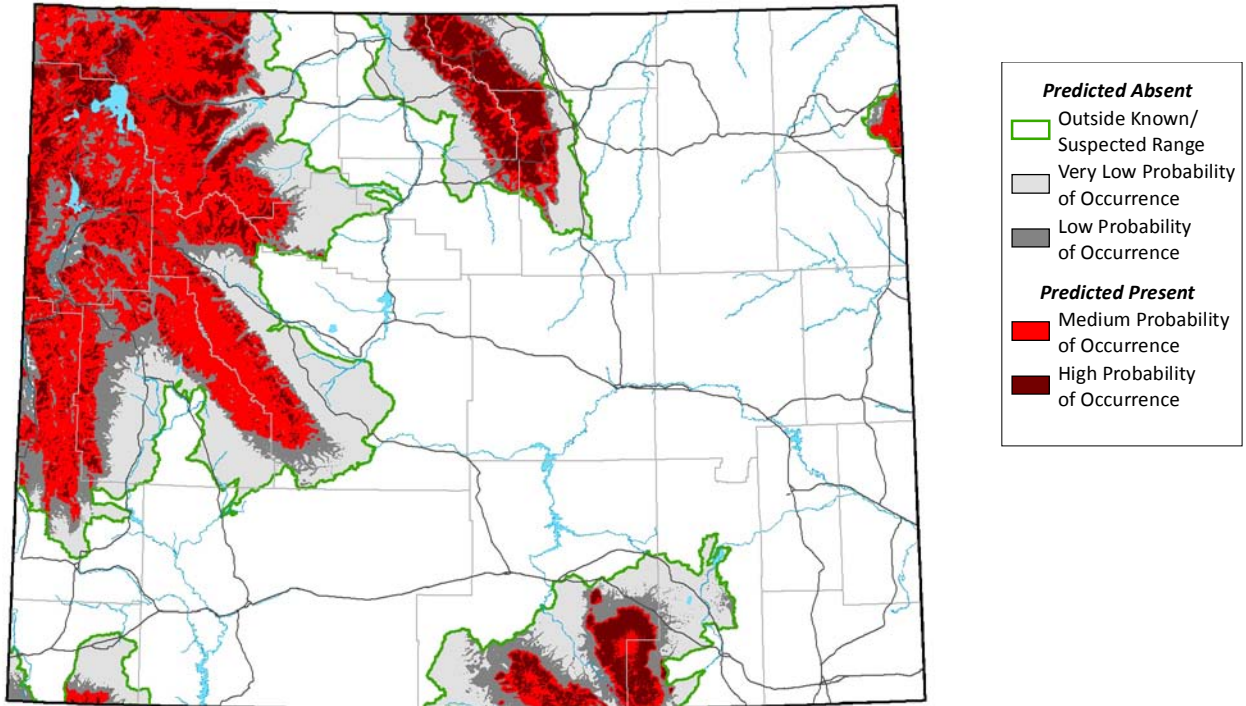
Doug Keinath, Senior Zoologist

Mark Andersen, GIS Specialist

© 2010, WYNDD

Distribution Model (Version: Thu Mar 18 05:30:27 MDT 2010)

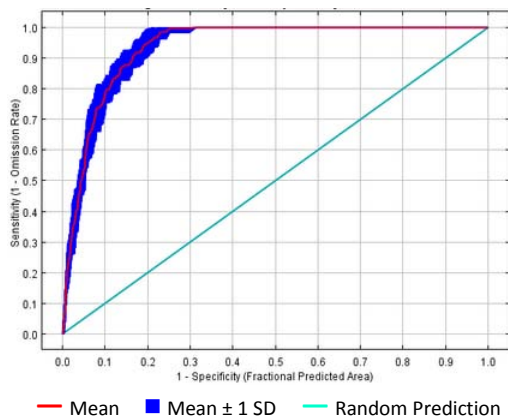
Details of distribution model creation are presented in Keinath et al. (2010b)



Model Parameters

- Season Modeled: Year-Round
- Algorithm: Maxent version 3.3.1
- Feature Types: Linear, Product
- Binary Threshold Rule: Maximum training sensitivity plus specificity
- Binary Threshold Value: 0.1540940
- High-Probability Threshold Value: 0.5474601
- Low-Probability Threshold Value: 0.0122031

Model Evaluation - ROC Plot



Model Quality Summary

Overall Assessment of Model Quality: HIGH

Expert Assessment: High

Occurrence Sample Size: High

Quality of Occurrences: Medium

Positive Success Rate: Very High

Test AUC and Model Gain: High

Model Evaluation Statistics

Final Model Statistics

Training AUC: 0.939

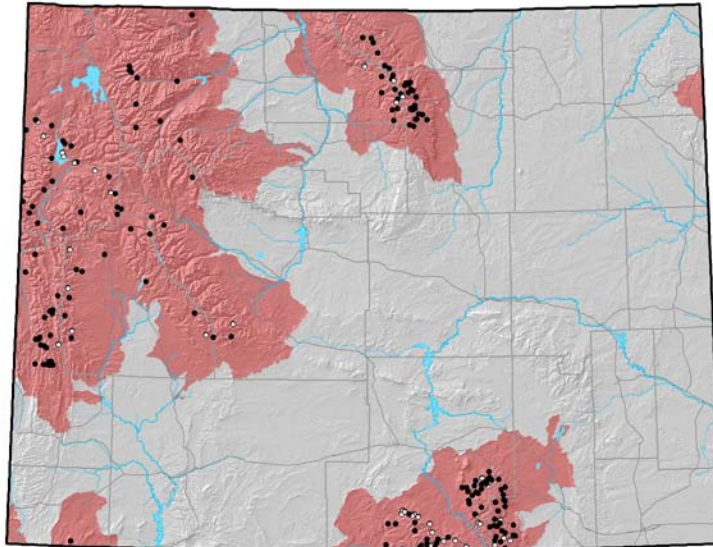
Regularized Training Gain: 1.754

Cross-Validation Statistics

- Average Test AUC: 0.936 ± 0.008
- Upper Bound on Test AUC: 0.933
- Average Test Gain: 1.740 ± 0.119
- Omission Error (fraction of test points omitted during 10-fold cross validation): 0.07 ± 0.05

Occurrence Data for Distribution Model

Occurrence Map



Points Used in Modeling, by Year of Observation

- Pre-1985
- 1985 or Later

Known and Suspected Range

Occurrence Summary Statistics

- Number of Occurrences in AWVED master dataset: 337
- Number of Occurrences used to create distribution model: 202
- Average Point Quality Index (highest quality is 12.00): 6.40 ± 1.80
- Most recent occurrence used: 2006
- Oldest occurrence used: 1978
- Occurrence File:
LOCAL_SAMPLE_POINTS_W_PDOG_2.csv

Comments

There are no additional comments specific to this species range map or distribution model.

References

- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010a. Range maps for Wyoming's species of greatest conservation need. Report prepared for the Wyoming Game and Fish Department by the Wyoming Natural Diversity Database, Laramie, Wyoming. January 19, 2010.
- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010b. Range and modeled distribution of Wyoming's species of greatest conservation need. Report prepared by the Wyoming Natural Diversity Database, Laramie Wyoming for the Wyoming Game and Fish Department, Cheyenne, Wyoming and the U.S. Geological Survey, Fort Collins, Colorado. August 20, 2010.

Predictor Variables used in the Distribution Model

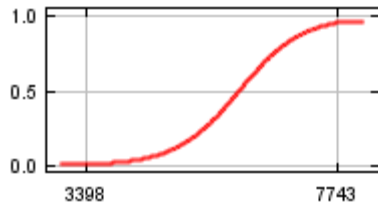
Percent Contribution (PC) to final model

<i>Environmental Variable</i>	<i>PC</i>
Annual mean relative humidity	35
Forest Cover Index	29
Hottest month mean maximum temperature	17
Conifer Index	15
Distance to Permanent Water	3
Annual mean precipitation	1

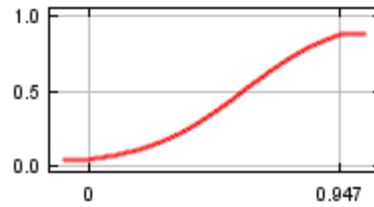
Response Curves

Each curve shows dependence of predicted suitability on input values of a single predictor variable considering correlations with others. Suitability is on the vertical axis (units: probability). Variable values are on the horizontal axis (units based on inputs; see Keinath et al 2010b for details).

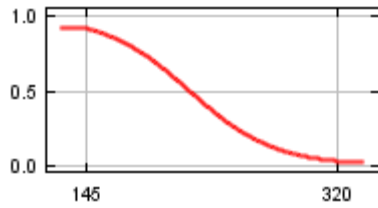
Annual mean relative humidity



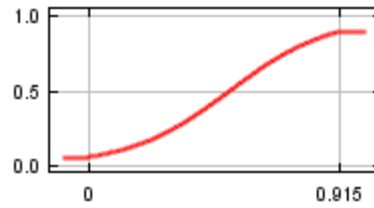
Forest Cover Index



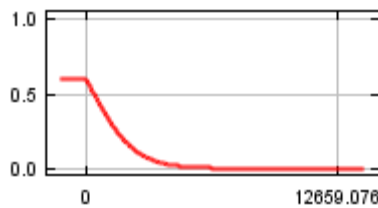
Hottest month mean maximum temperature



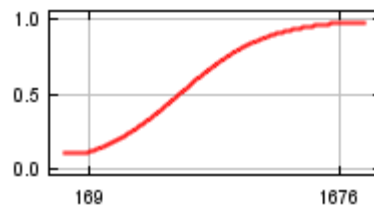
Conifer Index



Distance to Permanent Water



Annual mean precipitation

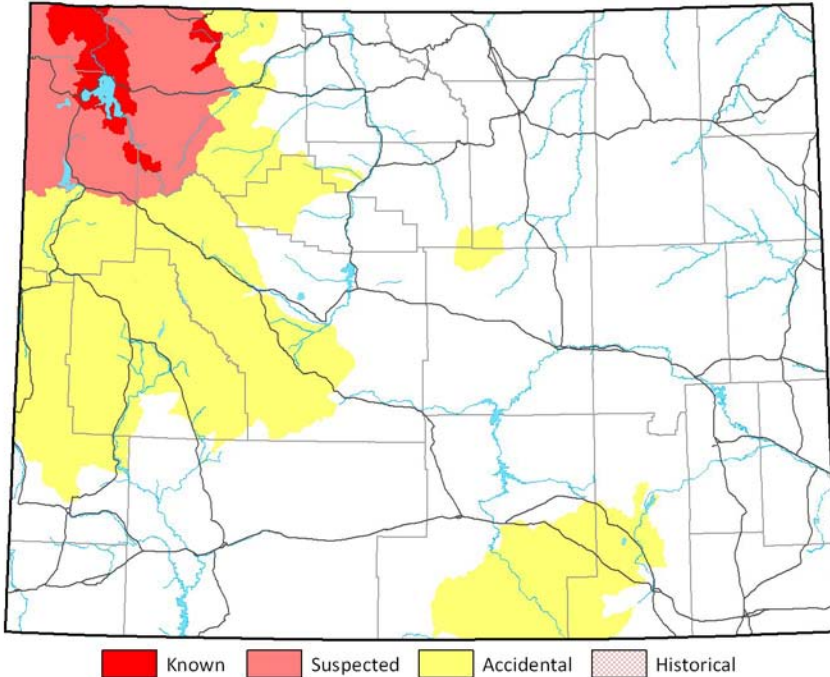


Fisher (*Martes pennanti*) Range Map and Distribution Model Summary

August 20, 2010

This report presents range and distribution of Fisher (AMAJF01020Q) in Wyoming (see Keinath et al. 2010b). Similar reports were developed by the Wyoming Natural Diversity Database for terrestrial vertebrate species of conservation need in Wyoming's State Wildlife Action Plan. This effort was supported by the Wyoming Game and Fish Department and the U.S. Geological Survey.

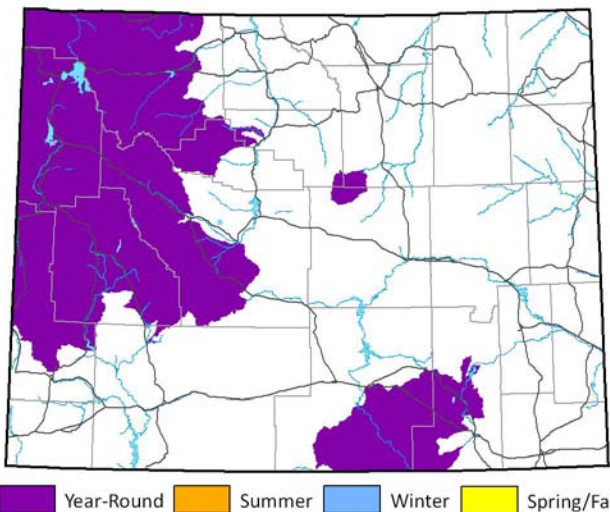
Range Map - Occupancy



Range Notes

- Version: 2010-01-19
- Proportion of range deemed known based on documented occurrences: 0.171
- Details of range map creation noted in Keinath et al. (2010a).

Range Map - Seasonality



Maps, models and report were created by and are available from the Wyoming Natural Diversity Database. (<http://uwadmnweb.uwyo.edu/wyndd/>).

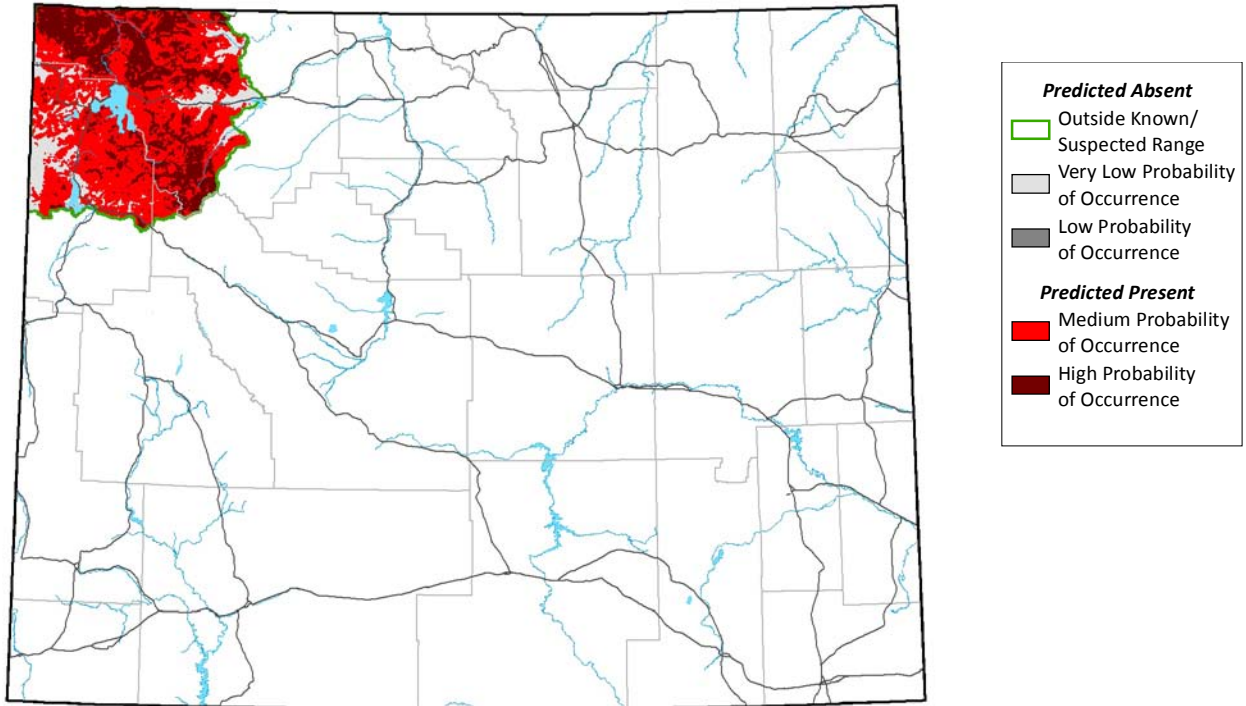
Doug Keinath, Senior Zoologist

Mark Andersen, GIS Specialist

© 2010, WYNDD

Distribution Model (Version: Fri Dec 04 18:06:01 MST 2009)

Details of distribution model creation are presented in Keinath et al. (2010b)



Model Parameters

- Season Modeled: Year-Round
- Algorithm: Maxent version 3.3.1
- Feature Types: Linear, Quadratic
- Binary Threshold Rule: Maximum training sensitivity plus specificity
- Binary Threshold Value: 0.2218290
- High-Probability Threshold Value: 0.6214026
- Low-Probability Threshold Value: 0.2218290

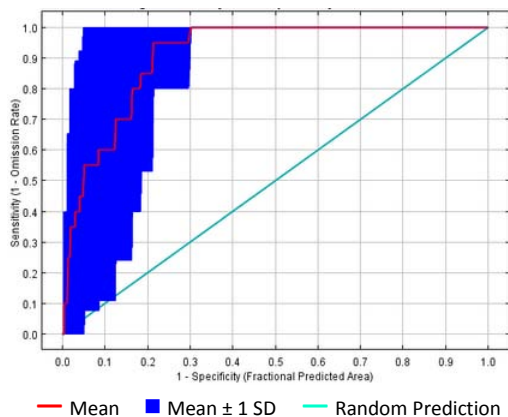
Model Quality Summary

Overall Assessment of Model Quality:

MEDIUM

- Expert Assessment: Medium
- Occurrence Sample Size: Low
- Quality of Occurrences: Low
- Positive Success Rate: High
- Test AUC and Model Gain: High

Model Evaluation - ROC Plot



Model Evaluation Statistics

Final Model Statistics

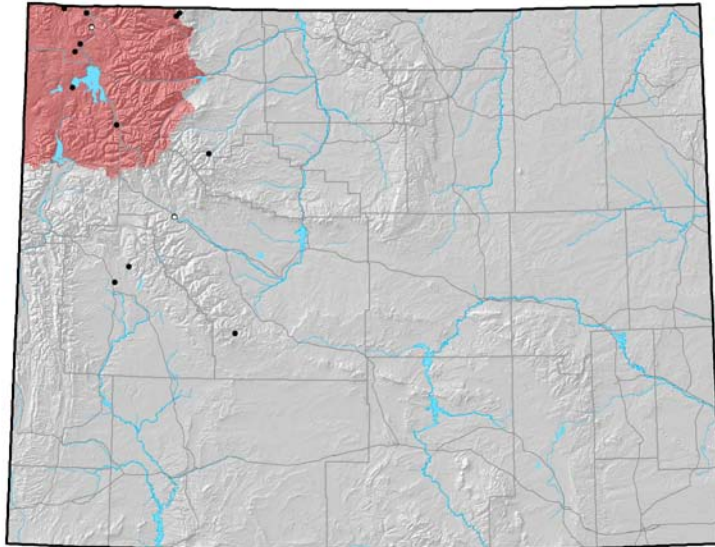
- Training AUC: 0.937
- Regularized Training Gain: 1.423

Cross-Validation Statistics

- Average Test AUC: 0.910 ± 0.088
- Upper Bound on Test AUC: 0.907
- Average Test Gain: 1.341 ± 1.171
- Omission Error (fraction of test points omitted during 10-fold cross validation): 0.20 ± 0.42

Occurrence Data for Distribution Model

Occurrence Map



Points Used in Modeling, by Year of Observation

- Pre-1985
- 1985 or Later

Known and Suspected Range

Occurrence Summary Statistics

- Number of Occurrences in AWVED master dataset: 27
- Number of Occurrences used to create distribution model: 14
- Average Point Quality Index (highest quality is 12.00): 4.93 ± 2.56
- Most recent occurrence used: 2005
- Oldest occurrence used: 1974
- Occurrence File:
LOCAL_SAMPLE_POINTS.csv

Comments

Due to timing of range map edits, the distribution model for fisher was created before final edits were made to the range map. As a result, several datapoints used in the model fall outside the accepted range of the species. These occurrences are generally valid observations of dispersing individuals deemed accidental (i.e., not resident). Although they are unlikely to substantially change model output, they should be removed from future distribution models.

References

- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010a. Range maps for Wyoming's species of greatest conservation need. Report prepared for the Wyoming Game and Fish Department by the Wyoming Natural Diversity Database, Laramie, Wyoming. January 19, 2010.
- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010b. Range and modeled distribution of Wyoming's species of greatest conservation need. Report prepared by the Wyoming Natural Diversity Database, Laramie Wyoming for the Wyoming Game and Fish Department, Cheyenne, Wyoming and the U.S. Geological Survey, Fort Collins, Colorado. August 20, 2010.

Predictor Variables used in the Distribution Model

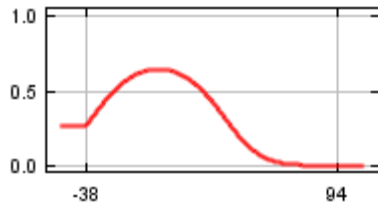
Percent Contribution (PC) to final model

<i>Environmental Variable</i>	<i>PC</i>
Annual mean temperature	66
Contagion Index	12
Driest quarter mean temperature	9
Variation in monthly radiation	8
Variation of monthly precipitation	2
Distance to Permanent Water	2

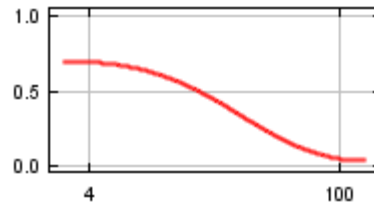
Response Curves

Each curve shows dependence of predicted suitability on input values of a single predictor variable considering correlations with others. Suitability is on the vertical axis (units: probability). Variable values are on the horizontal axis (units based on inputs; see Keinath et al 2010b for details).

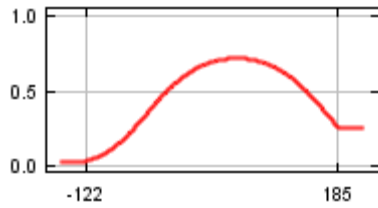
Annual mean temperature



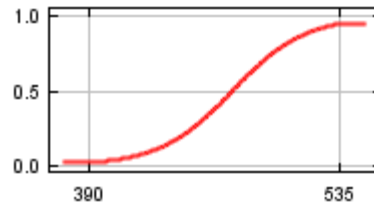
Contagion Index



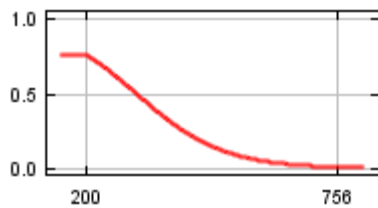
Driest quarter mean temperature



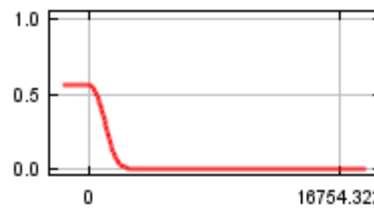
Variation in monthly radiation



Variation of monthly precipitation



Distance to Permanent Water

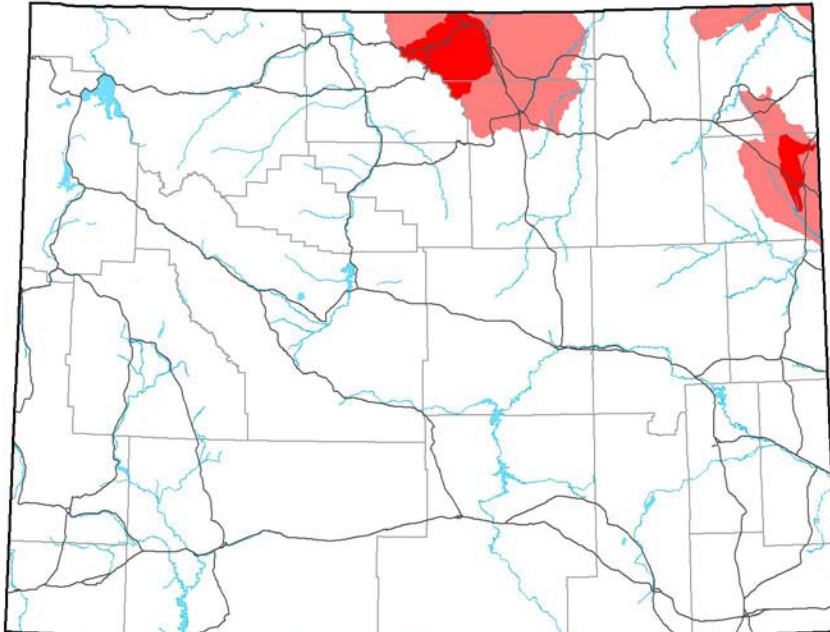


Least Weasel (*Mustela nivalis*) Range Map and Distribution Model Summary

August 20, 2010

This report presents range and distribution of Least Weasel (AMAJF02020) in Wyoming (see Keinath et al. 2010b). Similar reports were developed by the Wyoming Natural Diversity Database for terrestrial vertebrate species of conservation need in Wyoming's State Wildlife Action Plan. This effort was supported by the Wyoming Game and Fish Department and the U.S. Geological Survey.

Range Map - Occupancy

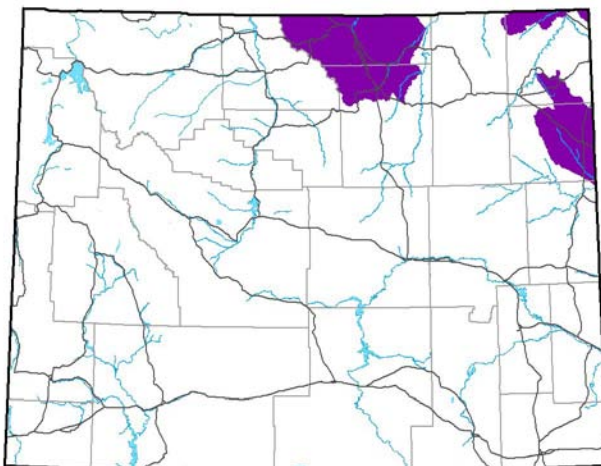


Known Suspected Accidental Historical

Range Notes

- Version: 2010-01-19
- Proportion of range deemed known based on documented occurrences: 0.120
- Details of range map creation noted in Keinath et al. (2010a).

Range Map - Seasonality



Year-Round Summer Winter Spring/Fall

Maps, models and report were created by and are available from the Wyoming Natural Diversity Database. (<http://uwadmnweb.uwyo.edu/wyndd/>).

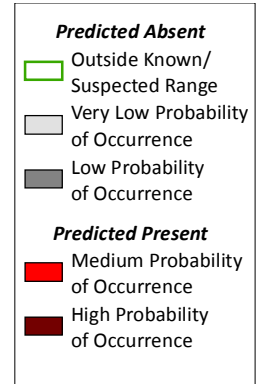
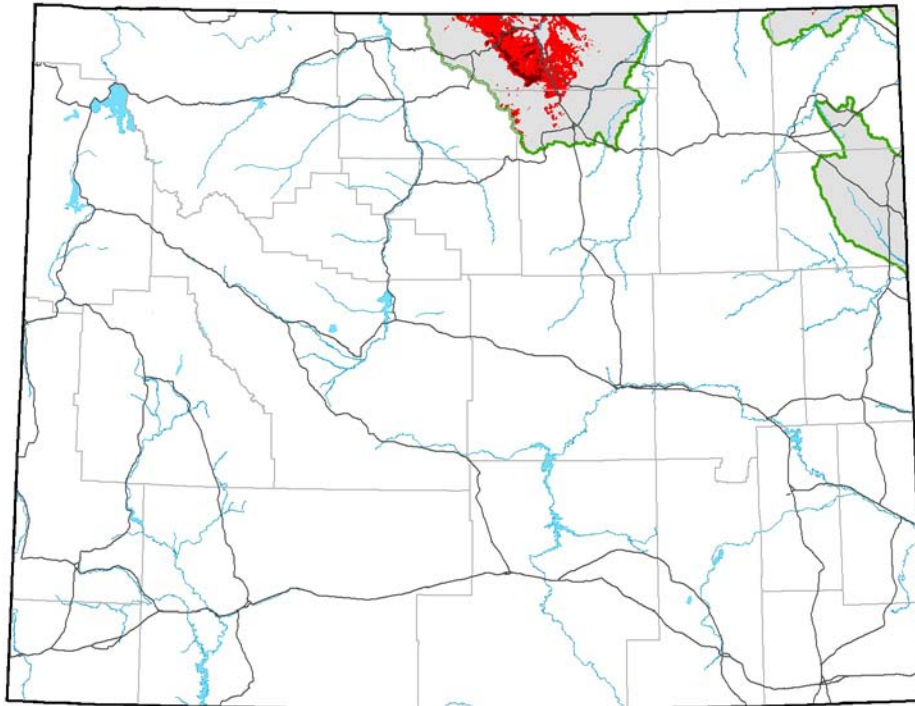
Doug Keinath, Senior Zoologist

Mark Andersen, GIS Specialist

© 2010, WYNDD

Distribution Model (Version: Fri Dec 04 21:27:24 MST 2009)

Details of distribution model creation are presented in Keinath et al. (2010b)



Model Parameters

- Season Modeled: Year-Round
- Algorithm: Maxent version 3.3.1
- Feature Types: Linear
- Binary Threshold Rule: Maximum training sensitivity plus specificity
- Binary Threshold Value: 0.2316100
- High-Probability Threshold Value: 0.7117732
- Low-Probability Threshold Value: 0.2316100

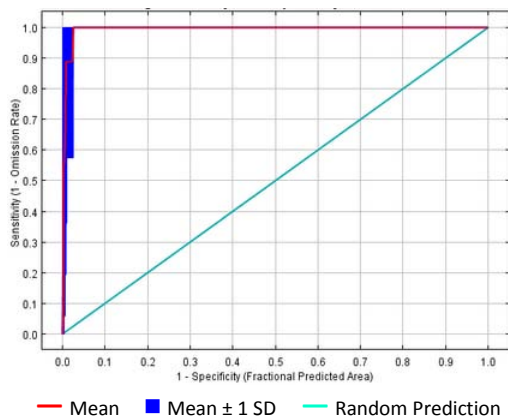
Model Quality Summary

Overall Assessment of Model Quality:

MEDIUM

- Expert Assessment: Medium
- Occurrence Sample Size: Low
- Quality of Occurrences: Medium
- Positive Success Rate: High
- Test AUC and Model Gain: High

Model Evaluation - ROC Plot



Model Evaluation Statistics

Final Model Statistics

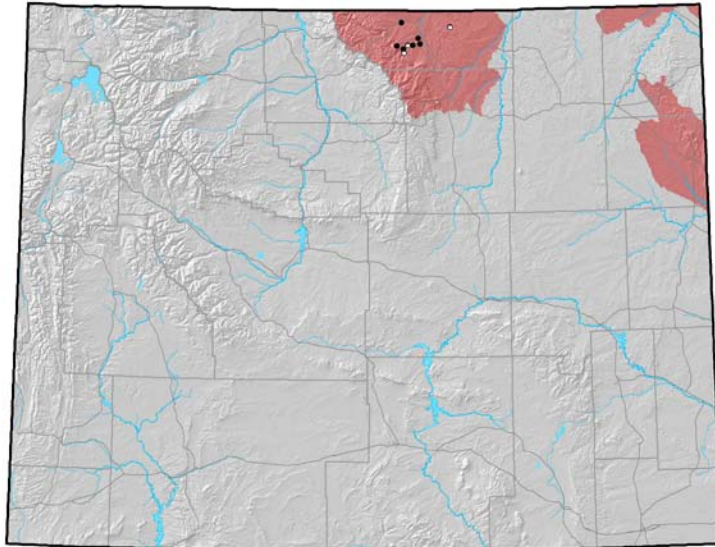
- Training AUC: 0.996
- Regularized Training Gain: 3.431

Cross-Validation Statistics

- Average Test AUC: 1.257 ± 1.239
- Upper Bound on Test AUC: 0.979
- Average Test Gain: 3.522 ± 1.538
- Omission Error (fraction of test points omitted during 9-fold cross validation): 0.11 ± 0.33

Occurrence Data for Distribution Model

Occurrence Map



Points Used in Modeling, by Year of Observation

- Pre-1985
- 1985 or Later

Known and Suspected Range

Occurrence Summary Statistics

- Number of Occurrences in AWVED master dataset: 44
- Number of Occurrences used to create distribution model: 9
- Average Point Quality Index (highest quality is 12.00): 6.22 ± 2.33
- Most recent occurrence used: 2004
- Oldest occurrence used: 1979
- Occurrence File:
LOCAL_SAMPLE_POINTS.csv

Comments

The model for this species is based on a small sample size of occurrence locations, which often results in low model quality. Collection of additional, high-quality occurrence locations could greatly improve the modeled distribution for this species.

References

- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010a. Range maps for Wyoming's species of greatest conservation need. Report prepared for the Wyoming Game and Fish Department by the Wyoming Natural Diversity Database, Laramie, Wyoming. January 19, 2010.
- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010b. Range and modeled distribution of Wyoming's species of greatest conservation need. Report prepared by the Wyoming Natural Diversity Database, Laramie Wyoming for the Wyoming Game and Fish Department, Cheyenne, Wyoming and the U.S. Geological Survey, Fort Collins, Colorado. August 20, 2010.

Predictor Variables used in the Distribution Model

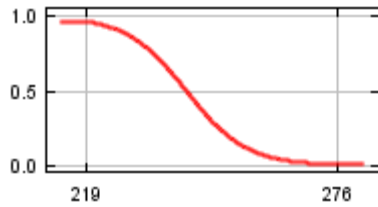
Percent Contribution (PC) to final model

<i>Environmental Variable</i>	<i>PC</i>
Radiation of the lightest month	28
Sagebrush Index	21
Contagion Index	18
Variation in monthly radiation	15
Precipitation of the warmest quarter	10
Elevation	9

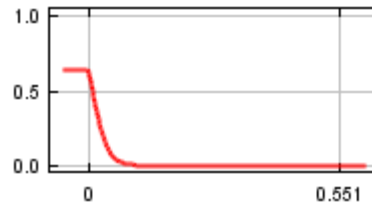
Response Curves

Each curve shows dependence of predicted suitability on input values of a single predictor variable considering correlations with others. Suitability is on the vertical axis (units: probability). Variable values are on the horizontal axis (units based on inputs; see Keinath et al 2010b for details).

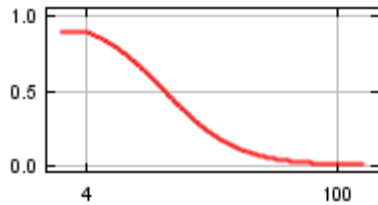
Radiation of the lightest month



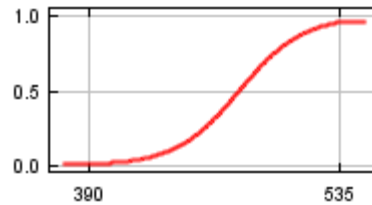
Sagebrush Index



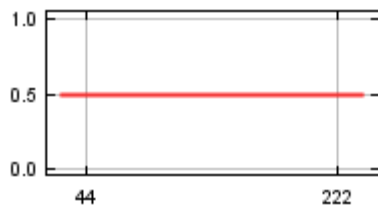
Contagion Index



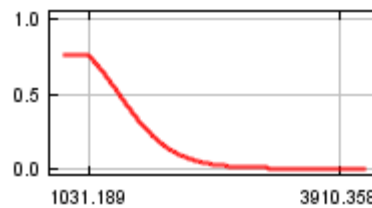
Variation in monthly radiation



Precipitation of the warmest quarter



Elevation

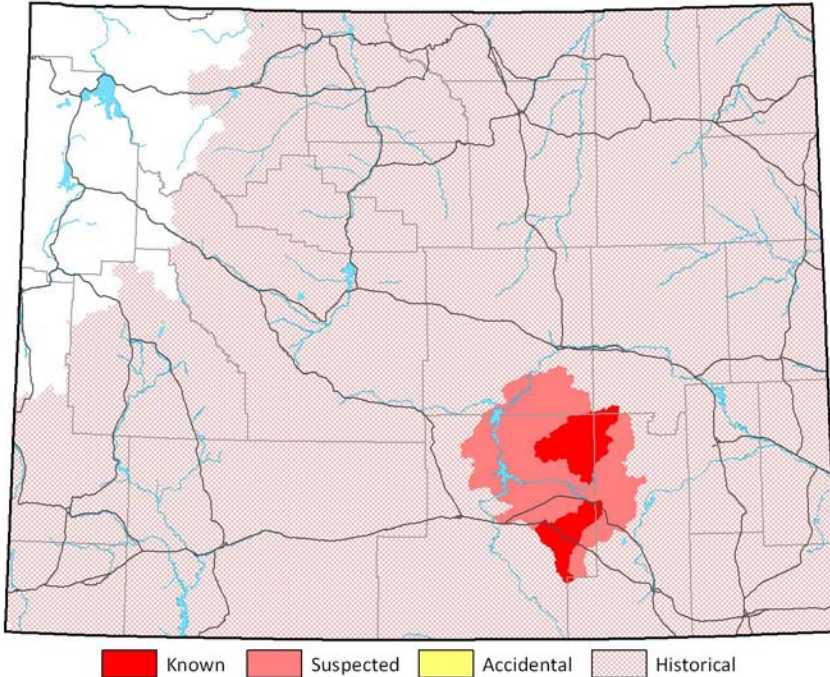


Black-footed Ferret (*Mustela nigripes*) Range Map and Distribution Model Summary

August 20, 2010

This report presents range and distribution of Black-footed Ferret (AMAJF02040) in Wyoming (see Keinath et al. 2010b). Similar reports were developed by the Wyoming Natural Diversity Database for terrestrial vertebrate species of conservation need in Wyoming's State Wildlife Action Plan. This effort was supported by the Wyoming Game and Fish Department and the U.S. Geological Survey.

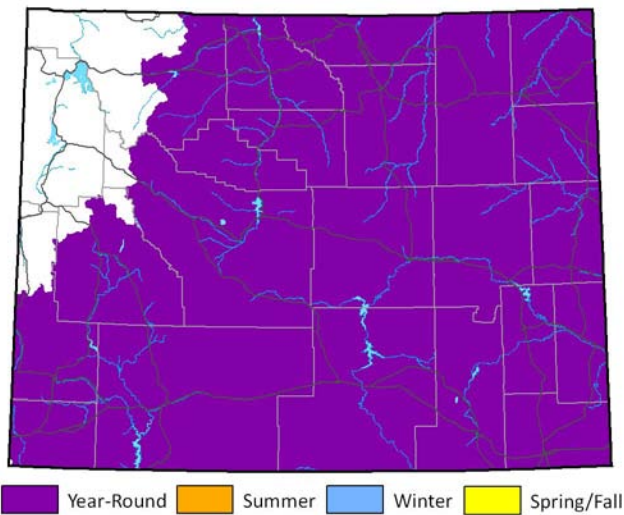
Range Map - Occupancy



Range Notes

- Version: 2010-01-19
- Proportion of range deemed known based on documented occurrences: 0.235
- Details of range map creation noted in Keinath et al. (2010a).

Range Map - Seasonality



Maps, models and report were created by and are available from the Wyoming Natural Diversity Database. (<http://uwadmnweb.uwyo.edu/wyndd/>).

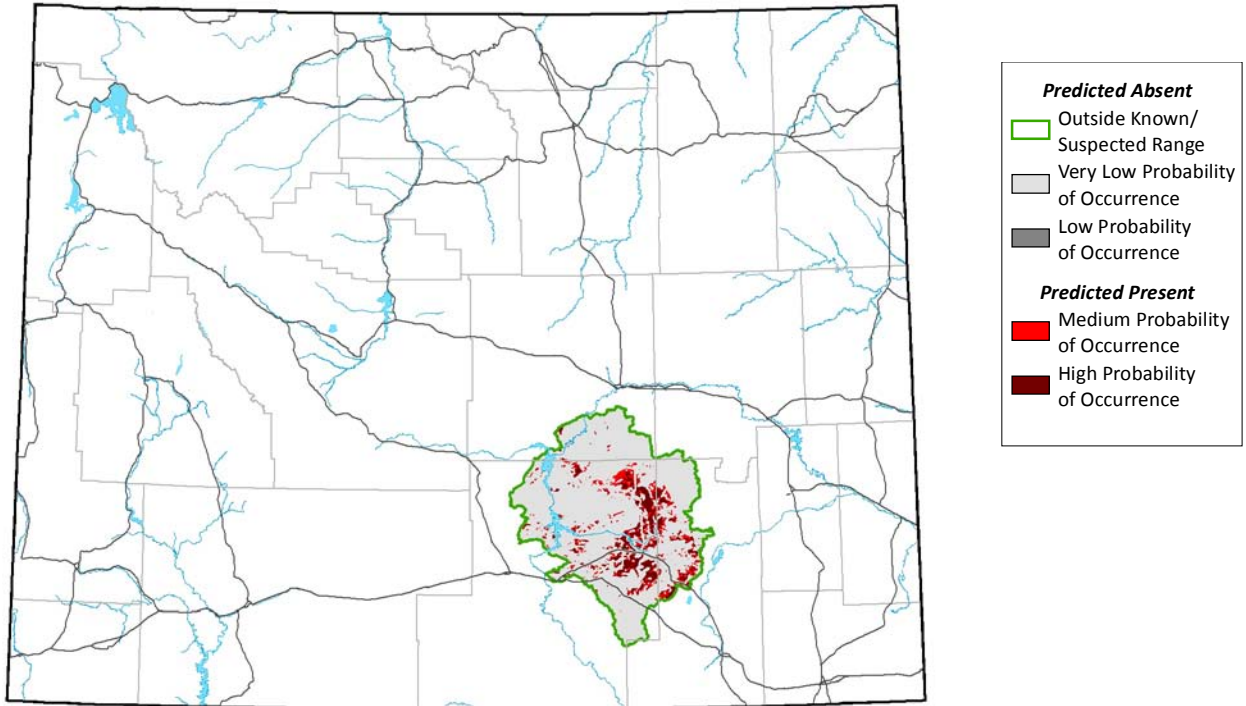
Doug Keinath, Senior Zoologist

Mark Andersen, GIS Specialist

© 2010, WYNDD

Distribution Model (Version: Thu Apr 22 09:01:18 MDT 2010)

Details of distribution model creation are presented in Keinath et al. (2010b)



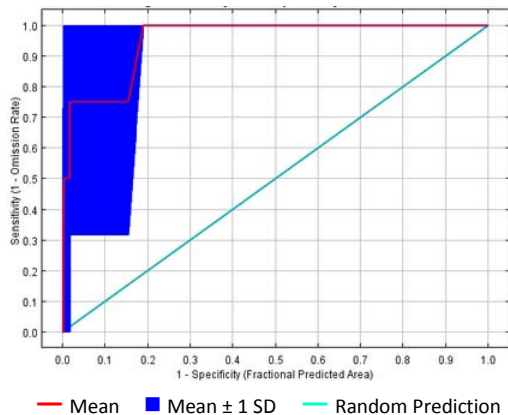
Model Parameters

- Season Modeled: Year-Round
- Algorithm: Maxent version 3.3.1
- Feature Types: Linear
- Binary Threshold Rule: Maximum training sensitivity plus specificity
- Binary Threshold Value: 0.5248430
- High-Probability Threshold Value: 0.6722456
- Low-Probability Threshold Value: 0.5248430

Model Quality Summary

Overall Assessment of Model Quality: LOW
 Expert Assessment: Low
 Occurrence Sample Size: Very Low
 Quality of Occurrences: Low
 Positive Success Rate: Low
 Test AUC and Model Gain: Low

Model Evaluation - ROC Plot



Model Evaluation Statistics

Final Model Statistics

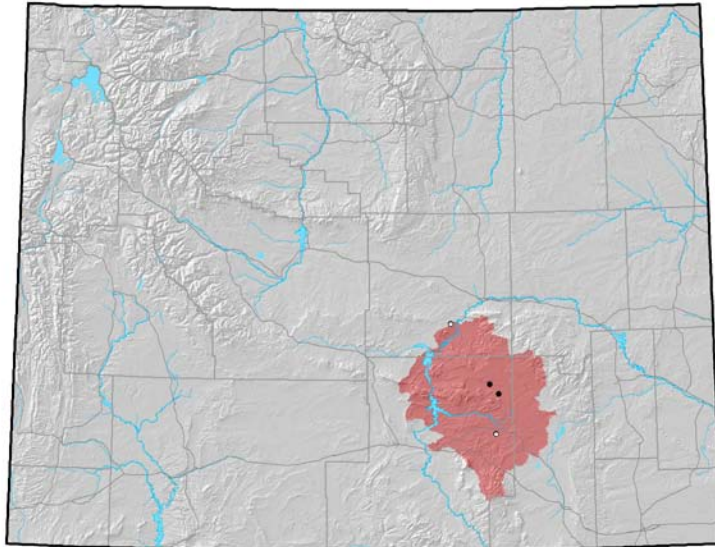
Training AUC: 0.996
 Regularized Training Gain: 3.470

Cross-Validation Statistics

- Average Test AUC: 0.380 ± 0.494
- Upper Bound on Test AUC: 0.986
- Average Test Gain: 0.562 ± 2.858
- Omission Error (fraction of test points omitted during 4-fold cross validation): 0.50 ± 0.58

Occurrence Data for Distribution Model

Occurrence Map



Points Used in Modeling, by Year of Observation

- Pre-1985
- 1985 or Later

Known and Suspected Range

Occurrence Summary Statistics

- Number of Occurrences in AWVED master dataset: 267
- Number of Occurrences used to create distribution model: 4
- Average Point Quality Index (highest quality is 12.00): 5.25 ± 2.50
- Most recent occurrence used: 2003
- Oldest occurrence used: 1982
- Occurrence File:
LOCAL_SAMPLE_POINTS_W_PDOG_2.csv

Comments

The model for this species is based on a small sample size of occurrence locations, which often results in low model quality. Collection of additional, high-quality occurrence locations could greatly improve the modeled distribution for this species.

References

- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010a. Range maps for Wyoming's species of greatest conservation need. Report prepared for the Wyoming Game and Fish Department by the Wyoming Natural Diversity Database, Laramie, Wyoming. January 19, 2010.
- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010b. Range and modeled distribution of Wyoming's species of greatest conservation need. Report prepared by the Wyoming Natural Diversity Database, Laramie Wyoming for the Wyoming Game and Fish Department, Cheyenne, Wyoming and the U.S. Geological Survey, Fort Collins, Colorado. August 20, 2010.

Predictor Variables used in the Distribution Model

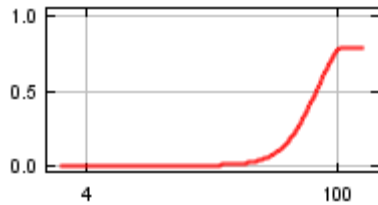
Percent Contribution (PC) to final model

<i>Environmental Variable</i>	<i>PC</i>
Contagion Index	52
Coldest month mean minimum temperature	23
Depth to Shallowest Restrictive Layer	17
Herbaceous Cover Index	5
Relative Humidity of most humid month	3
Percent Forest Cover	0

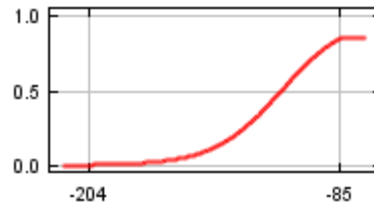
Response Curves

Each curve shows dependence of predicted suitability on input values of a single predictor variable considering correlations with others. Suitability is on the vertical axis (units: probability). Variable values are on the horizontal axis (units based on inputs; see Keinath et al 2010b for details).

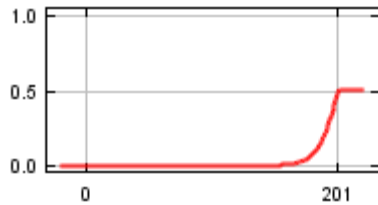
Contagion Index



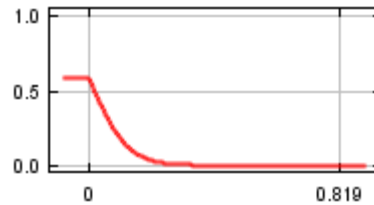
Coldest month mean minimum temperature



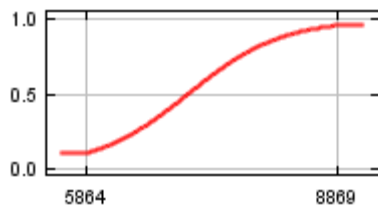
Depth to Shallowest Restrictive Layer



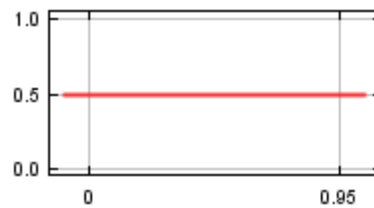
Herbaceous Cover Index



Relative Humidity of most humid month



Percent Forest Cover

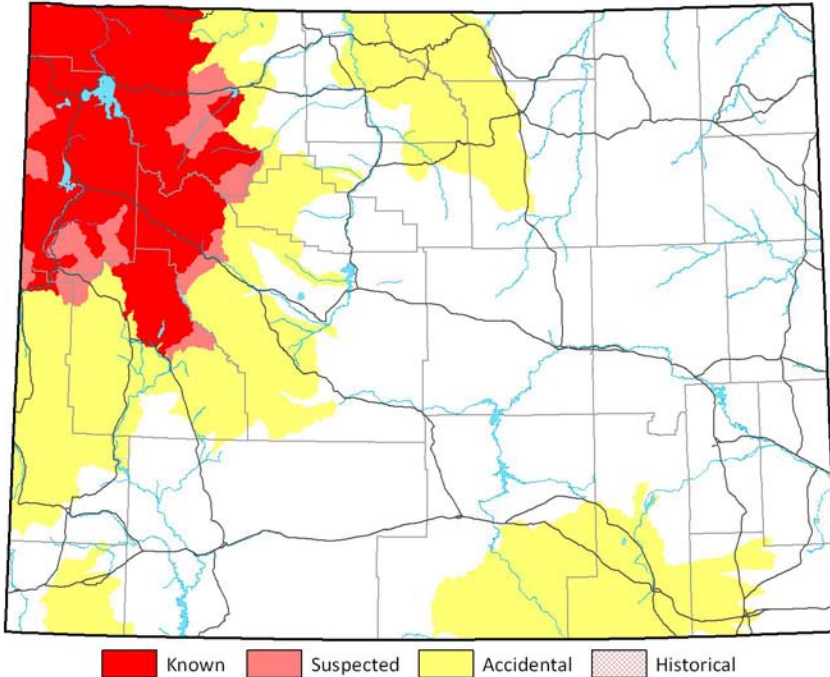


Wolverine (*Gulo gulo*) Range Map and Distribution Model Summary

August 20, 2010

This report presents range and distribution of Wolverine (AMAJF03010) in Wyoming (see Keinath et al. 2010b). Similar reports were developed by the Wyoming Natural Diversity Database for terrestrial vertebrate species of conservation need in Wyoming's State Wildlife Action Plan. This effort was supported by the Wyoming Game and Fish Department and the U.S. Geological Survey.

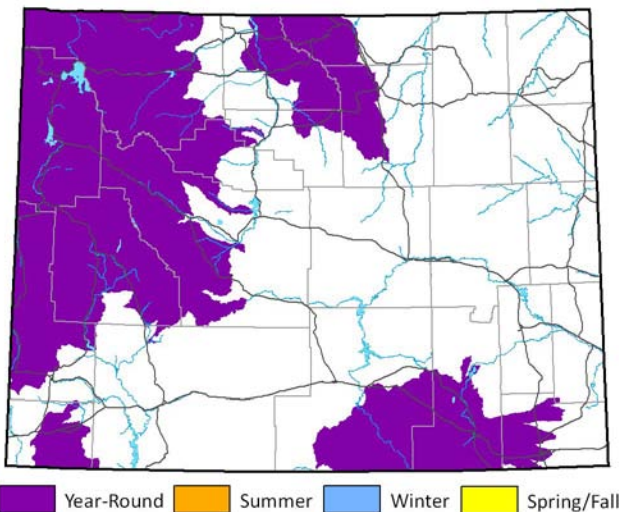
Range Map - Occupancy



Range Notes

- Version: 2010-01-19
- Proportion of range deemed known based on documented occurrences: 0.717
- Details of range map creation noted in Keinath et al. (2010a).

Range Map - Seasonality



Maps, models and report were created by and are available from the Wyoming Natural Diversity Database. (<http://uwadmnweb.uwyo.edu/wyndd/>).

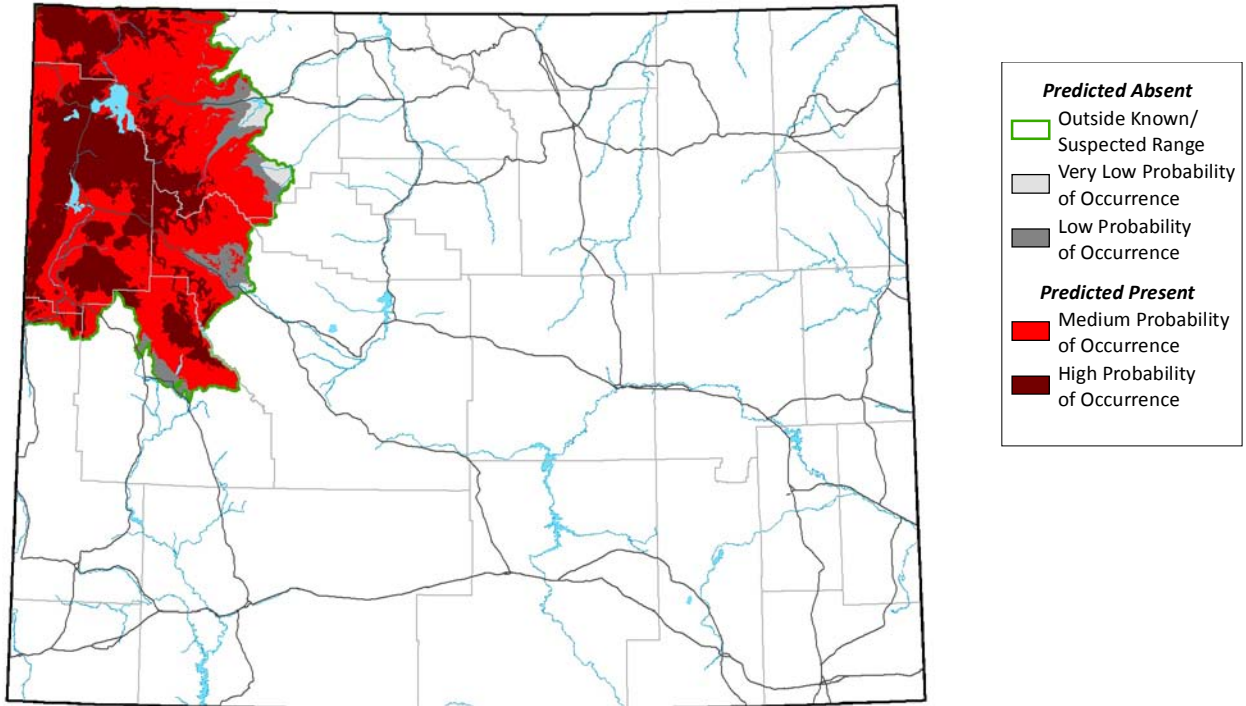
Doug Keinath, Senior Zoologist

Mark Andersen, GIS Specialist

© 2010, WYNDD

Distribution Model (Version: Mon Dec 21 19:42:12 MST 2009)

Details of distribution model creation are presented in Keinath et al. (2010b)



Model Parameters

- Season Modeled: Year-Round
- Algorithm: Maxent version 3.3.1
- Feature Types: Linear, Product, Quadratic, Hinge, Threshold
- Binary Threshold Rule: Maximum training sensitivity plus specificity
- Binary Threshold Value: 0.1557010
- High-Probability Threshold Value: 0.6039294
- Low-Probability Threshold Value: 0.0157852

Model Quality Summary

Overall Assessment of Model Quality: HIGH

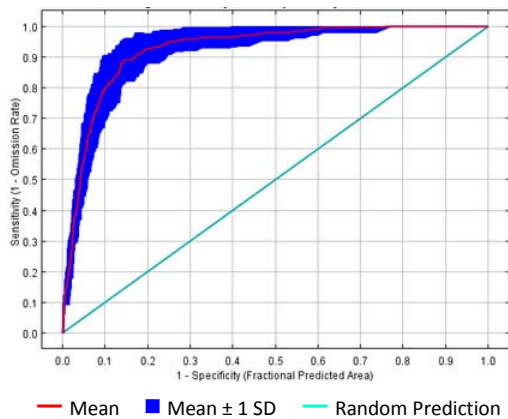
- Expert Assessment: High
- Occurrence Sample Size: High
- Quality of Occurrences: Medium
- Positive Success Rate: High
- Test AUC and Model Gain: High

Model Evaluation Statistics

Final Model Statistics

- Training AUC: 0.938
- Regularized Training Gain: 1.695

Model Evaluation - ROC Plot

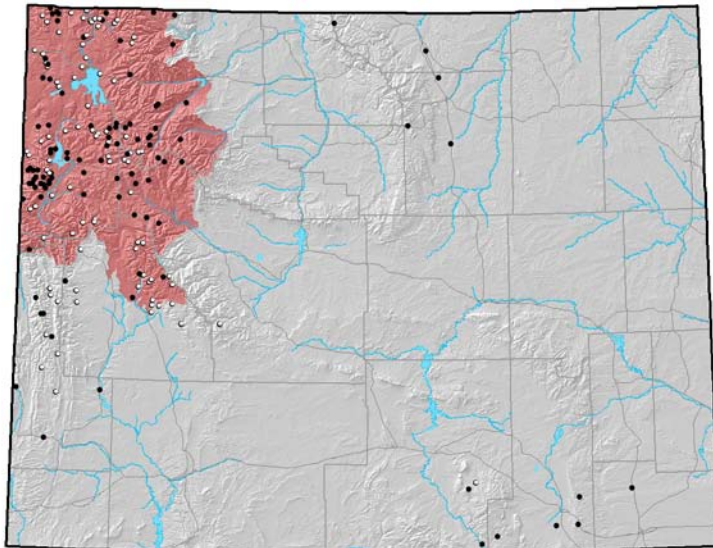


Cross-Validation Statistics

- Average Test AUC: 0.924 ± 0.026
- Upper Bound on Test AUC: 0.924
- Average Test Gain: 1.629 ± 0.324
- Omission Error (fraction of test points omitted during 10-fold cross validation): 0.12 ± 0.08

Occurrence Data for Distribution Model

Occurrence Map



Points Used in Modeling, by Year of Observation

- Pre-1985
- 1985 or Later

Known and Suspected Range

Occurrence Summary Statistics

- Number of Occurrences in AWVED master dataset: 285
- Number of Occurrences used to create distribution model: 192
- Average Point Quality Index (highest quality is 12.00): 6.16 ± 2.50
- Most recent occurrence used: 2008
- Oldest occurrence used: 1955
- Occurrence File:
LARGE_AREA_SAMPLE_POINTS_ALL.CSV

Comments

Due to timing of range map edits, the distribution model for wolverine was created before final edits were made to the range map. As a result, several datapoints used in the model fall outside the accepted range of the species. These occurrences are generally valid observations of dispersing individuals deemed accidental (i.e., not resident). Although they are unlikely to substantially change model output, they should be removed from future distribution models.

References

- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010a. Range maps for Wyoming's species of greatest conservation need. Report prepared for the Wyoming Game and Fish Department by the Wyoming Natural Diversity Database, Laramie, Wyoming. January 19, 2010.
- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010b. Range and modeled distribution of Wyoming's species of greatest conservation need. Report prepared by the Wyoming Natural Diversity Database, Laramie Wyoming for the Wyoming Game and Fish Department, Cheyenne, Wyoming and the U.S. Geological Survey, Fort Collins, Colorado. August 20, 2010.

Predictor Variables used in the Distribution Model

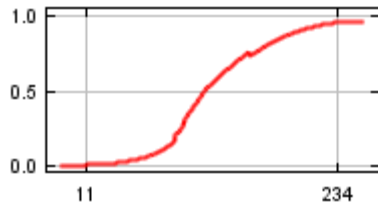
Percent Contribution (PC) to final model

<i>Environmental Variable</i>	<i>PC</i>
Precipitation of the driest quarter	37
Annual number of Frost Days	23
Annual mean relative humidity	17
Precipitation of the driest month	15
Radiation of the lightest month	5
Hottest month mean maximum temperature	4

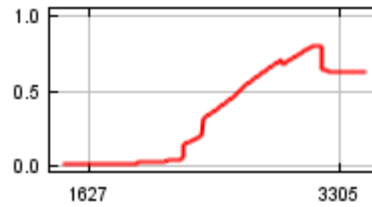
Response Curves

Each curve shows dependence of predicted suitability on input values of a single predictor variable considering correlations with others. Suitability is on the vertical axis (units: probability). Variable values are on the horizontal axis (units based on inputs; see Keinath et al 2010b for details).

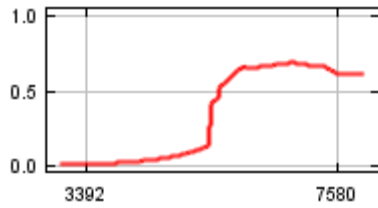
Precipitation of the driest quarter



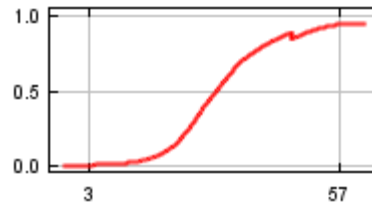
Annual number of Frost Days



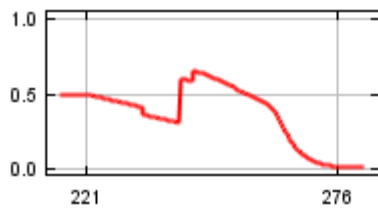
Annual mean relative humidity



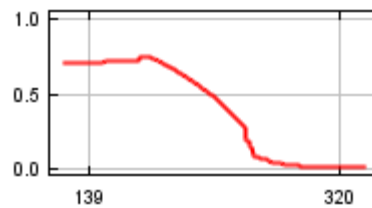
Precipitation of the driest month



Radiation of the lightest month



Hottest month mean maximum temperature

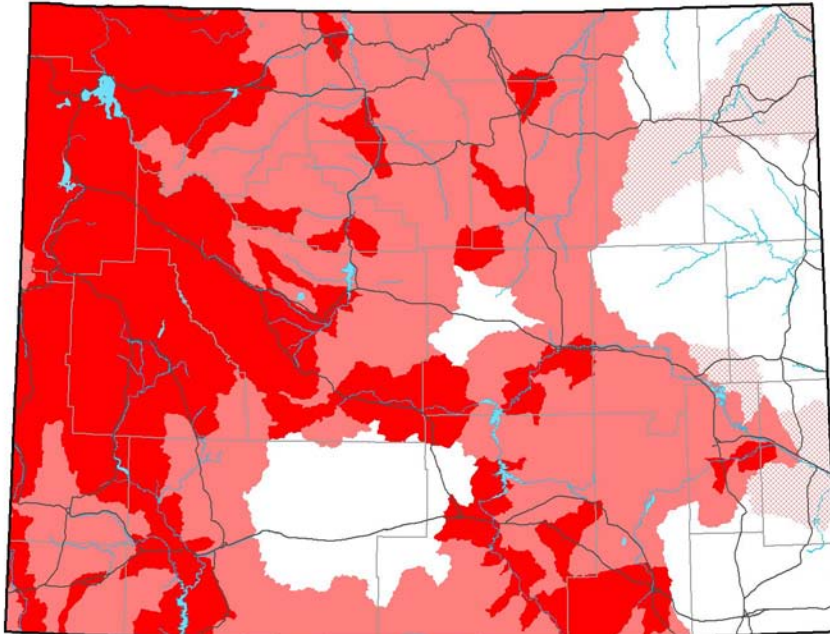


River Otter (*Lontra canadensis*) Range Map and Distribution Model Summary

August 20, 2010

This report presents range and distribution of River Otter (AMAJF10010) in Wyoming (see Keinath et al. 2010b). Similar reports were developed by the Wyoming Natural Diversity Database for terrestrial vertebrate species of conservation need in Wyoming's State Wildlife Action Plan. This effort was supported by the Wyoming Game and Fish Department and the U.S. Geological Survey.

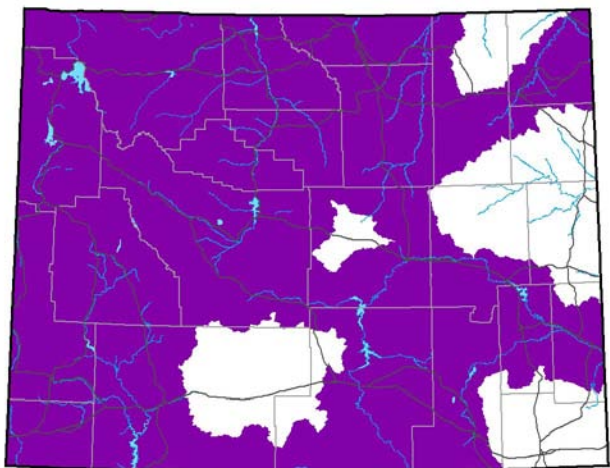
Range Map - Occupancy



Range Notes

- Version: 2010-01-19
- Proportion of range deemed known based on documented occurrences: 0.419
- Details of range map creation noted in Keinath et al. (2010a).

Range Map - Seasonality



Maps, models and report were created by and are available from the Wyoming Natural Diversity Database. (<http://uwadmnweb.uwyo.edu/wyndd/>).

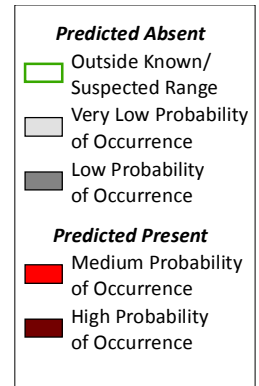
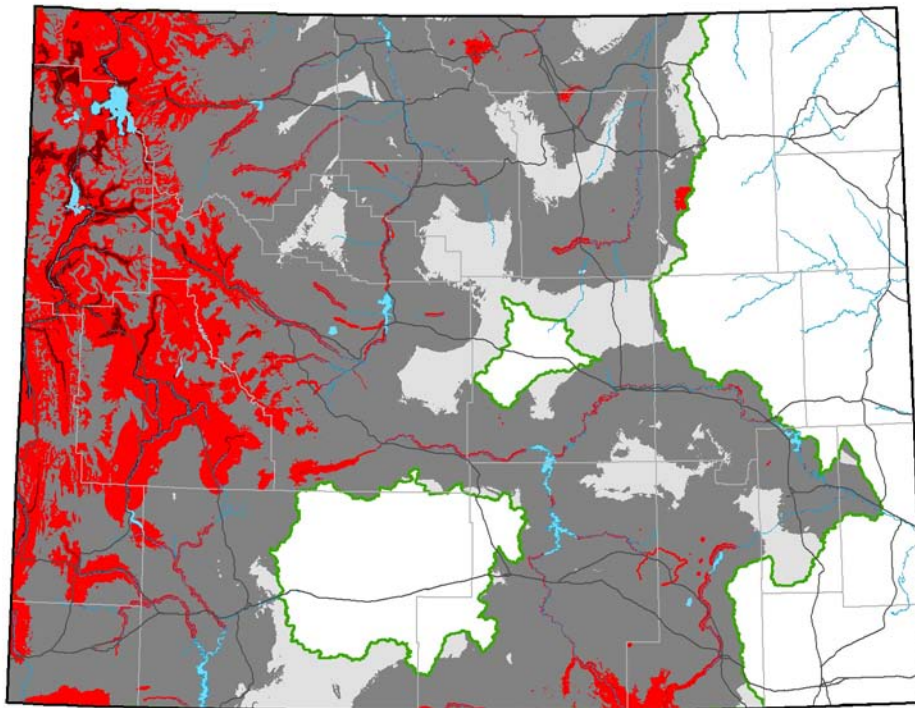
Doug Keinath, Senior Zoologist

Mark Andersen, GIS Specialist

© 2010, WYNDD

Distribution Model (Version: Tue Apr 13 11:20:21 MDT 2010)

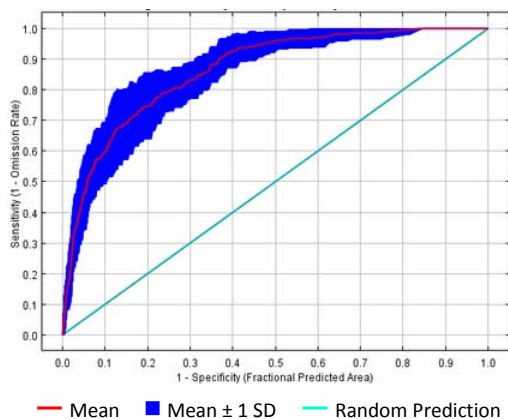
Details of distribution model creation are presented in Keinath et al. (2010b)



Model Parameters

- Season Modeled: Year-Round
- Algorithm: Maxent version 3.3.1
- Feature Types: Linear, Product, Quadratic, Hinge, Threshold
- Binary Threshold Rule: Maximum training sensitivity plus specificity
- Binary Threshold Value: 0.2452870
- High-Probability Threshold Value: 0.5942773
- Low-Probability Threshold Value: 0.0114295

Model Evaluation - ROC Plot



Model Quality Summary

Overall Assessment of Model Quality:

MEDIUM

- Expert Assessment: Medium
- Occurrence Sample Size: High
- Quality of Occurrences: Medium
- Positive Success Rate: Medium
- Test AUC and Model Gain: Medium

Model Evaluation Statistics

Final Model Statistics

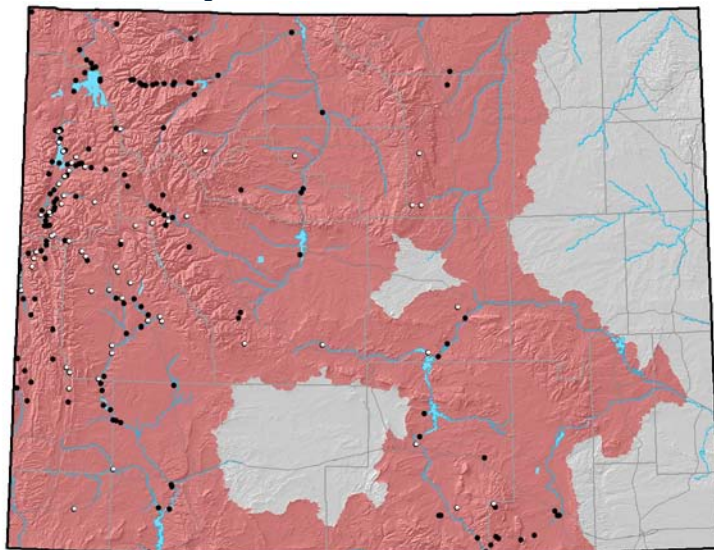
- Training AUC: 0.893
- Regularized Training Gain: 1.175

Cross-Validation Statistics

- Average Test AUC: 0.864 ± 0.037
- Upper Bound on Test AUC: 0.873
- Average Test Gain: 1.063 ± 0.341
- Omission Error (fraction of test points omitted during 10-fold cross validation): 0.24 ± 0.09

Occurrence Data for Distribution Model

Occurrence Map



Points Used in Modeling, by Year of Observation

- Pre-1985
- 1985 or Later

Known and Suspected Range

Occurrence Summary Statistics

- Number of Occurrences in AWVED master dataset: 384
- Number of Occurrences used to create distribution model: 202
- Average Point Quality Index (highest quality is 12.00): 6.46 ± 2.50
- Most recent occurrence used: 2008
- Oldest occurrence used: 1955
- Occurrence File:
DRAFT_3_SAGE_WATER_RERUNS.csv

Comments

The river otter is obligate to aquatic habitat and nearby shorelines, so only rivers within the modeled distribution should be deemed suitable for habitation. This species uses aspects of wetlands (e.g., dense emergent vegetation) for which statewide data are not available or reliable. This often results in low model quality because key habitat features are not mappable across the state. Great improvements in our ability to model this species distribution could be obtained by improving wetland maps.

References

- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010a. Range maps for Wyoming's species of greatest conservation need. Report prepared for the Wyoming Game and Fish Department by the Wyoming Natural Diversity Database, Laramie, Wyoming. January 19, 2010.
- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010b. Range and modeled distribution of Wyoming's species of greatest conservation need. Report prepared by the Wyoming Natural Diversity Database, Laramie Wyoming for the Wyoming Game and Fish Department, Cheyenne, Wyoming and the U.S. Geological Survey, Fort Collins, Colorado. August 20, 2010.

Predictor Variables used in the Distribution Model

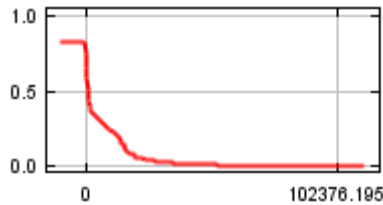
Percent Contribution (PC) to final model

<i>Environmental Variable</i>	<i>PC</i>
Distance to Permanent Flowing Water	61
Annual number of Frost Days	15
Warmest quarter mean temperature	14
Wettest quarter mean temperature	4
Elevation	3
Interannual variation in annual frost days	2

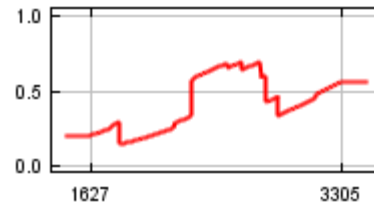
Response Curves

Each curve shows dependence of predicted suitability on input values of a single predictor variable considering correlations with others. Suitability is on the vertical axis (units: probability). Variable values are on the horizontal axis (units based on inputs; see Keinath et al 2010b for details).

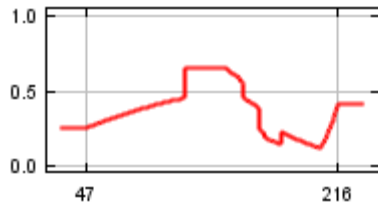
Distance to Permanent Flowing Water



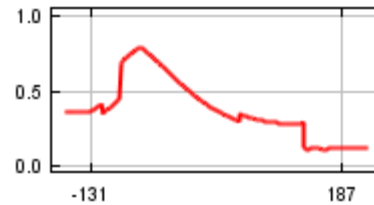
Annual number of Frost Days



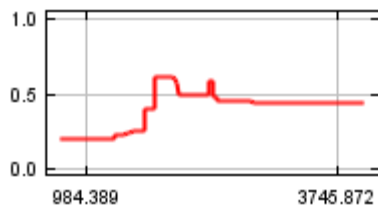
Warmest quarter mean temperature



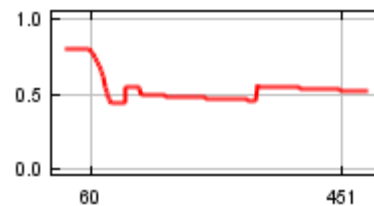
Wettest quarter mean temperature



Elevation



Interannual variation in annual frost days

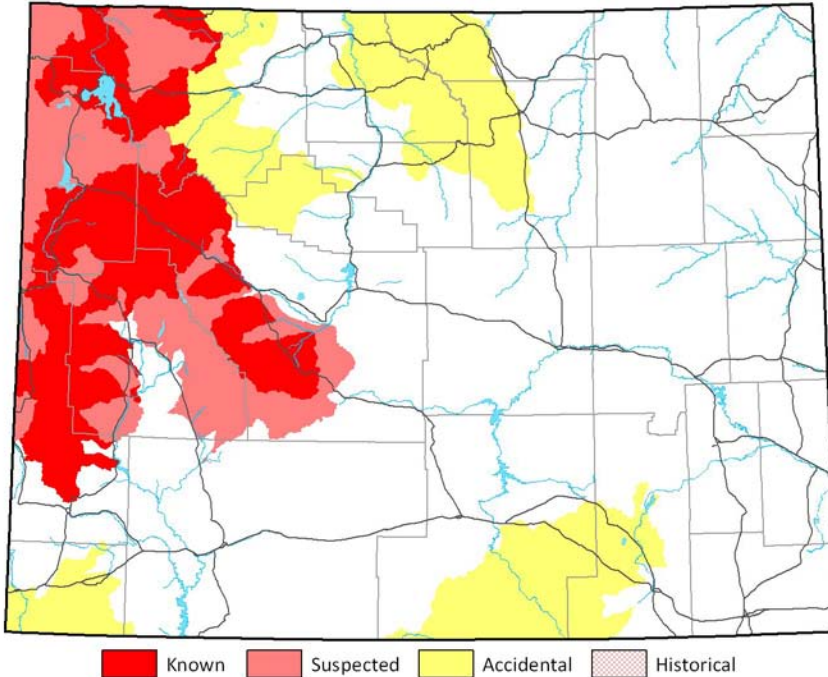


Canada Lynx (*Lynx canadensis*) Range Map and Distribution Model Summary

August 20, 2010

This report presents range and distribution of Canada Lynx (AMAJH03010) in Wyoming (see Keinath et al. 2010b). Similar reports were developed by the Wyoming Natural Diversity Database for terrestrial vertebrate species of conservation need in Wyoming's State Wildlife Action Plan. This effort was supported by the Wyoming Game and Fish Department and the U.S. Geological Survey.

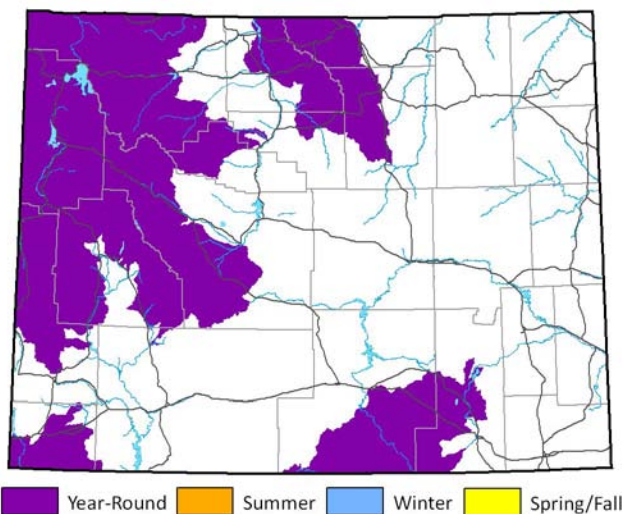
Range Map - Occupancy



Range Notes

- Version: 2010-01-19
- Proportion of range deemed known based on documented occurrences: 0.429
- Details of range map creation noted in Keinath et al. (2010a).

Range Map - Seasonality



Maps, models and report were created by and are available from the Wyoming Natural Diversity Database. (<http://uwadmnweb.uwyo.edu/wyndd/>).

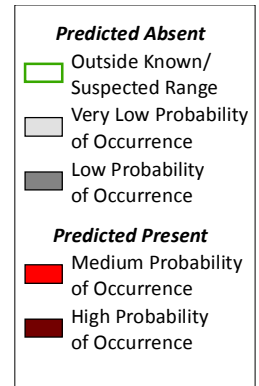
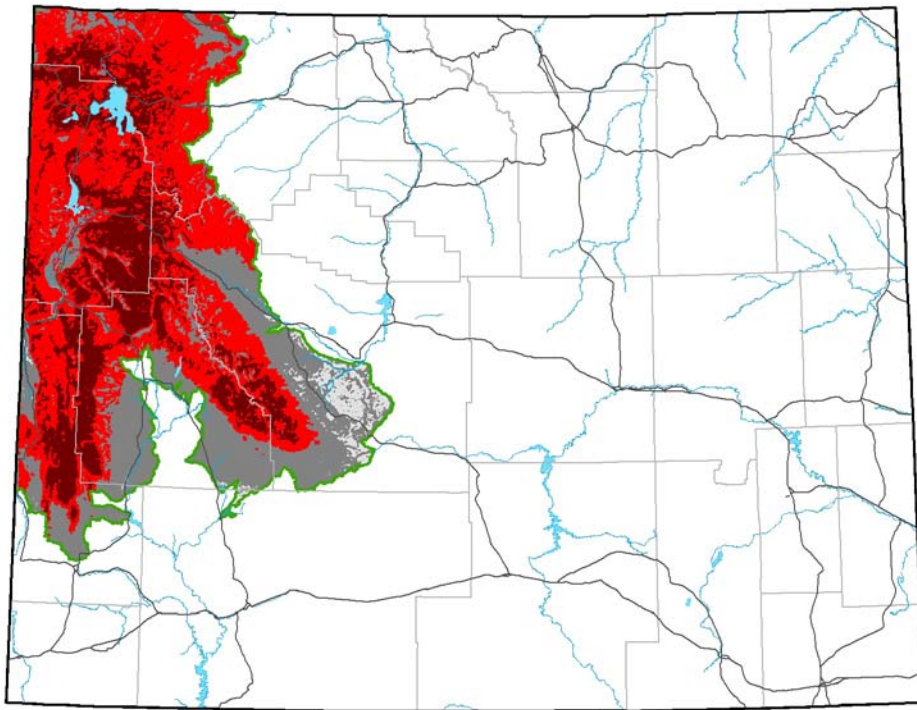
Doug Keinath, Senior Zoologist

Mark Andersen, GIS Specialist

© 2010, WYNDD

Distribution Model (Version: Mon Jan 04 08:21:24 MST 2010)

Details of distribution model creation are presented in Keinath et al. (2010b)



Model Parameters

- Season Modeled: Year-Round
- Algorithm: Maxent version 3.3.1
- Feature Types: Linear, Product, Quadratic, Hinge, Threshold
- Binary Threshold Rule: Maximum training sensitivity plus specificity
- Binary Threshold Value: 0.2038230
- High-Probability Threshold Value: 0.6015182
- Low-Probability Threshold Value: 0.0027083

Model Quality Summary

Overall Assessment of Model Quality: HIGH

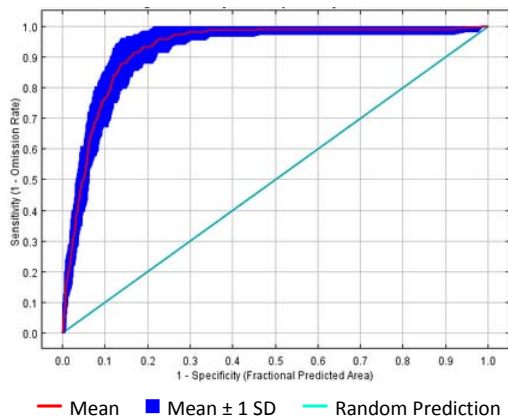
- Expert Assessment: High
- Occurrence Sample Size: High
- Quality of Occurrences: Medium
- Positive Success Rate: High
- Test AUC and Model Gain: High

Model Evaluation Statistics

Final Model Statistics

- Training AUC: 0.938
- Regularized Training Gain: 1.698

Model Evaluation - ROC Plot

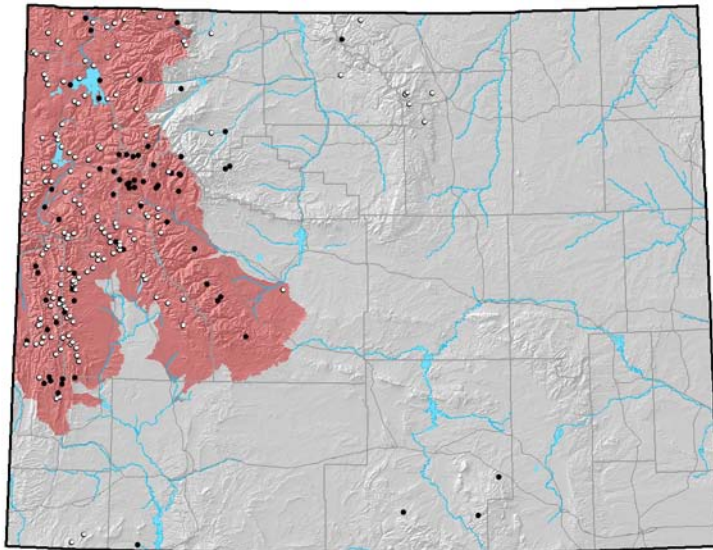


Cross-Validation Statistics

- Average Test AUC: 0.925 ± 0.029
- Upper Bound on Test AUC: 0.930
- Average Test Gain: 1.616 ± 0.364
- Omission Error (fraction of test points omitted during 10-fold cross validation): 0.10 ± 0.09

Occurrence Data for Distribution Model

Occurrence Map



Points Used in Modeling, by Year of Observation

- Pre-1985
- 1985 or Later

Known and Suspected Range

Occurrence Summary Statistics

- Number of Occurrences in AWVED master dataset: 334
- Number of Occurrences used to create distribution model: 232
- Average Point Quality Index (highest quality is 12.00): 5.84 ± 1.54
- Most recent occurrence used: 2006
- Oldest occurrence used: 1856
- Occurrence File:
LARGE_AREA_SAMPLE_POINTS_ALL.CSV

Comments

Due to timing of range map edits, the distribution model for lynx was created before final edits were made to the range map. As a result, several datapoints used in the model fall outside the accepted range of the species. These occurrences are generally valid observations of dispersing individuals deemed accidental (i.e., not resident). Although they are unlikely to substantially change model output, they should be removed from future distribution models.

References

- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010a. Range maps for Wyoming's species of greatest conservation need. Report prepared for the Wyoming Game and Fish Department by the Wyoming Natural Diversity Database, Laramie, Wyoming. January 19, 2010.
- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010b. Range and modeled distribution of Wyoming's species of greatest conservation need. Report prepared by the Wyoming Natural Diversity Database, Laramie Wyoming for the Wyoming Game and Fish Department, Cheyenne, Wyoming and the U.S. Geological Survey, Fort Collins, Colorado. August 20, 2010.

Predictor Variables used in the Distribution Model

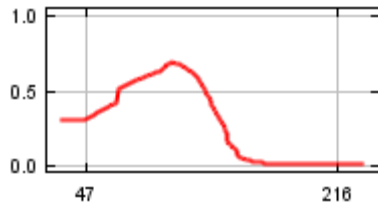
Percent Contribution (PC) to final model

<i>Environmental Variable</i>	<i>PC</i>
Warmest quarter mean temperature	32
Wettest quarter mean temperature	26
Conifer Index	21
Hottest month mean maximum temperature	12
Forest Cover Index	5
Annual Relative Humidity Range	4

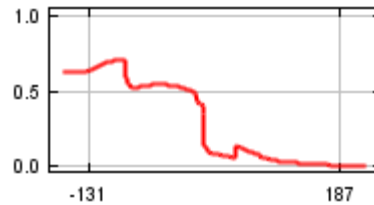
Response Curves

Each curve shows dependence of predicted suitability on input values of a single predictor variable considering correlations with others. Suitability is on the vertical axis (units: probability). Variable values are on the horizontal axis (units based on inputs; see Keinath et al 2010b for details).

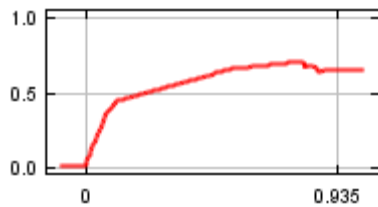
Warmest quarter mean temperature



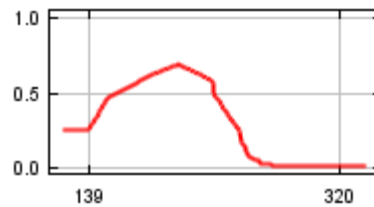
Wettest quarter mean temperature



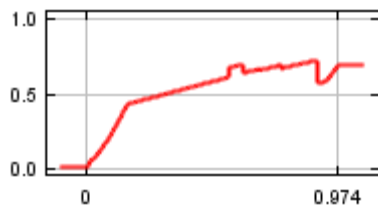
Conifer Index



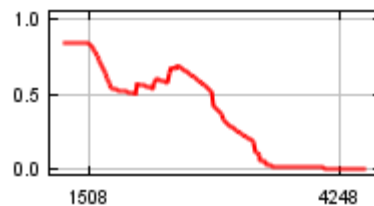
Hottest month mean maximum temperature



Forest Cover Index



Annual Relative Humidity Range



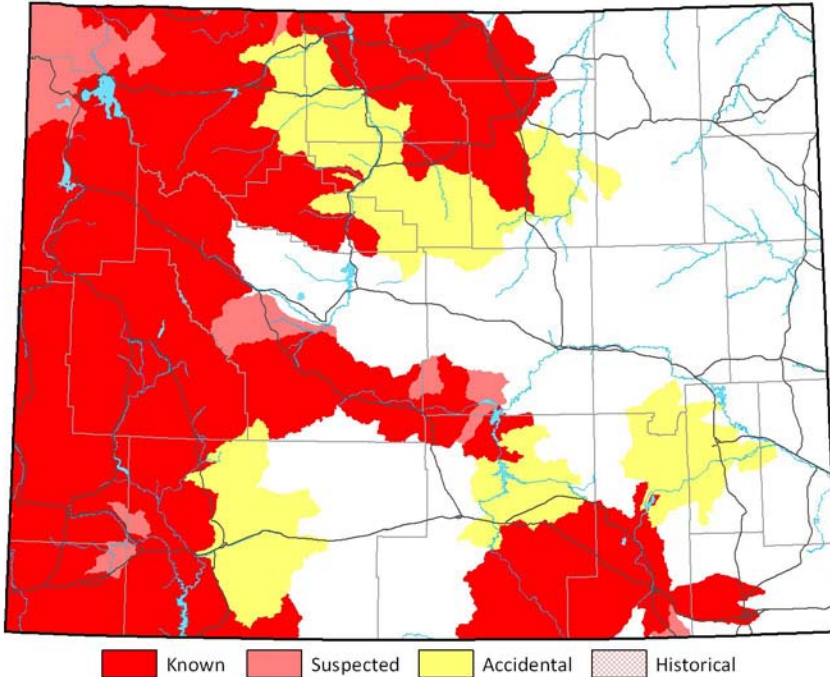
Moose (*Alces alces*)

Range Map and Distribution Model Summary

August 20, 2010

This report presents range and distribution of Moose (AMALC03010) in Wyoming (see Keinath et al. 2010b). Similar reports were developed by the Wyoming Natural Diversity Database for terrestrial vertebrate species of conservation need in Wyoming's State Wildlife Action Plan. This effort was supported by the Wyoming Game and Fish Department and the U.S. Geological Survey.

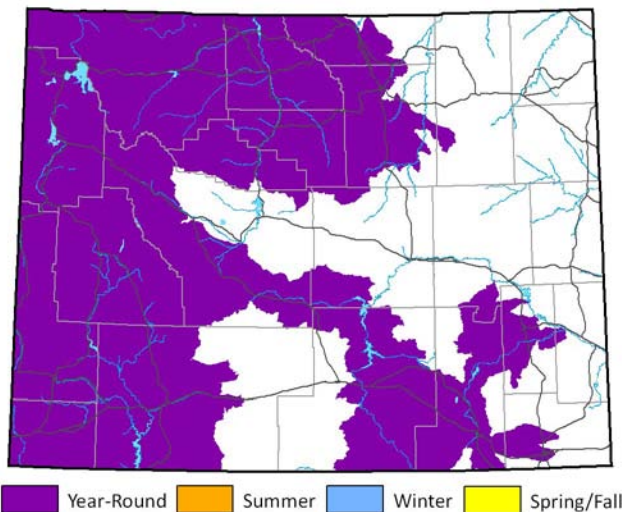
Range Map - Occupancy



Range Notes

- Version: 2010-01-19
- Proportion of range deemed known based on documented occurrences: 0.866
- Details of range map creation noted in Keinath et al. (2010a).

Range Map - Seasonality



Maps, models and report were created by and are available from the Wyoming Natural Diversity Database. (<http://uwadmnweb.uwyo.edu/wyndd/>).

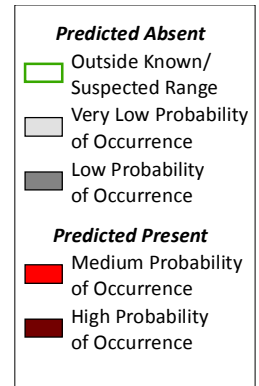
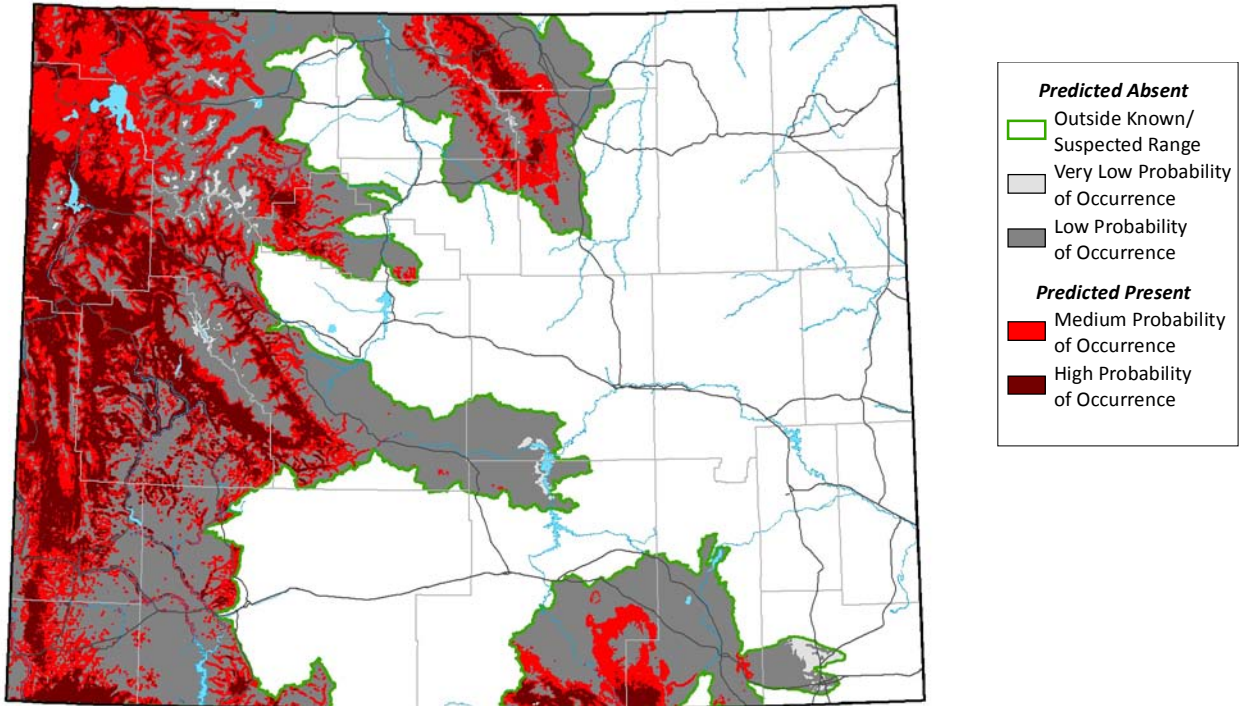
Doug Keinath, Senior Zoologist

Mark Andersen, GIS Specialist

© 2010, WYNDD

Distribution Model (Version: Sat Jan 23 16:40:30 MST 2010)

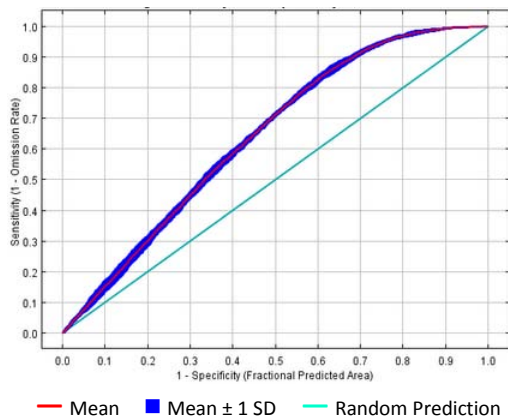
Details of distribution model creation are presented in Keinath et al. (2010b)



Model Parameters

- Season Modeled: Year-Round
- Algorithm: Maxent version 3.3.1
- Feature Types: Linear, Product, Quadratic, Hinge, Threshold
- Binary Threshold Rule: Maximum training sensitivity plus specificity
- Binary Threshold Value: 0.4356090
- High-Probability Threshold Value: 0.5324868
- Low-Probability Threshold Value: 0.0551209

Model Evaluation - ROC Plot



Model Quality Summary

Overall Assessment of Model Quality:

MEDIUM

- Expert Assessment: High
- Occurrence Sample Size: High
- Quality of Occurrences: Medium
- Positive Success Rate: High
- Test AUC and Model Gain: Low

Model Evaluation Statistics

Final Model Statistics

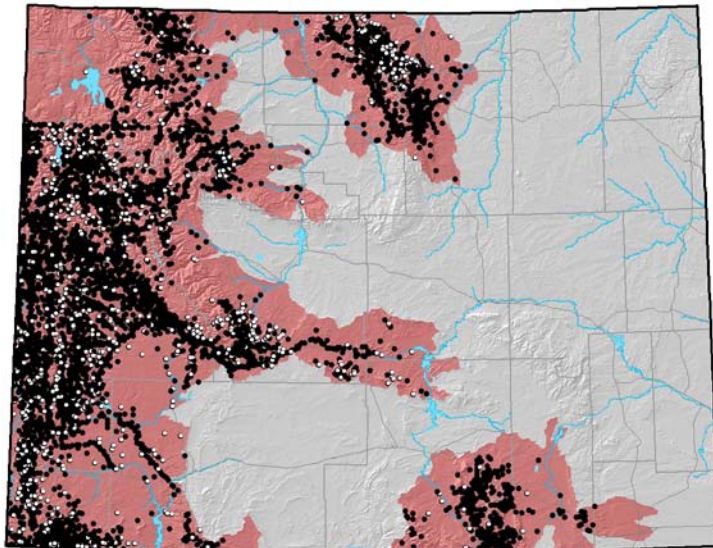
- Training AUC: 0.650
- Regularized Training Gain: 0.169

Cross-Validation Statistics

- Average Test AUC: 0.641 ± 0.007
- Upper Bound on Test AUC: 0.653
- Average Test Gain: 0.163 ± 0.011
- Omission Error (fraction of test points omitted during 10-fold cross validation): 0.18 ± 0.02

Occurrence Data for Distribution Model

Occurrence Map



Points Used in Modeling, by Year of Observation

- Pre-1985
- 1985 or Later

Known and Suspected Range

Occurrence Summary Statistics

- Number of Occurrences in AWVED master dataset: 54,063
- Number of Occurrences used to create distribution model: 4,930
- Average Point Quality Index (highest quality is 12.00): 6.73 ± 1.44
- Most recent occurrence used: 2007
- Oldest occurrence used: 1971
- Occurrence File:
GAME_SAMPLE_POINTS_ALL.csv

Comments

There are no additional comments specific to this species range map or distribution model.

References

- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010a. Range maps for Wyoming's species of greatest conservation need. Report prepared for the Wyoming Game and Fish Department by the Wyoming Natural Diversity Database, Laramie, Wyoming. January 19, 2010.
- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010b. Range and modeled distribution of Wyoming's species of greatest conservation need. Report prepared by the Wyoming Natural Diversity Database, Laramie Wyoming for the Wyoming Game and Fish Department, Cheyenne, Wyoming and the U.S. Geological Survey, Fort Collins, Colorado. August 20, 2010.

Predictor Variables used in the Distribution Model

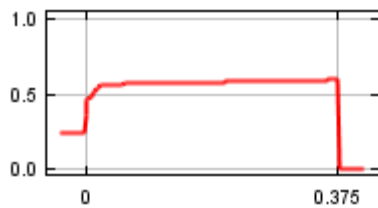
Percent Contribution (PC) to final model

<i>Environmental Variable</i>	<i>PC</i>
Deciduous Forest Index	39
Annual number of Frost Days	28
Elevation	9
Coldest month mean minimum temperature	9
Hottest month mean maximum temperature	9
Relative Humidity of most humid month	6

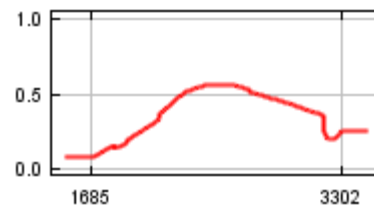
Response Curves

Each curve shows dependence of predicted suitability on input values of a single predictor variable considering correlations with others. Suitability is on the vertical axis (units: probability). Variable values are on the horizontal axis (units based on inputs; see Keinath et al 2010b for details).

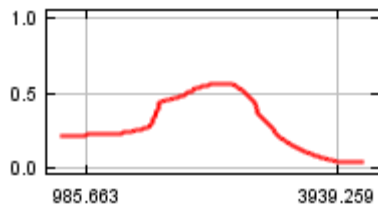
Deciduous Forest Index



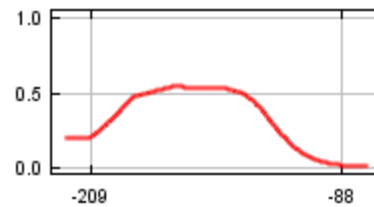
Annual number of Frost Days



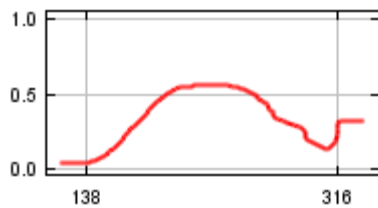
Elevation



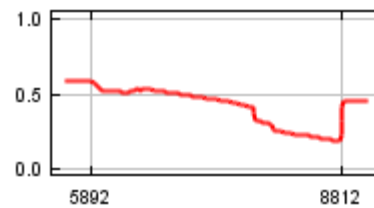
Coldest month mean minimum temperature



Hottest month mean maximum temperature



Relative Humidity of most humid month

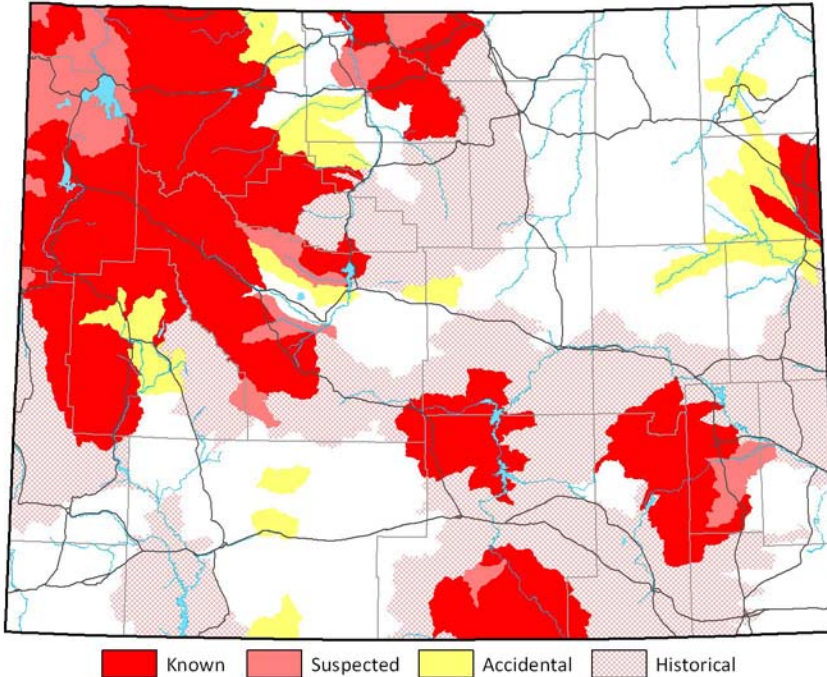


Bighorn Sheep (*Ovis canadensis*) Range Map and Distribution Model Summary

August 20, 2010

This report presents range and distribution of Bighorn Sheep (AMALE04010) in Wyoming (see Keinath et al. 2010b). Similar reports were developed by the Wyoming Natural Diversity Database for terrestrial vertebrate species of conservation need in Wyoming's State Wildlife Action Plan. This effort was supported by the Wyoming Game and Fish Department and the U.S. Geological Survey.

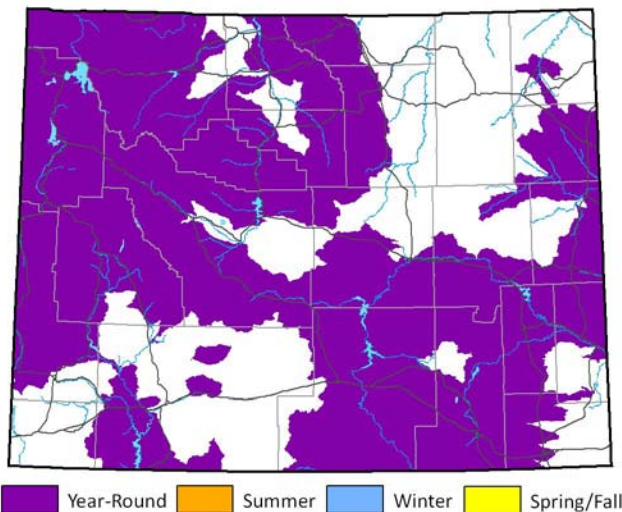
Range Map - Occupancy



Range Notes

- Version: 2010-01-19
- Proportion of range deemed known based on documented occurrences: 0.802
- Details of range map creation noted in Keinath et al. (2010a).

Range Map - Seasonality



Maps, models and report were created by and are available from the Wyoming Natural Diversity Database. (<http://uwadmnweb.uwyo.edu/wyndd/>).

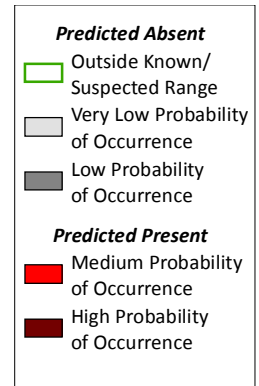
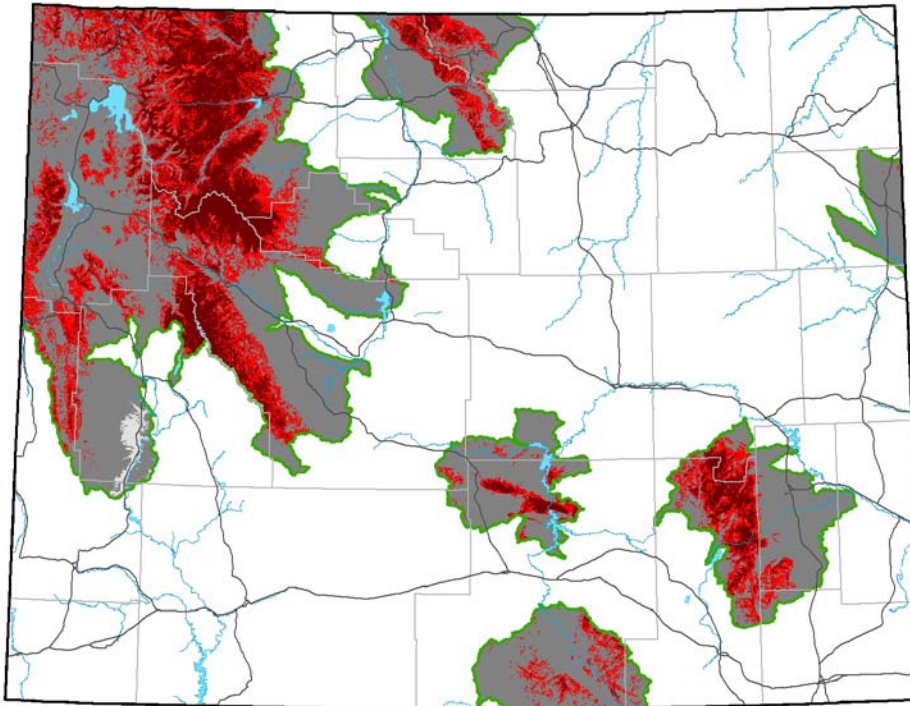
Doug Keinath, Senior Zoologist

Mark Andersen, GIS Specialist

© 2010, WYNDD

Distribution Model (Version: Sat Jan 23 16:41:33 MST 2010)

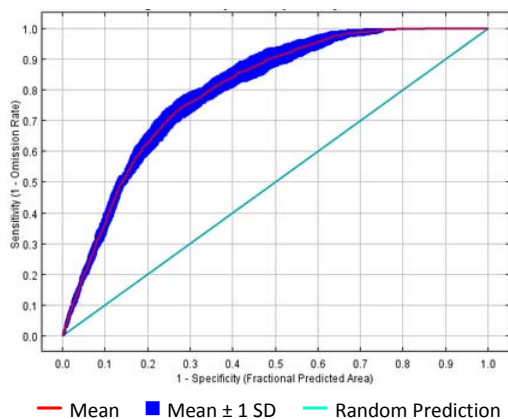
Details of distribution model creation are presented in Keinath et al. (2010b)



Model Parameters

- Season Modeled: Year-Round
- Algorithm: Maxent version 3.3.1
- Feature Types: Linear, Product, Quadratic, Hinge, Threshold
- Binary Threshold Rule: Maximum training sensitivity plus specificity
- Binary Threshold Value: 0.4062280
- High-Probability Threshold Value: 0.5544392
- Low-Probability Threshold Value: 0.0008860

Model Evaluation - ROC Plot



Model Quality Summary

Overall Assessment of Model Quality:

MEDIUM

- Expert Assessment: High
- Occurrence Sample Size: High
- Quality of Occurrences: Medium
- Positive Success Rate: Medium
- Test AUC and Model Gain: Medium

Model Evaluation Statistics

Final Model Statistics

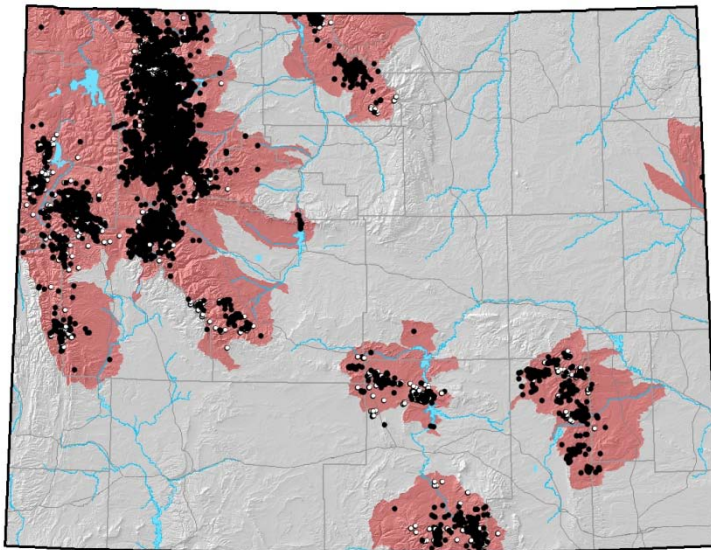
- Training AUC: 0.805
- Regularized Training Gain: 0.612

Cross-Validation Statistics

- Average Test AUC: 0.798 ± 0.018
- Upper Bound on Test AUC: 0.794
- Average Test Gain: 0.611 ± 0.078
- Omission Error (fraction of test points omitted during 10-fold cross validation): 0.24 ± 0.03

Occurrence Data for Distribution Model

Occurrence Map



Points Used in Modeling, by Year of Observation

- Pre-1985
- 1985 or Later

Known and Suspected Range

Occurrence Summary Statistics

- Number of Occurrences in AWVED master dataset: 15,996
- Number of Occurrences used to create distribution model: 1,716
- Average Point Quality Index (highest quality is 12.00): 6.76 ± 1.47
- Most recent occurrence used: 2007
- Oldest occurrence used: 1973
- Occurrence File:
GAME_SAMPLE_POINTS_ALL.csv

Comments

There are no additional comments specific to this species range map or distribution model.

References

- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010a. Range maps for Wyoming's species of greatest conservation need. Report prepared for the Wyoming Game and Fish Department by the Wyoming Natural Diversity Database, Laramie, Wyoming. January 19, 2010.
- Keinath, D.A., M.D. Andersen, and G.P. Beauvais. 2010b. Range and modeled distribution of Wyoming's species of greatest conservation need. Report prepared by the Wyoming Natural Diversity Database, Laramie Wyoming for the Wyoming Game and Fish Department, Cheyenne, Wyoming and the U.S. Geological Survey, Fort Collins, Colorado. August 20, 2010.

Predictor Variables used in the Distribution Model

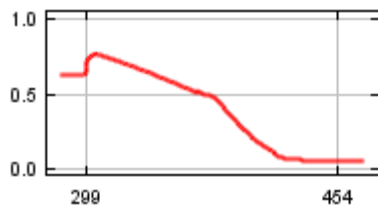
Percent Contribution (PC) to final model

<i>Environmental Variable</i>	<i>PC</i>
Annual temperature range (T3 – T4)	31
Vector Ruggedness Measure	28
Annual precipitation range (P3 – P2)	14
Depth to Shallowest Restrictive Layer	9
Radiation of the lightest month	9
Relative Humidity of most humid month	9

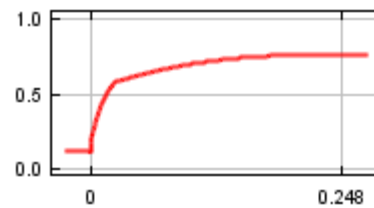
Response Curves

Each curve shows dependence of predicted suitability on input values of a single predictor variable considering correlations with others. Suitability is on the vertical axis (units: probability). Variable values are on the horizontal axis (units based on inputs; see Keinath et al 2010b for details).

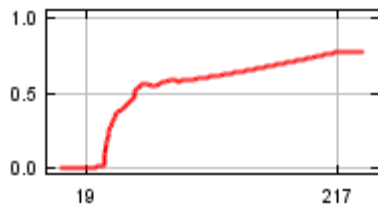
Annual temperature range (T3 – T4)



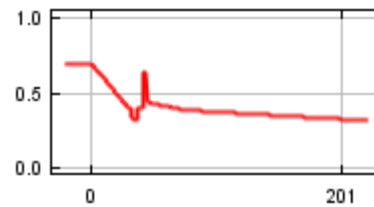
Vector Ruggedness Measure



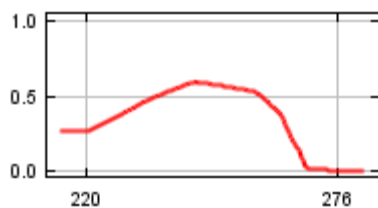
Annual precipitation range (P3 – P2)



Depth to Shallowest Restrictive Layer



Radiation of the lightest month



Relative Humidity of most humid month

