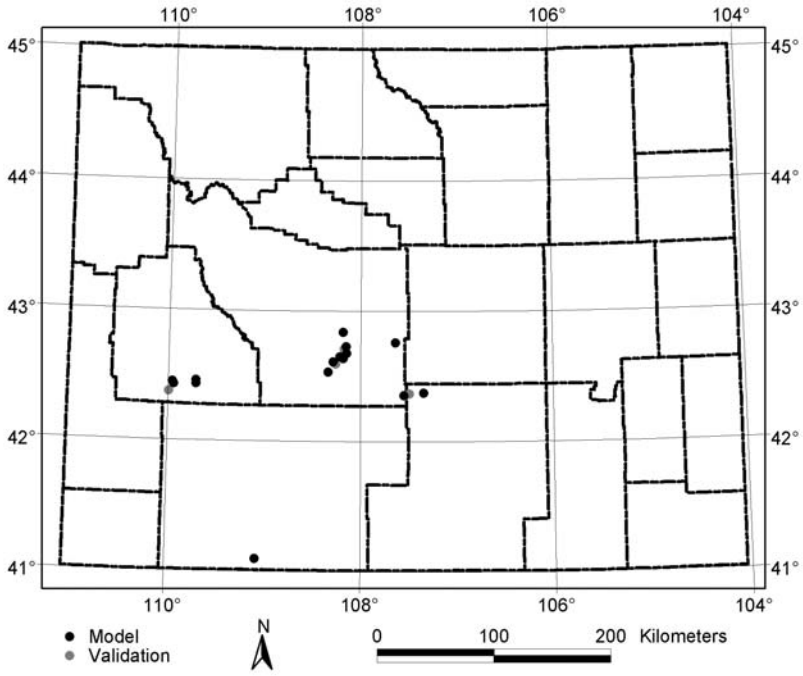
Appendix A.

Potential Distribution Models for BLM Sensitive and Listed Threatened and Endangered Vascular Plant Species in Wyoming

Appendix A contains models of the potential distribution of 44 vascular plant species in Wyoming listed as Sensitive by the BLM or Threatened or Endangered under the US Endangered Species Act. Each model consists of a two-page report that includes a summary of the datasets used to create the model, the potential distribution map, and tables of classification success and error rates for model-building and validation datasets. Other components of the reports differ according to whether the model was produced using classification tree, range/intersection, or wetland methods. Each section of the reports is briefly described and illustrated below.

Classification Tree Models
Example: *Cirsium aridum* Dorn

Known Distribution in Wyoming (below). The mapped area depicts the known range of *Cirsium aridum* within Wyoming. Black dots represent known present points used in model construction and gray dots indicate present points used for validation.



Number of Points for Modeling (below). This table includes the number of present and absent points from Wyoming used in building and validating a standard classification tree model.

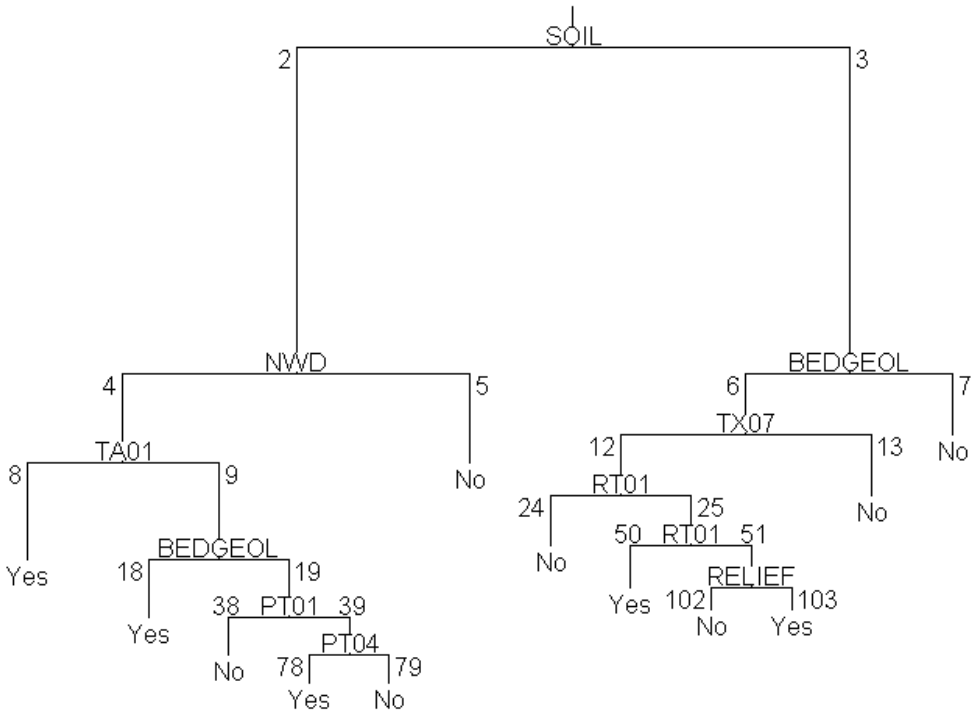
	Model-Building	Validation	Total
Known Present	15	4	19
Known Absent	961	185	1146
Total	976	189	1165

Data Source (Points) This table lists the sources used for location data and the number of present points derived from each source.

Modeling Notes This section includes a list of the environmental factors used as independent (predictor) variables and the parameters used for classification tree analysis and pruning. See tables 2, 4, 5, 6, and 7 for a complete list of independent variables and their codes. "Biomes used for validation" lists only the major biome types in which this species is known or likely to occur in Wyoming or the region. See Table 8 for a complete list of biome types and their associated codes.

Independent variables: ELEV, RELIEF, PT01, PT04, PT07, PT10, NWD, RT01, RT07, TA01, TA04, TA07, TA10, TX07, NFD, GDD, BEDGEOL, LANDCOV, SOIL, SURFGEOL
Minimum number of observations before split: 2
Minimum node size: 4
Minimum node deviance: 0.01
Minimum percent for pruning: 0.2
Biomes used for validation: FOOT, IDGRS, IDS

Classification Tree Used in Model Building This figure (below) depicts the final pruned tree used for construction of the *C. aridum* model and shows the environmental variable and node numbers associated with each split (see tables 2, 4, 5, 6, and 7 for a complete list of codes). The terminal nodes are designated by "Yes" if the species is predicted to be present, or "No" if it is predicted to be absent. See the Classification Tree Output and Path Composition and Likelihood sections below for the specific values or categories of each variable used for splitting nodes along with the number and percentage of points in each node.



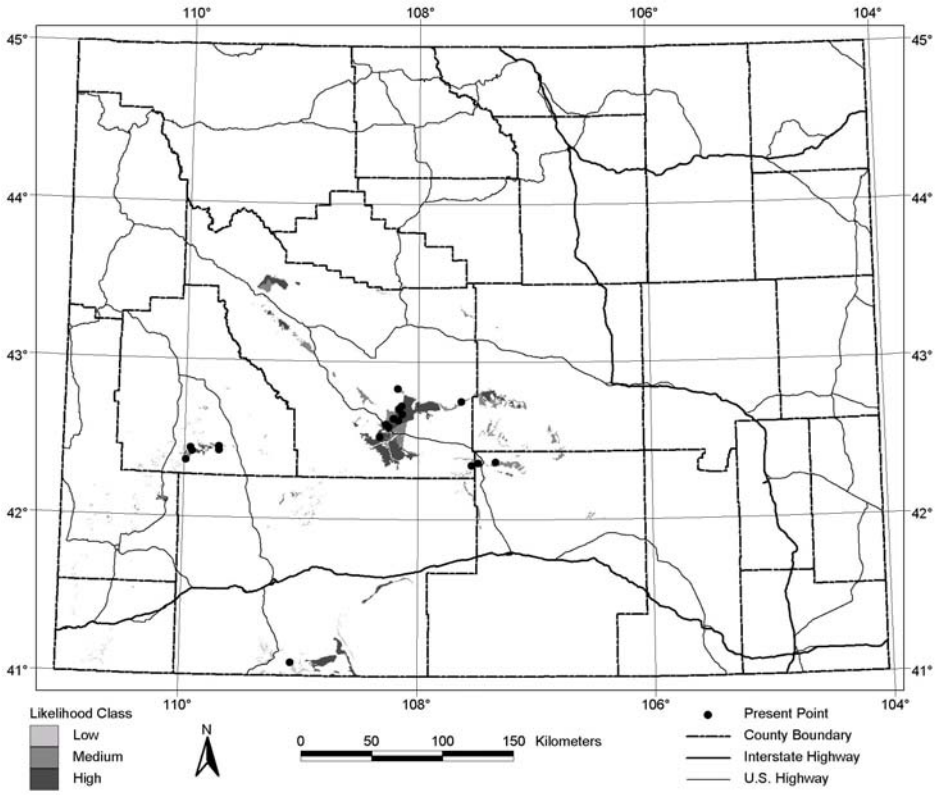
Classification Tree Output The root node (number 1) indicates the number of data points used in construction of this tree (976), the number of absent and present points (961 and 15, respectively), and the percentage of absent and present points represented at the node. Subsequent lines specify the node numbers (which correspond with the nodes in the classification tree shown above), the environmental variable selected at the node, the values or categories represented, the total number of points at each node, the number of absent and present points at the node, the percentage of absent and present points at the node relative to the total available pool of absent and present points in the entire model, and whether the node represents presence (Yes) or absence (No) of the species. Nodes that end with an * are terminal nodes. See tables 2, 4, 5, 6, and 7 for the codes and values of environmental variables.

Node_Num) Node_Def Node_Size (Num_No,Num_Yes) (Pct_No,Pct_Yes) Node_Type
1) root 976 (961,15) (100,100) Yes
2) SOIL:WY34,WY41 67 (55,12) (5.7,80) Yes
4) NWD<58.5 40 (28,12) (2.9,80) Yes
8) TA01<-6.99 10 (2,8) (0.2,53.3) **Yes ***
9) TA01>-6.99 30 (26,4) (2.7,26.7) Yes
18) BEDGEOL:Eol 2 (0,2) (0,13.3) **Yes ***
19) BEDGEOL:Eoe,MiPl,Olg,Pal,TQc 28 (26,2) (2.7,13.3) Yes
38) PT01<1.29 21 (21,0) (2.2,0) No *
39) PT01>1.29 7 (5,2) (0.5,13.3) Yes
78) PT04<3.945 3 (1,2) (0.1,13.3) **Yes ***
79) PT04>3.945 4 (4,0) (0.4,0) No *
5) NWD>58.5 27 (27,0) (2.8,0) No *
3) SOIL:WY01,WY06C,WY07C,WY08C,WY10,WY11,WY14,WY15,WY16C,WY17C,WY18,WY20,
WY23,WY27,WY31C,WY35,WY36,WY38C,WY40C,WY42,WY44,WY45
909 (906,3) (94.3,20) No
6) BEDGEOL:Eoe 179 (176,3) (18.3,20) Yes
12) TX07<25.83 37 (34,3) (3.5,20) Yes
24) RT01<7.415 26 (26,0) (2.7,0) No *
25) RT01>7.415 11 (8,3) (0.8,20) Yes
50) RT01<7.43 2 (0,2) (0,13.3) **Yes ***
51) RT01>7.43 9 (8,1) (0.8,6.7) Yes
102) RELIEF<244 7 (7,0) (0.7,0) No *
103) RELIEF>244 2 (1,1) (0.1,6.7) **Yes ***
13) TX07>25.83 142 (142,0) (14.8,0) No *
7) BEDGEOL:Eex,Ein,Eol,H2O,Kmix,Ksh,Kss,MiPl,Olg,PCf,PCm,PTJ,Pal,Pze,Qal,Qlc,Qls,Qs,Qt,
Qvf,TQc,Tlvf 730 (730,0) (76,0) No *

Path Composition and Likelihood This table lists the nodes that comprise each of five "yes" (predicted present) paths for the model shown above. The percentage of present points in the terminal "Yes" node for each path is indicated, as is the likelihood of points falling within the path based on a three-part scoring system (high, medium, low). Paths are ranked high if they contain twice the average number of present points used in the entire model, medium if they contain between one-half and twice the average number of present points, and low if they contain less than one-half the average number of present points.

Yes Path	Node List	% of Present Points	Likelihood Class
a	8, 4, 2	53.3	High
b	18, 9, 4, 2	13.3	Medium
c	78, 39, 19, 9, 4, 2	13.3	Medium
d	50, 25, 12, 6, 3	13.3	Medium
e	103, 51, 25, 12, 6, 3	6.7	Low

Predicted Distribution in Wyoming The Classification Tree Output and Path Composition tables are used to define the values and variables that are intersected in GIS to produce 5 discrete maps of potential habitat for this species (one map for each path). These maps are merged to form the final predicted distribution map for this species in Wyoming (below). The paths are color-coded to indicate the likelihood class, with darker areas representing a higher probability of occurrence. White areas on the map represent areas where this species is not expected to occur. Black dots superimposed over the map indicate known present locations used to build and validate the model.



Classification Rates for Wyoming Points The following tables indicate the number of known present and absent points correctly classified in the model-building and validation datasets for the *C. aridum* model. Points that are known to be present but predicted by the model as absent are considered false negatives or omission errors, while points that are known to be absent but predicted as present by the model are false positives or commission errors. Present points were not used for validation if fewer than 16 points were available for model-building.

Model-Building Points

	Model Present	Model Absent		
Known Present	14 / 15 93.3%	1 / 15 6.7%	Total Correct	970 / 976 99.4%
Known Absent	5 / 961 0.5%	956 / 961 99.5%	Total Incorrect	6 / 976 0.6%

Validation Points

	Model Present	Model Absent		
Known Present	3 / 4 75.0%	1 / 4 25.0%	Total Correct	184 / 189 97.4%
Known Absent	4 / 185 2.2%	181 / 185 97.8%	Total Incorrect	5 / 189 2.6%

Area of Predicted Distribution This entry indicates the area and percentage of the state in which the modeled species may potentially occur.

Range/Intersection Models
Example: *Trifolium barnebyi* (Isely) Dorn & Lichvar

Figures and tables depicting "Known Distribution in Wyoming", "Number of Points for Modeling", "Data Sources", "Classification Rates for Wyoming Points", and "Area of Predicted Distribution" are the same for both range/intersection and standard classification tree models.

Modeling Notes In range/intersection models, only the biomes used for selecting absence points for validation are listed. The mathematical factor (K) used to calculate the minimum and maximum values for continuous variables is included.

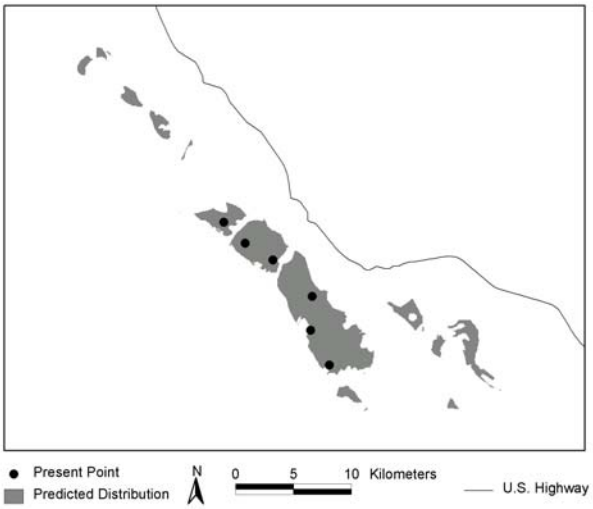
Ranges of Continuous Variables This table lists the minimum and maximum values of all continuous environmental variables used in construction of range/intersection models. Codes and measurement units for each variable are explained in Table 2.

	MIN	MAX	UNITS
ELEV	1652	2124	m
RELIEF	88	228	m
PT01	1.98	2.67	cm
PT04	3.67	4.92	cm
PT07	1.61	2.24	cm
PT10	2.51	3.21	cm
RT01	6.47	7.46	$MJ/m^2/day$
RT07	23.75	26.37	$MJ/m^2/day$
TA01	-8.39	-5.84	ºC
TA04	3.15	7.24	ºC
TA07	17.01	21.21	ºC
TA10	4.57	8.06	ºC

Values of Categorical Variables This table lists the values of categorical environmental variables used in construction of range/intersection models. Consult Tables 4, 5, 6, and 7 for a complete list of values for each variable and descriptions of the codes.

BEDGEOL: Ksh, PTJ
LANDCOVMAJ: Junpr
SOIL: WY16C, WY35
SURFGEOL: Ri, sci

Predicted Distribution in Wyoming The potential distribution maps for range/intersection models are identical to those for standard classification tree models except that the mapped area is not subdivided based on likelihood categories. For those species in which the predicted area is extremely small, a more detailed close-up image is provided (sample for *T. barnebyi* shown at right).

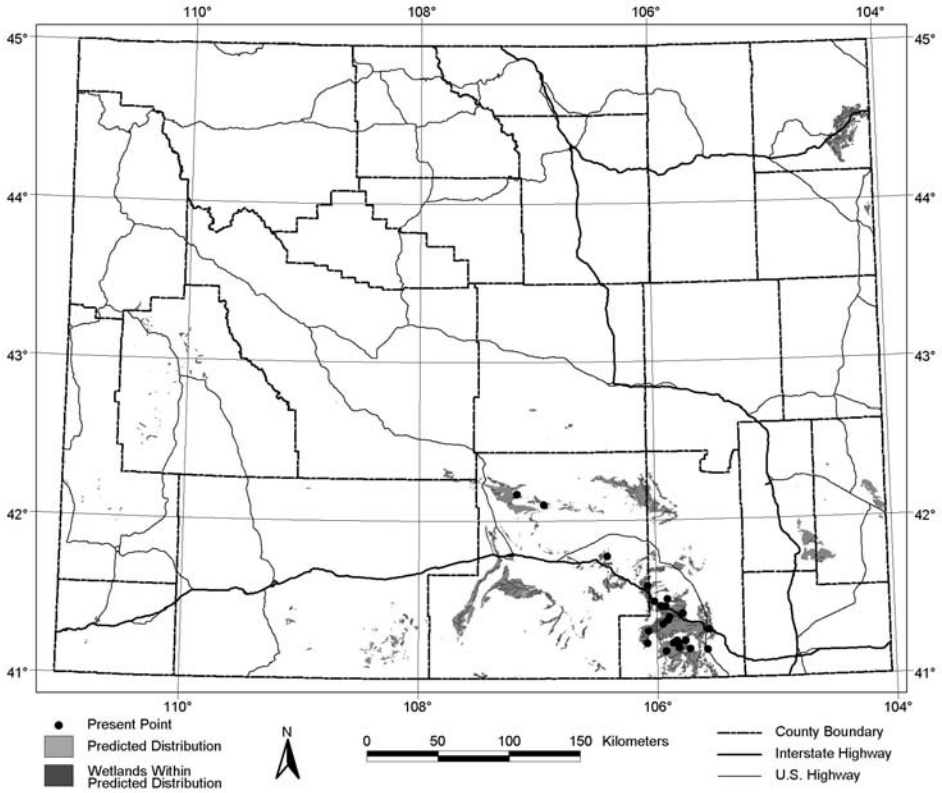


Wetland Models
Example: *Sisyrinchium pallidum* Cholewa & Henderson

Figures and tables depicting "Known Distribution in Wyoming", "Number of Points for Modeling", "Data Sources", "Classification Tree Used in Model Building", "Classification Tree Output", "Path Composition and Likelihood","Classification Rates for Wyoming Points", and "Area of Predicted Distribution" are the same for wetland models and standard classification tree models. Tables for "Ranges of Continuous Variables" and "Values of Categorical Variables" are the same as those for range/intersection models.

Modeling Notes As in the case of biomes, different riparian and aquatic land cover types were used to identify wetland habitats in which a target species was known or likely to occur in Wyoming. See Table 17 for a complete list of types.

Predicted Distribution in Wyoming Wetland models can be derived from classification tree or range/intersection models by overlaying the final predicted distribution map (shown in medium gray) with a riparian or aquatic habitat coverage (depicted in dark gray). As in range/intersection models, predicted upland habitats are not differentiated into low, medium, or high likelihood areas.



Classification Rates for Wyoming Points For wetland models, classification success and error values were calculated for the upland and wetland components of the final model.

Model-Building Points

	Predicted		Wetlands	
	Model Present	Model Absent	Model Present	Model Absent
Known Present	17 / 18 94.4%	1 / 18 5.6%	9 / 18 50.0%	9 / 18 50.0%
Known Absent	5 / 962 0.5%	957 / 962 99.5%	1 / 962 0.1%	961 / 962 99.9%
Total Correct	974 / 980 99.4%		970 / 980 99.0%	
Total Incorrect	6 / 980 0.6%		10 / 980 1.0%	

Validation Points

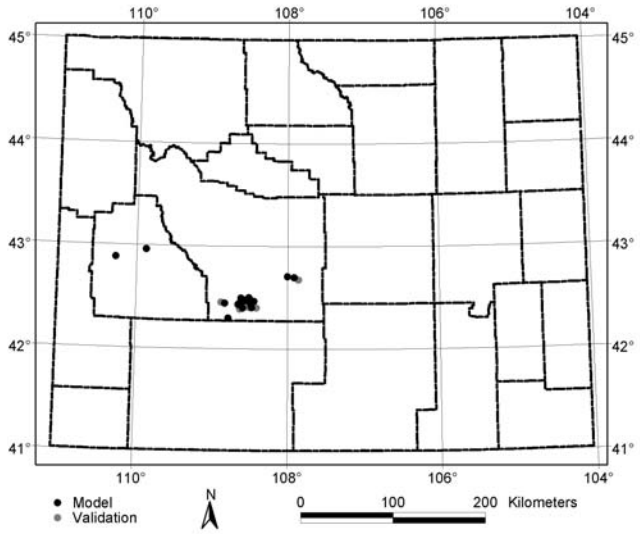
	Predicted		Wetlands	
	Model Present	Model Absent	Model Present	Model Absent
Known Present	2 / 5 40.0%	3 / 5 60.0%	0 / 5 0.0%	5 / 5 100.0%
Known Absent	4 / 162 2.5%	158 / 162 97.5%	1 / 162 0.6%	161 / 162 99.4%
Total Correct	160 / 167 95.8%		161 / 167 96.4%	
Total Incorrect	7 / 167 4.2%		6 / 167 3.6%	

Area of Predicted Distribution Separate figures are provided for potential upland and wetland habitat available for wetland plant species.

Area of Predicted Distribution: 4774 km^2 (1.9% of WY); Wetlands: 258 km^2 (0.1% of WY)

Antennaria arcuata Cronq.

Known Distribution in Wyoming



Numbers of Points for Modeling

	Model	Validation	Total
Known Present	18	6	24
Known Absent	961	223	1184
Total	979	229	1208

Data Source (Points)

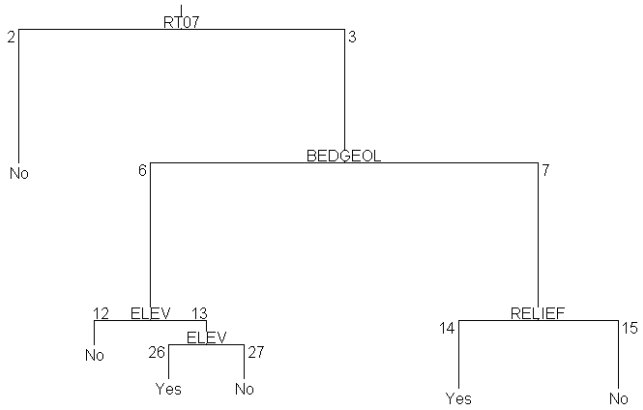
Wyoming Heritage Program (24)

Modeling Notes

Independent variables: ELEV, RELIEF, PT01, PT04, PT07, PT10, NWD, RT01, RT07, TA01, TA04, TA07, TA10, TX07, NFD, GDD, BEDGEOL, LANDCOV, SOIL, SURFGEOL
Minimum number of observations before split: 2
Minimum node size: 4
Minimum node deviance: 0.01
Minimum percent for pruning: 0.3
Biomes used for validation: FOOT, IDGRS, RMF, WET
Riparian types: StrRipI, StrRipP

The wetland model is the intersection of the classification tree model with the specified riparian types.

Classification Tree Used in Model Building



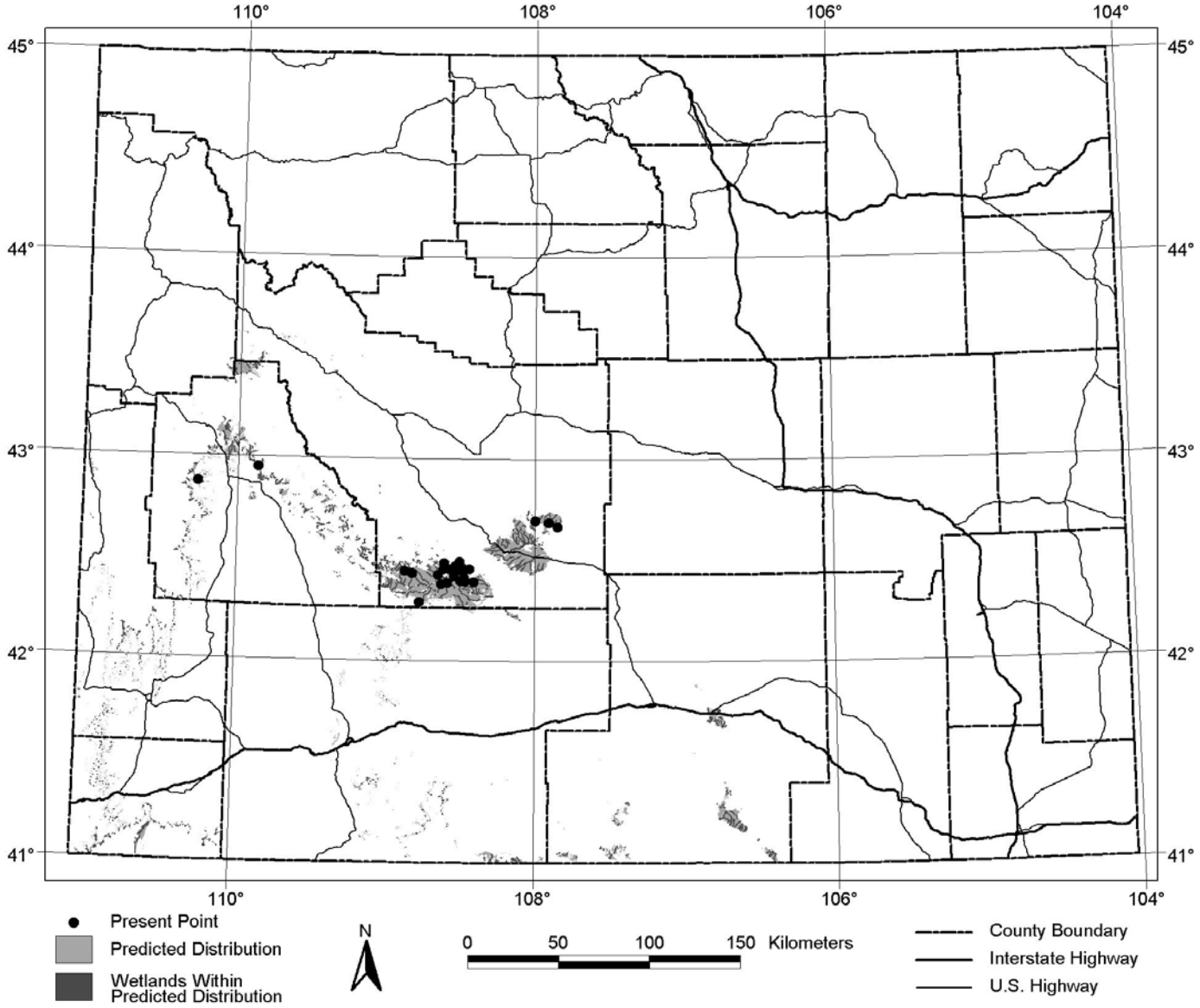
Classification Tree Output

Node_Num) Node_Def Node_Size (Num_No,Num_Yes) (Pct_No,Pct_Yes) Node_Type
1) root 979 (961,18) (100,100) Yes
  2) RT07<25.115 743 (743,0) (77.3,0) No *
  3) RT07>25.115 236 (218,18) (22.7,100) Yes
    6) BEDGEOL:Eoe,Eol,H2O,Kmix,Ksh,Kss,Olg,PTJ,Pal,Qal,Qlc, Qs 205 (203,2) (21.1,11.1) No
      12) ELEV<2303.5 185 (185,0) (19.3,0) No *
      13) ELEV>2303.5 20 (18,2) (1.9,11.1) Yes
        26) ELEV<2317 2 (0,2) (0,11.1) **Yes ***
        27) ELEV>2317 18 (18,0) (1.9,0) No *
    7) BEDGEOL:MiPl,PCf,Pze,Qt 31 (15,16) (1.6,88.9) Yes
      14) RELIEF<86 19 (3,16) (0.3,88.9) **Yes ***
      15) RELIEF>86 12 (12,0) (1.2,0) No *

Path Composition and Likelihood

Yes Path	Node List	% of Present Points	Likelihood Class
a	26, 13, 6, 3	11.1	Low
b	14, 7, 3	88.9	Medium

Predicted Distribution in Wyoming



Classification Rates

Model-Building Points

	Predicted		Wetlands	
	Model Present	Model Absent	Model Present	Model Absent
Known Present	18 / 18 100.0%	0 / 18 0.0%	8 / 18 44.4%	10 / 18 55.6%
Known Absent	4 / 961 0.4%	957 / 961 99.6%	1 / 961 0.1%	960 / 961 99.9%
Total Correct	975 / 979 99.6%		968 / 979 98.9%	
Total Incorrect	4 / 979 0.4%		11 / 979 1.1%	

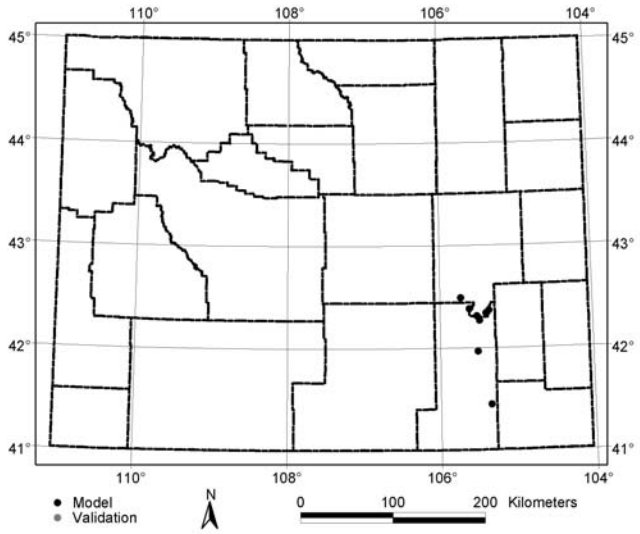
Validation Points

	Predicted		Wetlands	
	Model Present	Model Absent	Model Present	Model Absent
Known Present	5 / 6 83.3%	1 / 6 16.7%	4 / 6 66.7%	2 / 6 33.3%
Known Absent	2 / 223 0.9%	221 / 223 99.1%	0 / 223 0.0%	223 / 223 100.0%
Total Correct	226 / 229 98.7%		227 / 229 99.1%	
Total Incorrect	3 / 229 1.3%		2 / 229 0.9%	

Area of Predicted Distribution: 2,972 km^2 (1.2% of WY); **Wetlands:** 134 km^2 (0.05% of WY)

Aquilegia laramiensis A. Nels.

Known Distribution in Wyoming



Numbers of Points for Modeling

	Model	Validation	Total
Known Present	8	0	8
Known Absent	960	206	1166
Total	968	206	1174

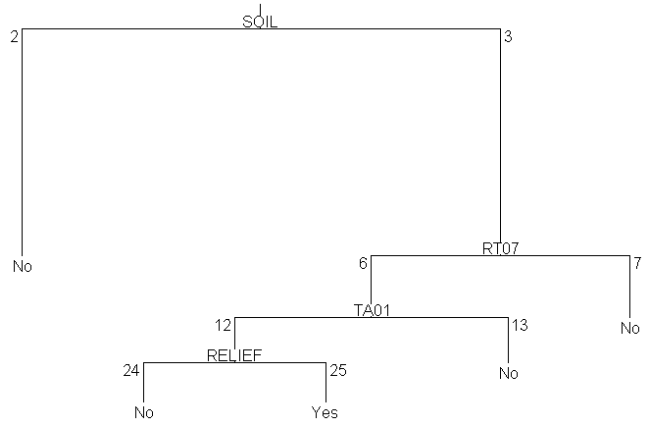
Data Source (Points)

Wyoming Heritage Program (8)

Modeling Notes

Independent variables: ELEV, RELIEF, PT01, PT04, PT07, PT10, NWD, RT01, RT07, TA01, TA04, TA07, TA10, TX07, NFD, GDD, BEDGEOL, LANDCOV, SOIL, SURFGEOL
Minimum number of observations before split: 1
Minimum node size: 2
Minimum node deviance: 0.01
Minimum percent for pruning: 0.1
Biomes used for validation: FOOT, IDGRS, RMF

Classification Tree Used in Model Building



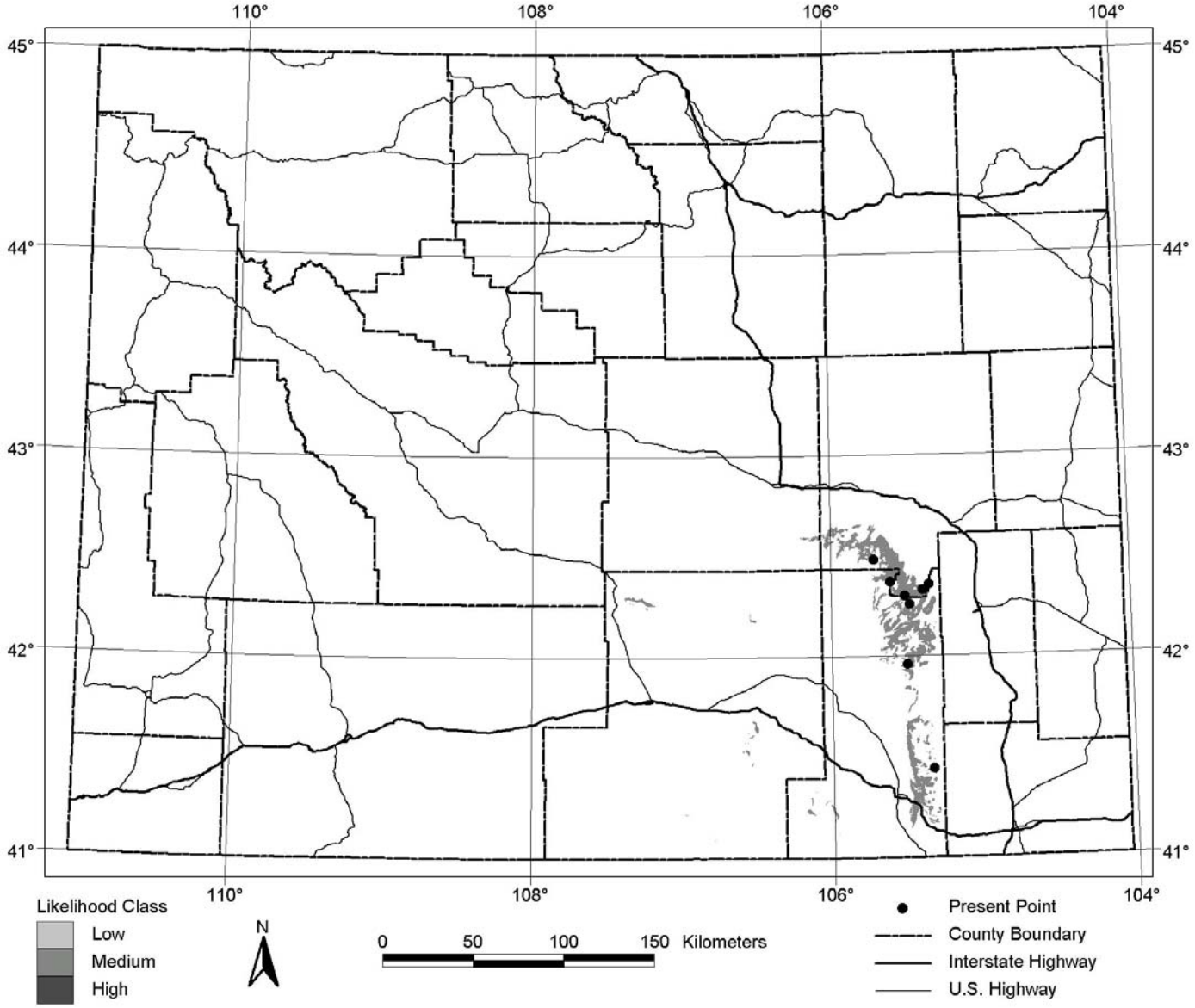
Classification Tree Output

Node_Num) Node_Def Node_Size (Num_No,Num_Yes) (Pct_No,Pct_Yes) Node_Type
1) root 968 (960,8) (100,100) Yes
  2) SOIL:WY01,WY06C,WY07C,WY08C,WY10,WY11,WY14, WY15,WY16C,WY17C,WY18,WY20,WY23,WY27,WY34, WY35,WY36,WY38C,WY40C,WY41,WY42,WY44 928 (928,0) (96.7,0) No *
  3) SOIL:WY31C,WY45 40 (32,8) (3.3,100) Yes
    6) RT07<24.255 19 (11,8) (1.1,100) Yes
      12) TA01<-5.505 12 (4,8) (0.4,100) Yes
        24) RELIEF<92.5 3 (3,0) (0.3,0) No *
        25) RELIEF>92.5 9 (1,8) (0.1,100) **Yes ***
      13) TA01>-5.505 7 (7,0) (0.7,0) No *
    7) RT07>24.255 21 (21,0) (2.2,0) No *

Path Composition and Likelihood

Yes Path	Node List	% of Present Points	Likelihood Class
a	25, 12, 6, 3	100.0	Medium

Predicted Distribution in Wyoming



Classification Rates

Model-Building Points

	Model Present	Model Absent		
Known Present	7 / 8 87.5%	1 / 8 12.5%	Total Correct	967 / 968 99.9%
Known Absent	0 / 960 0.0%	960 / 960 100.0%	Total Incorrect	1 / 968 0.1%

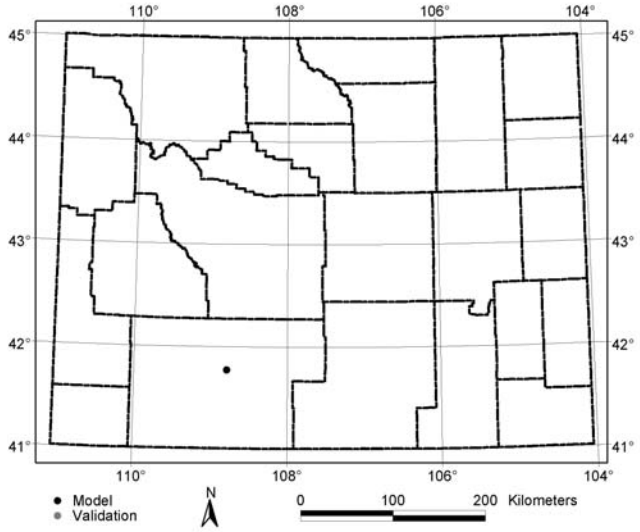
Validation Points

	Model Present	Model Absent		
Known Present	0 / 0	0 / 0	Total Correct	205 / 206 99.5%
Known Absent	1 / 206 0.5%	205 / 206 99.5%	Total Incorrect	1 / 206 0.5%

Area of Predicted Distribution: 1,691 km^2 (0.67% of WY)

Artemisia biennis Willd. var. *diffusa* Dorn

Known Distribution in Wyoming



Numbers of Points for Modeling

	Model	Validation	Total
Known Present	1	0	1
Known Absent	963	163	1126
Total	964	163	1127

Data Source (Points)

Wyoming Heritage Program (1)

Modeling Notes

Factor used to expand ranges: 0.1
Biomes used for validation: IDGRS, IDS, WET

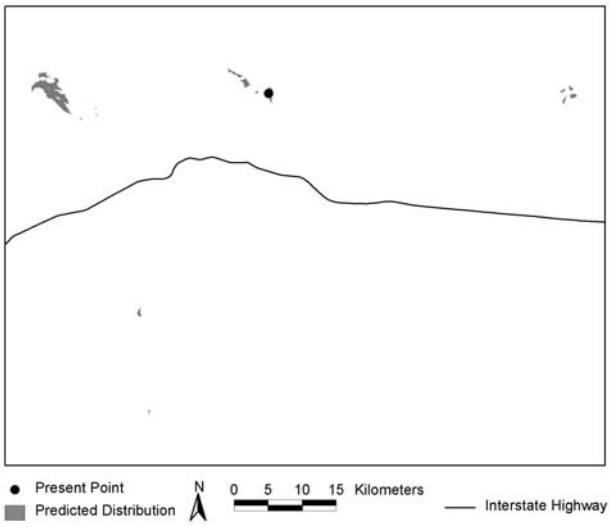
Ranges of Continuous Variables

	MIN	MAX	UNITS
ELEV	1831	2239	m
RELIEF	0	46	m
PT01	1.19	1.45	cm
PT04	1.97	2.41	cm
PT07	1.66	2.02	cm
PT10	2.03	2.49	cm
RT01	6.83	8.35	$MJ/m^2/day$
RT07	23.12	28.26	$MJ/m^2/day$
TA01	-9.20	-5.20	^oC
TA04	2.66	6.66	^oC
TA07	16.52	20.52	^oC
TA10	3.91	7.91	^oC

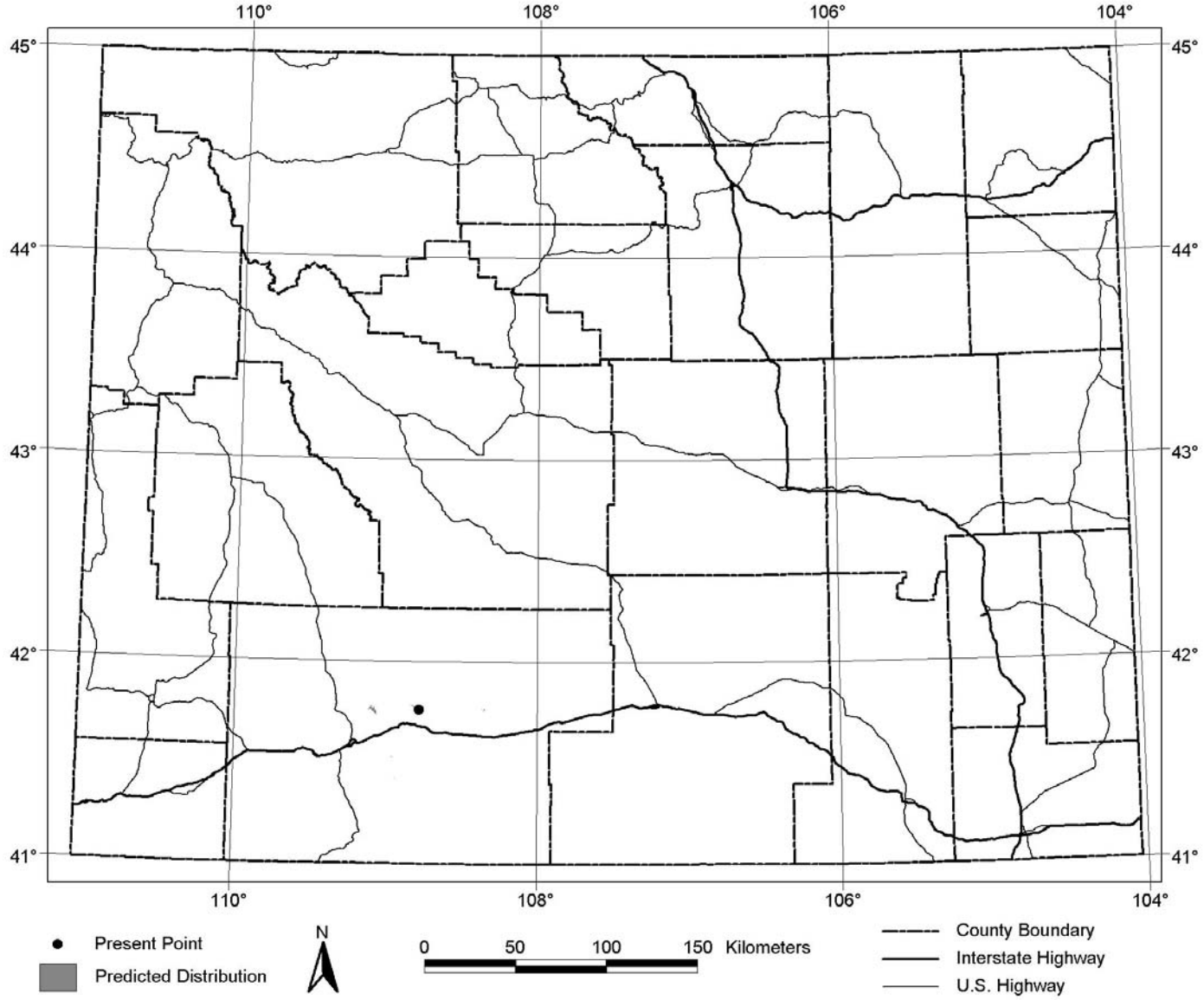
Values of Categorical Variables

BEDGEOL: Kmix, Qlc
LANDCOV: DstSh, Playa
SOIL: WY17C, WY38C
SURFGEOL: pea, ri

Detailed View of Predicted Distribution



Predicted Distribution in Wyoming



Classification Rates

Model-Building Points

	Model Present	Model Absent		
Known Present	1 / 1 100.0%	0 / 1 0.0%	Total Correct	964 / 964 100.0%
Known Absent	0 / 963 0.0%	963 / 963 100.0%	Total Incorrect	0 / 964 0.0%

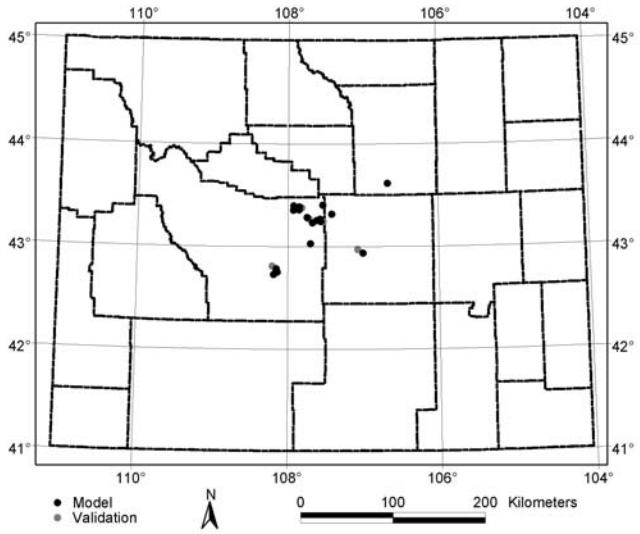
Validation Points

	Model Present	Model Absent		
Known Present	0 / 0	0 / 0	Total Correct	163 / 163 100.0%
Known Absent	0 / 163 0.0%	163 / 163 100.0%	Total Incorrect	0 / 163 0.0%

Area of Predicted Distribution: 9.8 km^2 (0.00% of WY)

Artemisia porteri Cronq.

Known Distribution in Wyoming



Numbers of Points for Modeling

	Model	Validation	Total
Known Present	19	6	25
Known Absent	959	182	1141
Total	978	188	1166

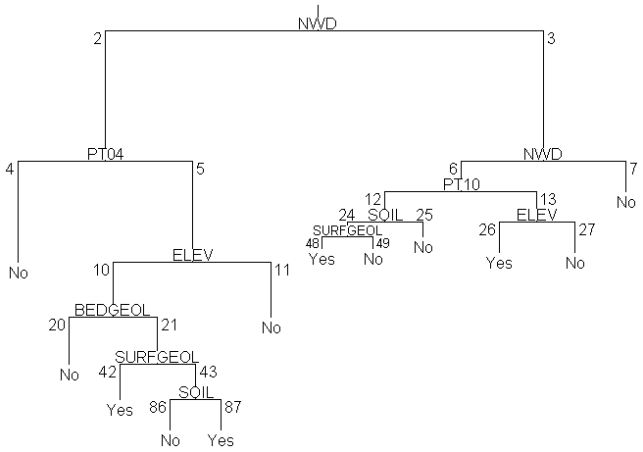
Data Source (Points)

Rocky Mountain Herbarium (1)
Wyoming Heritage Program (24)

Modeling Notes

Independent variables: ELEV, RELIEF, PT01, PT04, PT07, PT10, NWD, RT01, RT07, TA01, TA04, TA07, TA10, TX07, NFD, GDD, BEDGEOL, LANDCOV, SOIL, SURFGEOL
Minimum number of observations before split: 2
Minimum node size: 4
Minimum node deviance: 0.01
Minimum percent for pruning: 0.2
Biomes used for validation: FOOT, IDGRS, IDS

Classification Tree Used in Model Building



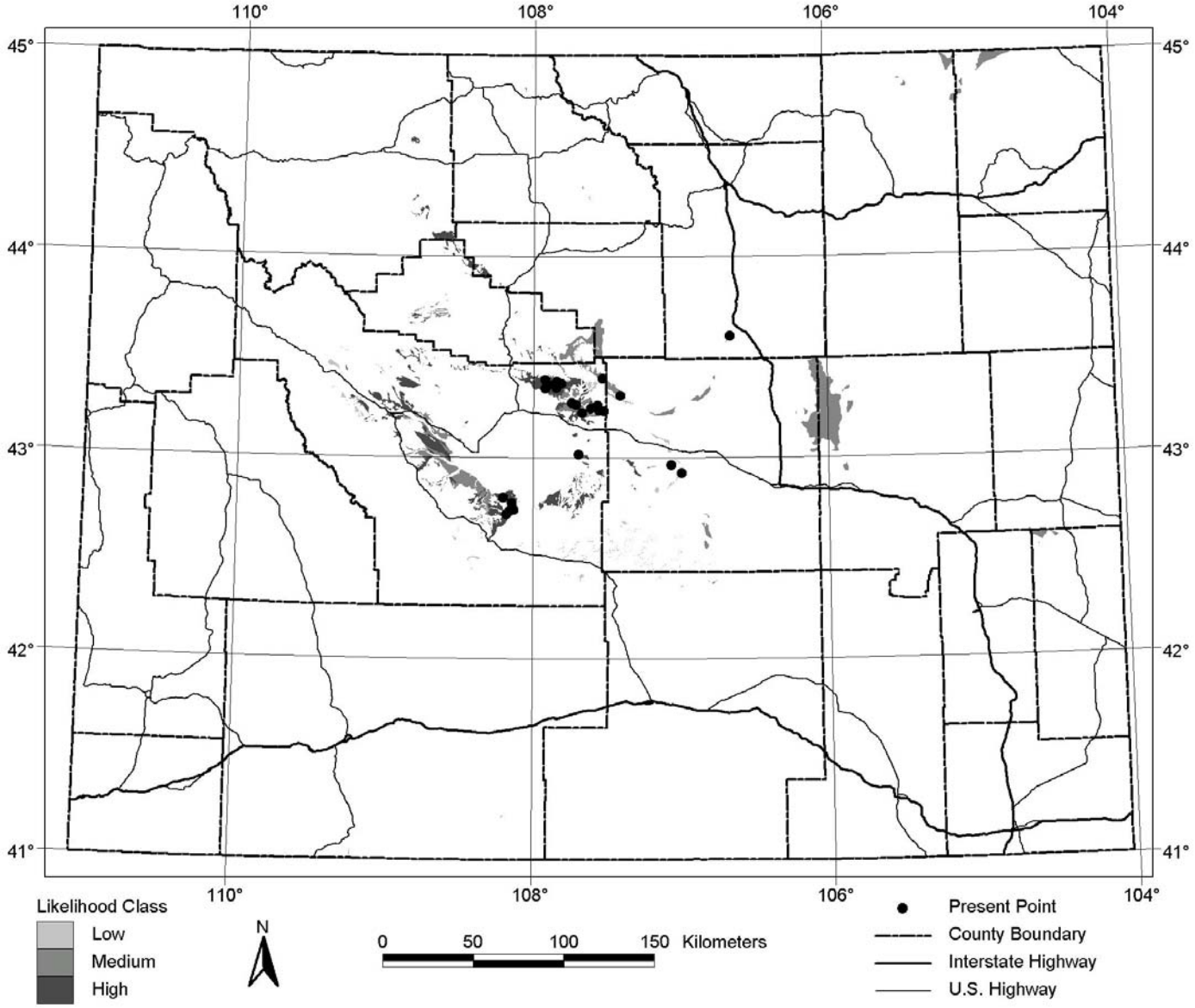
Classification Tree Output

Node_Num) Node_Def Node_Size (Num_No,Num_Yes) (Pct_No,Pct_Yes) Node_Type
1) root 978 (959,19) (100,100) Yes
  2) NWD<49.75 126 (111,15) (11.6,78.9) Yes
    4) PT04<2.775 81 (81,0) (8.4,0) No *
    5) PT04>2.775 45 (30,15) (3.1,78.9) Yes
      10) ELEV<1992 28 (13,15) (1.4,78.9) Yes
        20) BEDGEOL:Kmix,Ksh,MiPl,PTJ,Pal 8 (8,0) (0.8,0) No *
        21) BEDGEOL:Eoe,Eol,Qal,Qs 20 (5,15) (0.5,78.9) Yes
          42) SURFGEOL:Ri,fdi,li,sci 12 (0,12) (0,63.2) **Yes ***
          43) SURFGEOL:ri,ti 8 (5,3) (0.5,15.8) Yes
            86) SOIL:WY15,WY16C,WY17C,WY34 5 (5,0) (0.5,0) No *
            87) SOIL:WY42,WY44 3 (0,3) (0,15.8) **Yes ***
      11) ELEV>1992 17 (17,0) (1.8,0) No *
  3) NWD>49.75 852 (848,4) (88.4,21.1) No
    6) NWD<58.05 234 (230,4) (24,21.1) No
      12) PT10<3.355 213 (212,1) (22.1,5.3) No
        24) SOIL:WY34 18 (17,1) (1.8,5.3) Yes
          48) SURFGEOL:Ri 3 (2,1) (0.2,5.3) **Yes ***
          49) SURFGEOL:bi,fdi,fi,ri,sci,tre 15 (15,0) (1.6,0) No *
        25) SOIL:WY06C,WY10,WY14,WY15,WY16C,WY17C,WY27, WY35,WY38C,WY40C,WY42,WY44
            195 (195,0) (20.3,0) No *
      13) PT10>3.355 21 (18,3) (1.9,15.8) Yes
        26) ELEV<1983.5 5 (2,3) (0.2,15.8) **Yes ***
        27) ELEV>1983.5 16 (16,0) (1.7,0) No *
    7) NWD>58.05 618 (618,0) (64.4,0) No *

Path Composition and Likelihood

Yes Path	Node List	% of Present Points	Likelihood Class
a	42, 21, 10, 5, 2	63.2	High
b	87, 43, 21, 10, 5, 2	15.8	Medium
c	48, 24, 12, 6, 3	5.3	Low
d	26, 13, 6, 3	15.8	Medium

Predicted Distribution in Wyoming



Classification Rates

Model-Building Points

	Model Present	Model Absent		
Known Present	18 / 19 94.7%	1 / 19 5.3%	Total Correct	973 / 978 99.5%
Known Absent	4 / 959 0.4%	955 / 959 99.6%	Total Incorrect	5 / 978 0.5%

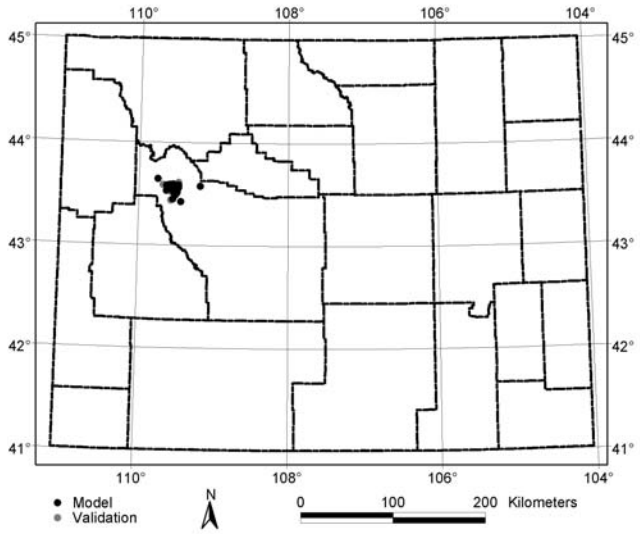
Validation Points

	Model Present	Model Absent		
Known Present	4 / 6 66.7%	2 / 6 33.3%	Total Correct	185 / 188 98.4%
Known Absent	1 / 182 0.5%	181 / 182 99.5%	Total Incorrect	3 / 188 1.6%

Area of Predicted Distribution: 3,076 km^2 (1.2% of WY)

Astragalus gilviflorus Sheld. var. *purpureus* Dorn

Known Distribution in Wyoming



Numbers of Points for Modeling

	Model	Validation	Total
Known Present	16	5	21
Known Absent	960	168	1128
Total	976	173	1149

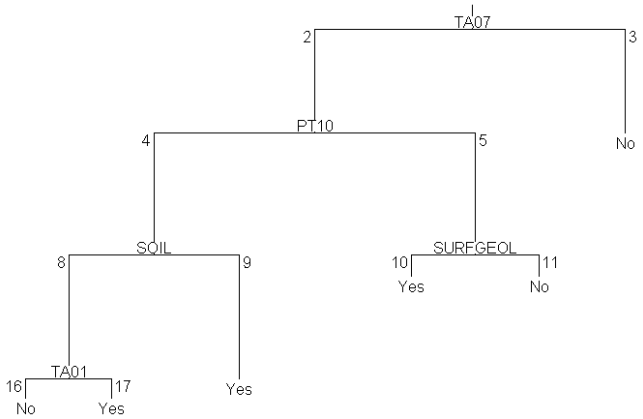
Data Source (Points)

Wyoming Heritage Program (21)

Modeling Notes

Independent variables: ELEV, RELIEF, PT01, PT04, PT07, PT10, NWD, RT01, RT07, TA01, TA04, TA07, TA10, TX07, NFD, GDD, BEDGEOL, LANDCOV, SOIL, SURFGEOL
Minimum number of observations before split: 2
Minimum node size: 4
Minimum node deviance: 0.01
Minimum percent for pruning: 0.5
Biomes used for validation: FOOT, IDGRS

Classification Tree Used in Model Building



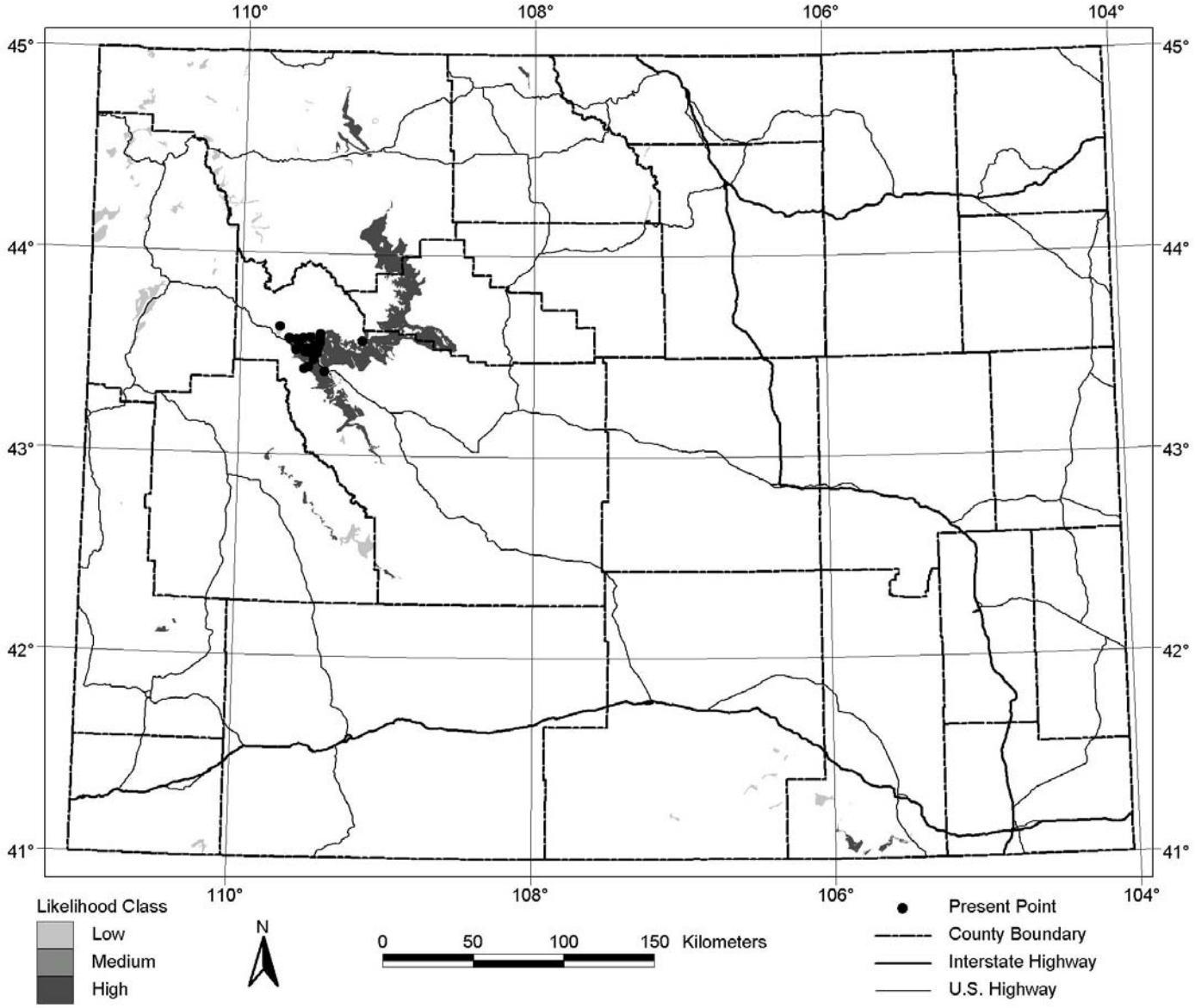
Classification Tree Output

Node_Num) Node_Def Node_Size (Num_No,Num_Yes) (Pct_No,Pct_Yes) Node_Type
1) root 976 (960,16) (100,100) Yes
  2) TA07<16.615 313 (297,16) (30.9,100) Yes
    4) PT10<2.865 64 (49,15) (5.1,93.8) Yes
      8) SOIL:WY06C,WY14,WY17C,WY27,WY36,WY38C,WY40C, WY41 47 (46,1) (4.8,6.3) Yes
        16) TA01<-7.36 45 (45,0) (4.7,0) No *
        17) TA01>-7.36 2 (1,1) (0.1,6.3) **Yes ***
      9) SOIL:WY08C,WY34,WY35,WY37,WY42 17 (3,14) (0.3,87.5) **Yes ***
    5) PT10>2.865 249 (248,1) (25.8,6.3) No
      10) SURFGEOL:oai 6 (5,1) (0.5,6.3) **Yes ***
      11) SURFGEOL:Ri,ai,fi,gi,li,ri,sci,tdi,ti,ui 243 (243,0) (25.3,0) No *
  3) TA07>16.615 663 (663,0) (69.1,0) No *

Path Composition and Likelihood

Yes Path	Node List	% of Present Points	Likelihood Class
a	17, 8, 4, 2	6.3	Low
b	9, 4, 2	87.5	High
c	10, 5, 2	6.3	Low

Predicted Distribution in Wyoming



Classification Rates

Model-Building Points

	Model Present	Model Absent		
Known Present	15 / 16 93.8%	1 / 16 6.3%	Total Correct	967 / 976 99.1%
Known Absent	8 / 960 0.8%	952 / 960 99.2%	Total Incorrect	9 / 976 0.9%

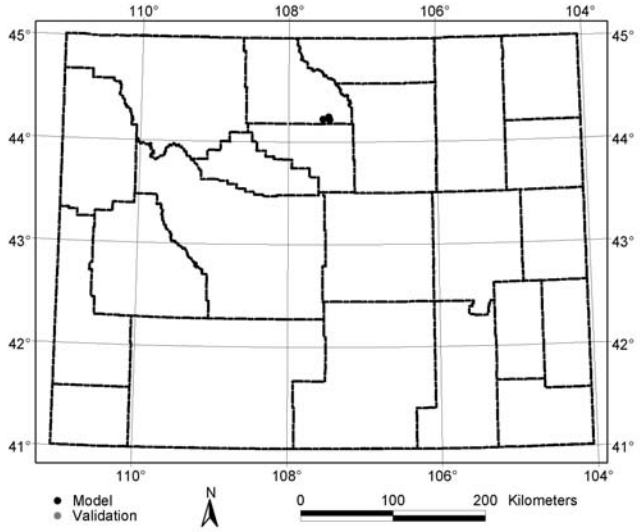
Validation Points

	Model Present	Model Absent		
Known Present	4 / 5 80.0%	1 / 5 20.0%	Total Correct	168 / 173 97.1%
Known Absent	4 / 168 2.4%	164 / 168 97.6%	Total Incorrect	5 / 173 2.9%

Area of Predicted Distribution: 3,493 km^2 (1.4% of WY)

Astragalus jejunus Wats. var. *articulatus* Dorn

Known Distribution in Wyoming



Numbers of Points for Modeling

	Model	Validation	Total
Known Present	3	0	3
Known Absent	962	170	1132
Total	965	170	1135

Data Source (Points)

Wyoming Heritage Program (3)

Modeling Notes

Factor used to expand ranges: 0.05
Biomes used for validation: FOOT, IDGRS

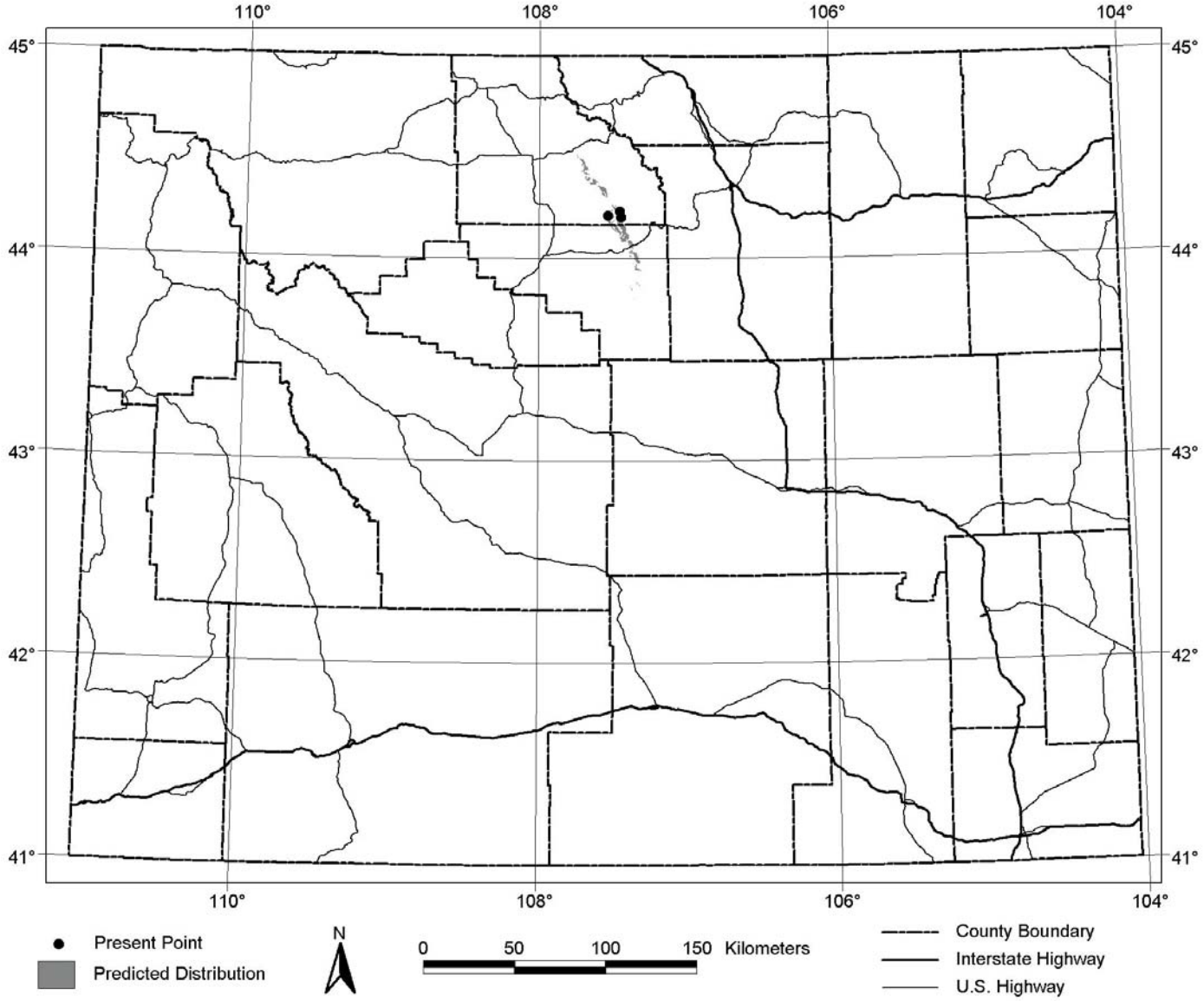
Ranges of Continuous Variables

	MIN	MAX	UNITS
ELEV	1439	1849	m
RELIEF	113	191	m
PT01	1.19	1.86	cm
PT04	3.08	4.47	cm
PT07	1.88	2.65	cm
PT10	2.35	3.37	cm
RT01	5.96	6.92	$MJ/m^2/day$
RT07	22.96	25.58	$MJ/m^2/day$
TA01	-7.44	-5.32	^oC
TA04	4.21	7.41	^oC
TA07	17.97	21.15	^oC
TA10	4.92	7.85	^oC

Values of Categorical Variables

BEDGEOL: PTJ, Pze
LANDCOV: Junpr, WySge
SOIL: WY42
SURFGEOL: Ri, sci

Predicted Distribution in Wyoming



Classification Rates

Model-Building Points

	Model Present	Model Absent		
Known Present	3 / 3 100.0%	0 / 3 0.0%	Total Correct	964 / 965 99.9%
Known Absent	1 / 962 0.1%	961 / 962 99.9%	Total Incorrect	1 / 965 0.1%

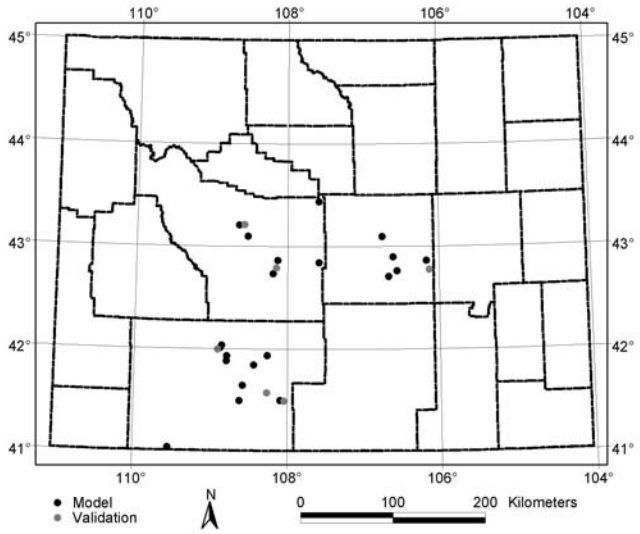
Validation Points

	Model Present	Model Absent		
Known Present	0 / 0	0 / 0	Total Correct	170 / 170 100.0%
Known Absent	0 / 170 0.0%	170 / 170 100.0%	Total Incorrect	0 / 170 0.0%

Area of Predicted Distribution: 144 km^2 (0.06% of WY)

Astragalus nelsonianus Barneby

Known Distribution in Wyoming



Numbers of Points for Modeling

	Model	Validation	Total
Known Present	21	6	27
Known Absent	954	183	1137
Total	975	189	1164

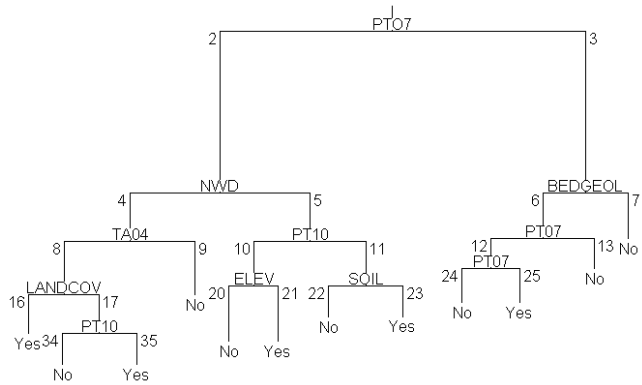
Data Source (Points)

Rocky Mountain Herbarium (3)
Wyoming Heritage Program (24)

Modeling Notes

Independent variables: ELEV, RELIEF, PT01, PT04, PT07, PT10, NWD, RT01, RT07, TA01, TA04, TA07, TA10, TX07, NFD, GDD, BEDGEOL, LANDCOV, SOIL, SURFGEOL
Minimum number of observations before split: 2
Minimum node size: 4
Minimum node deviance: 0.01
Minimum percent for pruning: 0.6
Biomes used for validation: FOOT, IDGRS, IDS

Classification Tree Used in Model Building



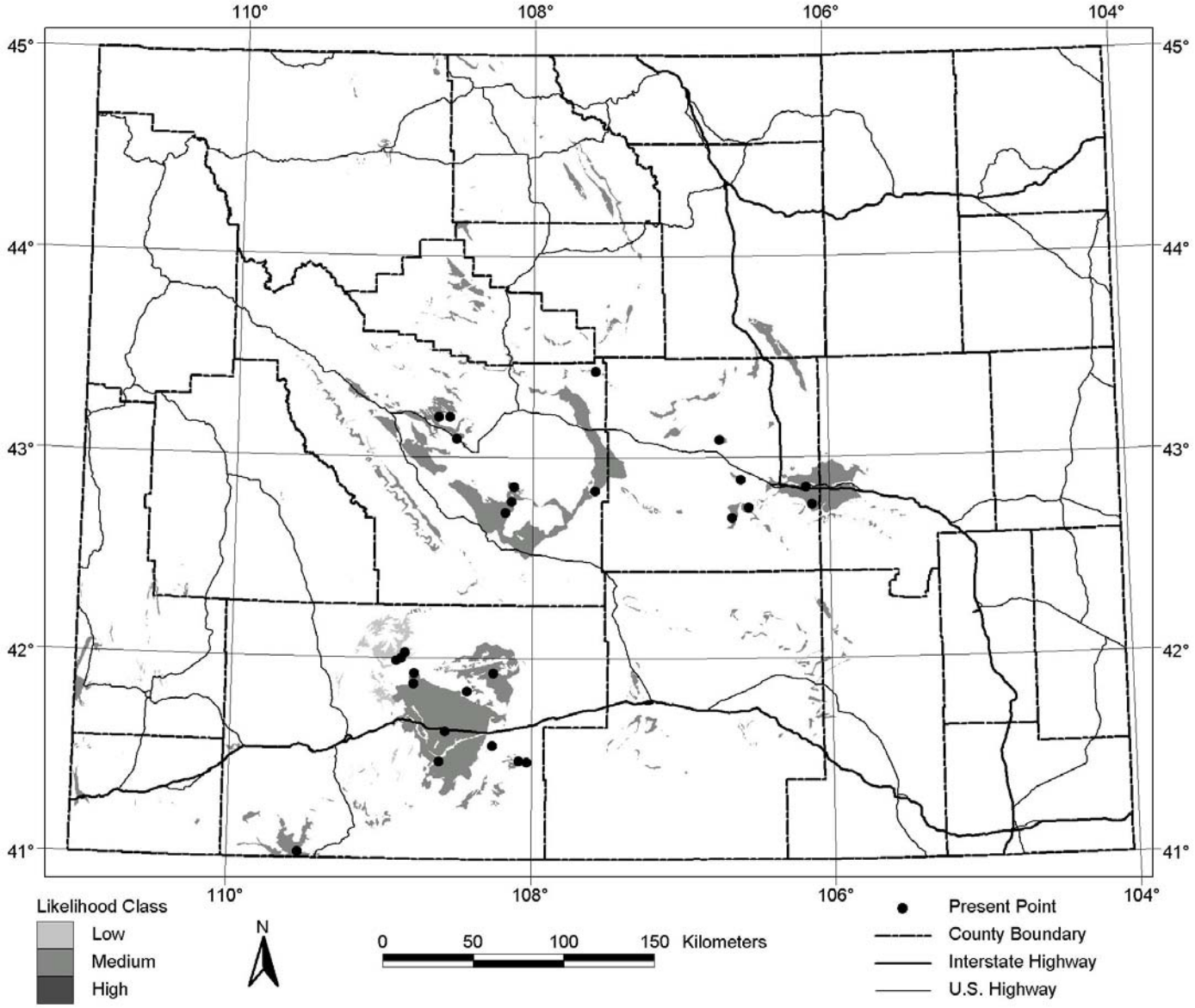
Classification Tree Output

Node_Num) Node_Def Node_Size (Num_No,Num_Yes) (Pct_No,Pct_Yes) Node_Type
1) root 975 (954,21) (100,100) Yes
  2) PT07<2.315 192 (174,18) (18.2,85.7) Yes
    4) NWD<47.25 45 (34,11) (3.6,52.4) Yes
      8) TA04<6.96 26 (15,11) (1.6,52.4) Yes
        16) LANDCOV:BsnRk,HmDis,StBsh 5 (0,5) (0,23.8) **Yes ***
        17) LANDCOV:AcDun,DstSh,FrRip,Junpr,ShRip,WySge 21 (15,6) (1.6,28.6) Yes
          34) PT10<2.12 9 (9,0) (0.9,0) No *
          35) PT10>2.12 12 (6,6) (0.6,28.6) **Yes ***
      9) TA04>6.96 19 (19,0) (2,0) No *
    5) NWD>47.25 147 (140,7) (14.7,33.3) Yes
      10) PT10<2.915 125 (123,2) (12.9,9.5) No
        20) ELEV<2264.5 121 (121,0) (12.7,0) No *
        21) ELEV>2264.5 4 (2,2) (0.2,9.5) **Yes ***
      11) PT10>2.915 22 (17,5) (1.8,23.8) Yes
        22) SOIL:WY16C,WY17C,WY35,WY38C,WY40C,WY41 11 (11,0) (1.2,0) No *
        23) SOIL:WY27,WY42,WY44 11 (6,5) (0.6,23.8) **Yes ***
  3) PT07>2.315 783 (780,3) (81.8,14.3) No
    6) BEDGEOL:Kmix,Pze 99 (96,3) (10.1,14.3) Yes
      12) PT07<2.925 27 (24,3) (2.5,14.3) Yes
        24) PT07<2.745 20 (20,0) (2.1,0) No *
        25) PT07>2.745 7 (4,3) (0.4,14.3) **Yes ***
      13) PT07>2.925 72 (72,0) (7.5,0) No *
    7) BEDGEOL:Eex,Ein,Eoe,Eol,Ksh,Kss,MiPl,Olg,PCf,PCm,PTJ, Pal,Qal,Qls,Qs,Qt,Qvf,TQc,Tlvf 684 (684,0) (71.7,0) No *

Path Composition and Likelihood

Yes Path	Node List	% of Present Points	Likelihood Class
a	16, 8, 4, 2	23.8	Medium
b	35, 17, 8, 4, 2	28.6	Medium
c	21, 10, 5, 2	9.5	Low
d	23, 11, 5, 2	23.8	Medium
e	25, 12, 6, 3	14.3	Medium

Predicted Distribution in Wyoming



Classification Rates for Wyoming Points

Model-Building Points

	Model Present	Model Absent		
Known Present	20 / 21 95.2%	1 / 21 4.8%	Total Correct	955 / 975 97.9%
Known Absent	19 / 954 2.0%	935 / 954 98.0%	Total Incorrect	20 / 975 2.1%

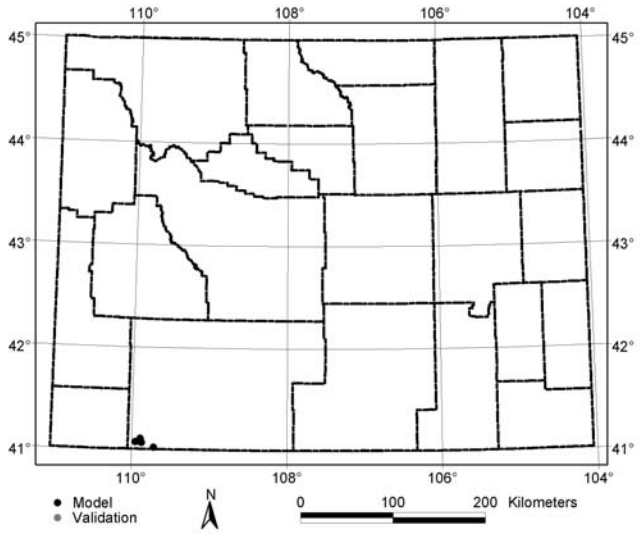
Validation Points

	Model Present	Model Absent		
Known Present	3 / 6 50.0%	3 / 6 50.0%	Total Correct	176 / 189 93.1%
Known Absent	10 / 183 5.5%	173 / 183 94.5%	Total Incorrect	13 / 189 6.9%

Area of Predicted Distribution: 8,509 km^2 (3.4% of WY)

Astragalus proimanthus Barneby

Known Distribution in Wyoming



Numbers of Points for Modeling

	Model	Validation	Total
Known Present	6	0	6
Known Absent	962	145	1107
Total	968	145	1113

Data Source (Points)

Wyoming Heritage Program (6)

Modeling Notes

Factor used to expand ranges: 0.05
Biomes used for validation: IDGRS, IDS

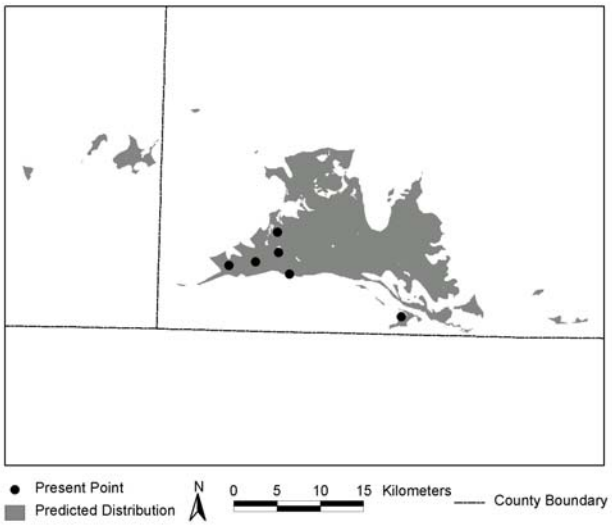
Ranges of Continuous Variables

	MIN	MAX	UNITS
ELEV	1889	2267	m
RELIEF	41	164	m
PT01	1.37	1.73	cm
PT04	3.11	3.55	cm
PT07	1.96	2.54	cm
PT10	3.01	3.61	cm
RT01	7.32	8.41	$MJ/m^2/day$
RT07	23.80	26.42	$MJ/m^2/day$
TA01	-7.40	-5.07	^oC
TA04	3.54	6.92	^oC
TA07	16.90	20.29	^oC
TA10	5.19	8.18	^oC

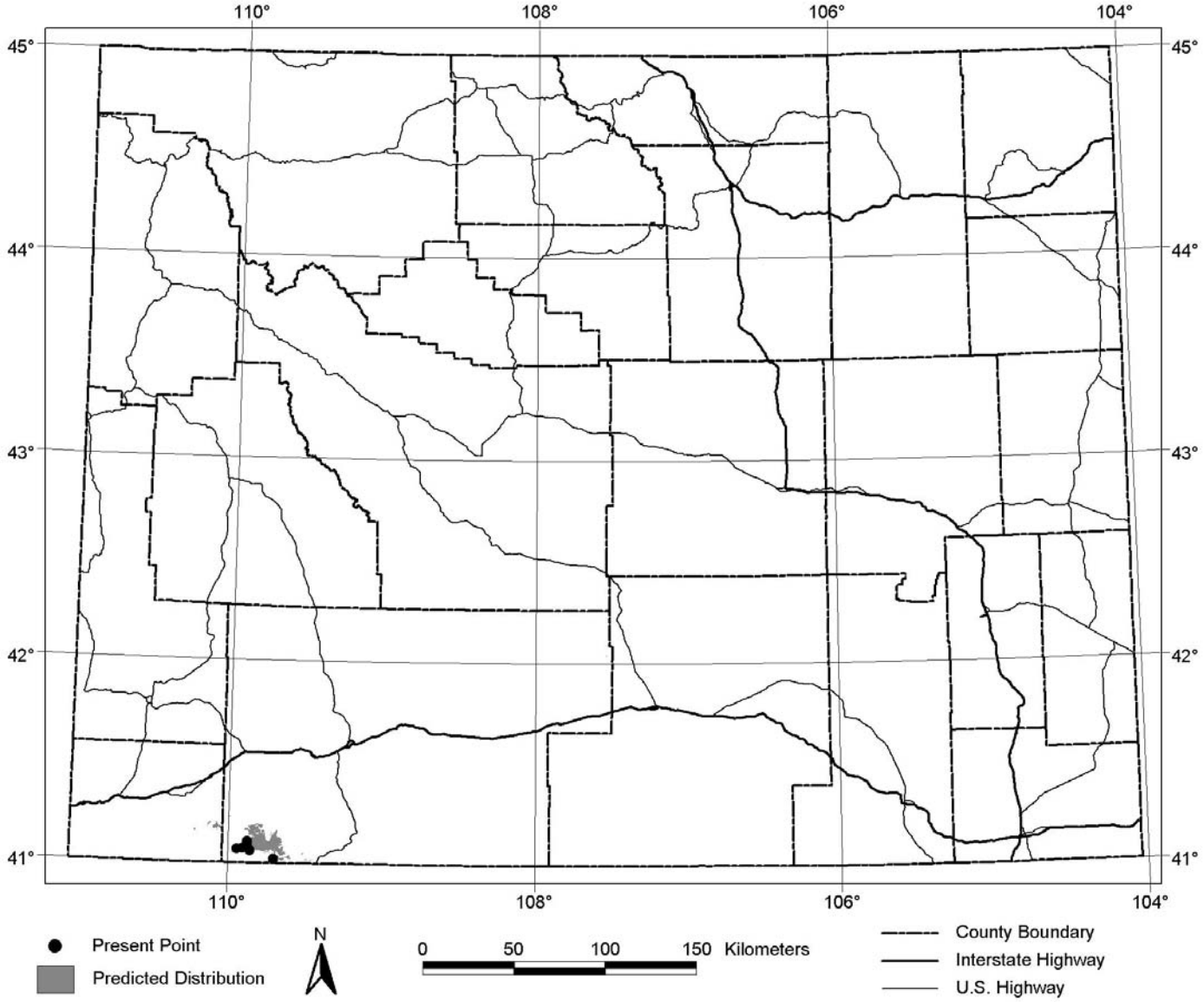
Values of Categorical Variables

BEDGEOL: Eoe, Eol
LANDCOV: DstSh, WySge
SOIL: WY17C, WY27, WY44
SURFGEOL: oai, ri, sci

Detailed View of Predicted Distribution



Predicted Distribution in Wyoming



Classification Rates

Model-Building Points

	Model Present	Model Absent		
Known Present	6 / 6 100.0%	0 / 6 0.0%	Total Correct	968 / 968 100.0%
Known Absent	0 / 962 0.0%	962 / 962 100.0%	Total Incorrect	0 / 968 0.0%

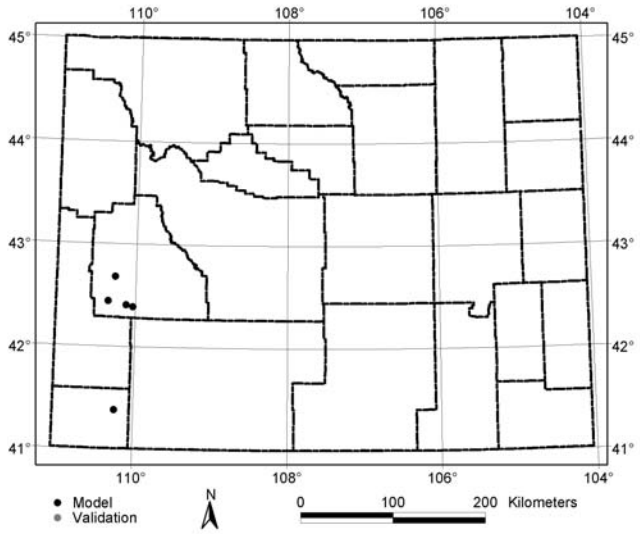
Validation Points

	Model Present	Model Absent		
Known Present	0 / 0	0 / 0	Total Correct	145 / 145 100.0%
Known Absent	0 / 145 0.0%	145 / 145 100.0%	Total Incorrect	0 / 145 0.0%

Area of Predicted Distribution: 258 km^2 (0.10% of WY)

Astragalus racemosus Pursh var. *treleasei* Porter

Known Distribution in Wyoming



Numbers of Points for Modeling

	Model	Validation	Total
Known Present	5	0	5
Known Absent	960	131	1091
Total	965	131	1096

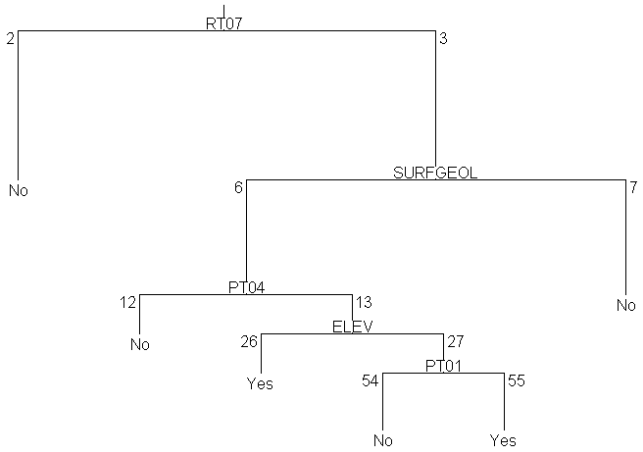
Data Source (Points)

Rocky Mountain Herbarium (1)
Wyoming Heritage Program (4)

Modeling Notes

Independent variables: ELEV, RELIEF, PT01, PT04, PT07, PT10, NWD, RT01, RT07, TA01, TA04, TA07, TA10, TX07, NFD, GDD, BEDGEOL, LANDCOV, SOIL, SURFGEOL
Minimum number of observations before split: 1
Minimum node size: 2
Minimum node deviance: 0.01
Minimum percent for pruning: 0.0
Biomes used for validation: IDGRS

Classification Tree Used in Model Building



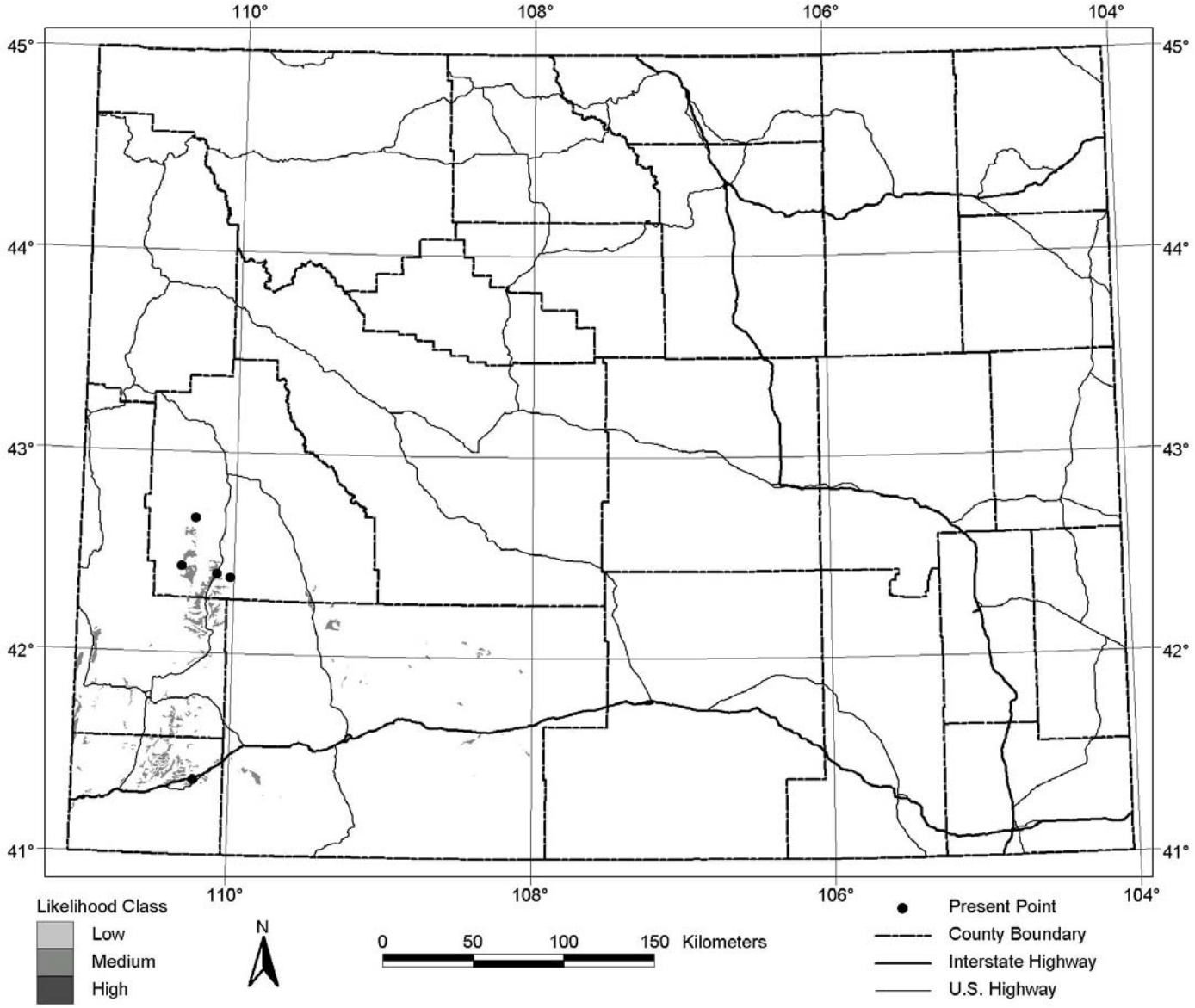
Classification Tree Output

Node_Num) Node_Def Node_Size (Num_No,Num_Yes) (Pct_No,Pct_Yes) Node_Type
1) root 965 (960,5) (100,100) Yes
  2) RT07<2556.5 869 (869,0) (90.5,0) No *
  3) RT07>2556.5 96 (91,5) (9.5,100) Yes
    6) SURFGEOL:sci 18 (13,5) (1.4,100) Yes
      12) PT04<230 7 (7,0) (0.7,0) No *
      13) PT04>230 11 (6,5) (0.6,100) Yes
        26) ELEV<2107 3 (0,3) (0,60) **Yes ***
        27) ELEV>2107 8 (6,2) (0.6,40) Yes
          54) PT01<394 6 (6,0) (0.6,0) No *
          55) PT01>394 2 (0,2) (0,40) **Yes ***
    7) SURFGEOL:LAKE,Ri,ai,ei,fi,li,pea,ri,ti 78 (78,0) (8.1,0) No *

Path Composition and Likelihood

Yes Path	Node List	% of Present Points	Likelihood Class
a	26, 13, 6, 3	60.0	Medium
b	55, 27, 13, 6, 3	40.0	Medium

Predicted Distribution in Wyoming



Classification Rates

Model-Building Points

	Model Present	Model Absent		
Known Present	5 / 5 100.0%	0 / 5 0.0%	Total Correct	965 / 965 100.0%
Known Absent	0 / 960 0.0%	960 / 960 100.0%	Total Incorrect	0 / 965 0.0%

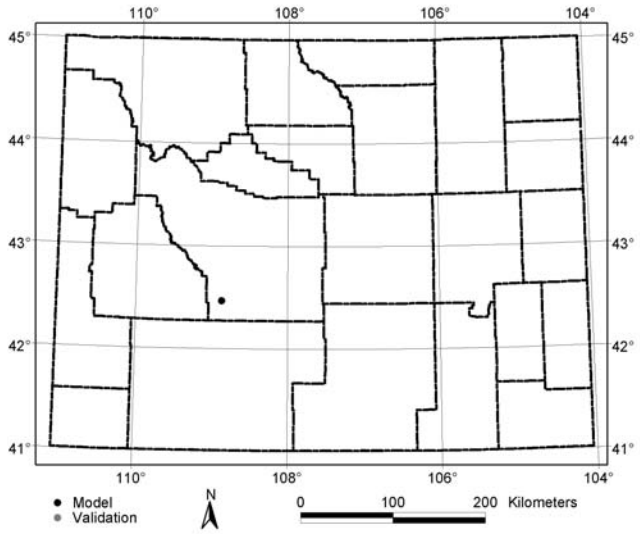
Validation Points

	Model Present	Model Absent		
Known Present	0 / 0	0 / 0	Total Correct	131 / 131 100.0%
Known Absent	0 / 131 0.0%	131 / 131 100.0%	Total Incorrect	0 / 131 0.0%

Area of Predicted Distribution: 889 km^2 (0.35% of WY)

Boechera pusilla (Rollins) Dorn

Known Distribution in Wyoming



Numbers of Points for Modeling

	Model	Validation	Total
Known Present	1	0	1
Known Absent	963	134	1097
Total	964	134	1098

Data Source (Points)

Wyoming Heritage Program (1)

Modeling Notes

Factor used to expand ranges: 0.05
Biomes used for validation: IDGRS

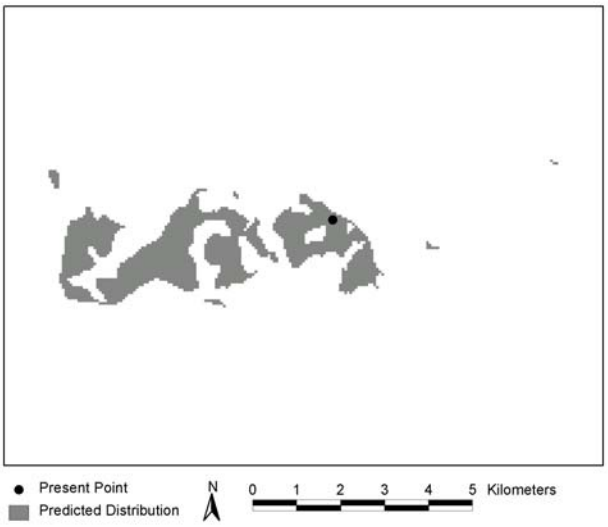
Ranges of Continuous Variables

	MIN	MAX	UNITS
ELEV	2312	2556	m
RELIEF	56	114	m
PT01	3.88	4.28	cm
PT04	5.68	6.28	cm
PT07	2.83	3.13	cm
PT10	3.13	3.45	cm
RT01	7.05	7.79	$MJ/m^2/day$
RT07	24.13	26.67	$MJ/m^2/day$
TA01	-9.54	-7.54	^oC
TA04	0.50	2.50	^oC
TA07	14.10	16.10	^oC
TA10	2.50	4.50	^oC

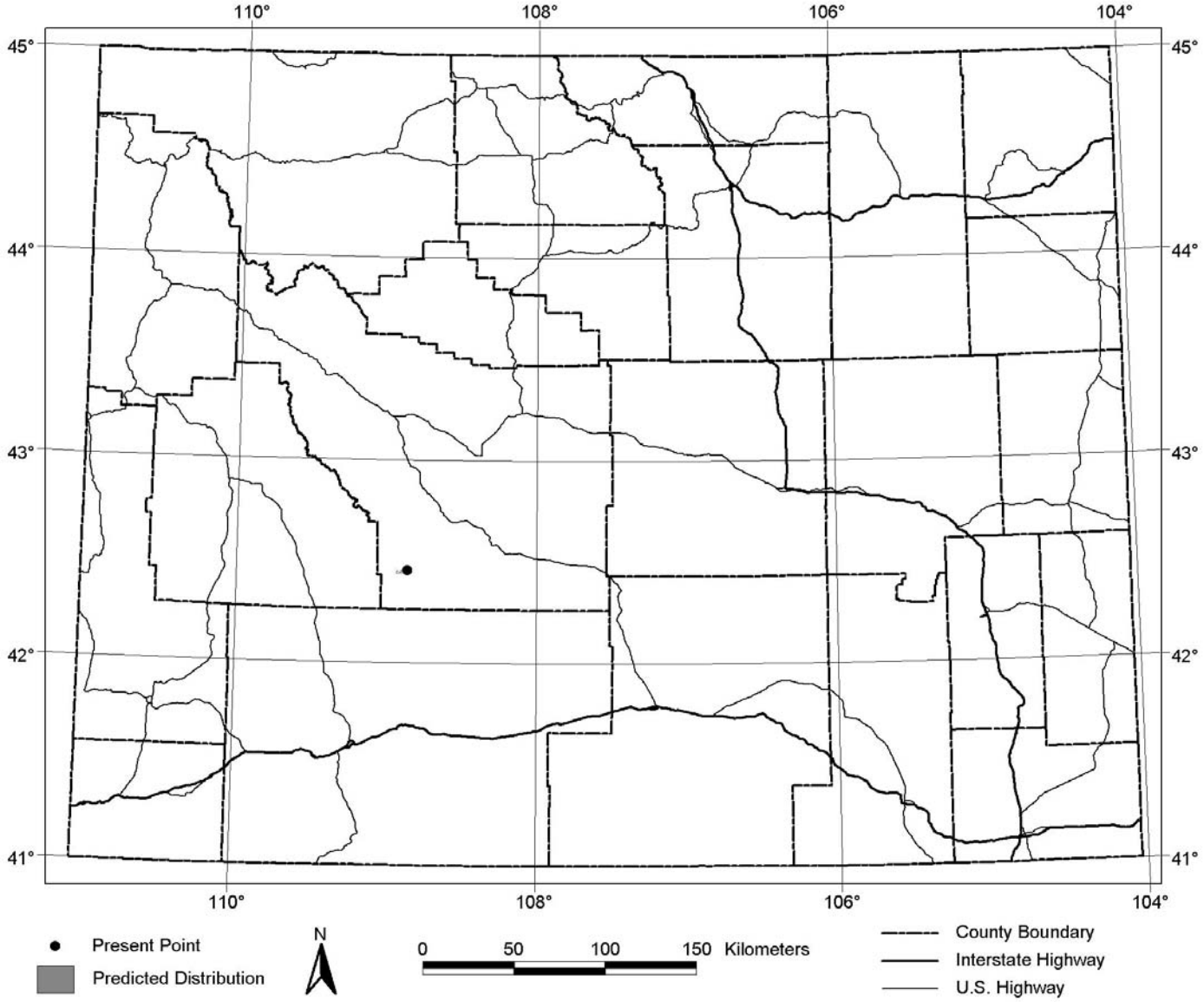
Values of Categorical Variables

BEDGEOL: PCf
LANDCOV: WySge
SOIL: WY08C
SURFGEOL: ui

Detailed View of Predicted Distribution



Predicted Distribution in Wyoming



Classification Rates

Model-Building Points

	Model Present	Model Absent		
Known Present	1 / 1 100.0%	0 / 1 0.0%	Total Correct	964 / 964 100.0%
Known Absent	0 / 963 0.0%	963 / 963 100.0%	Total Incorrect	0 / 964 0.0%

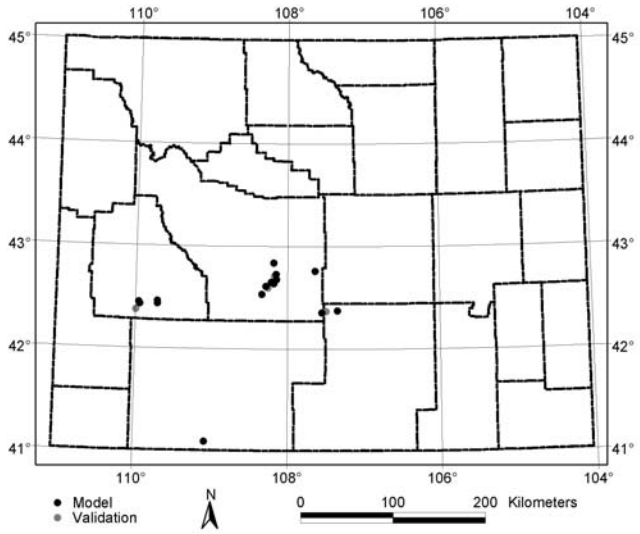
Validation Points

	Model Present	Model Absent		
Known Present	0 / 0	0 / 0	Total Correct	134 / 134 100.0%
Known Absent	0 / 134 0.0%	134 / 134 100.0%	Total Incorrect	0 / 134 0.0%

Area of Predicted Distribution: 8.0 km^2 (0.00% of WY)

Cirsium aridum Dorn

Known Distribution in Wyoming



Numbers of Points for Modeling

	Model	Validation	Total
Known Present	15	4	19
Known Absent	961	185	1146
Total	976	189	1165

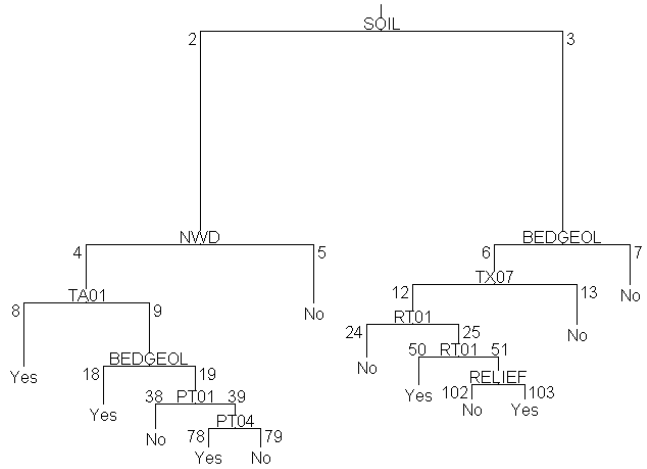
Data Source (Points)

Wyoming Heritage Program (19)

Modeling Notes

Independent variables: ELEV, RELIEF, PT01, PT04, PT07, PT10, NWD, RT01, RT07, TA01, TA04, TA07, TA10, TX07, NFD, GDD, BEDGEOL, LANDCOV, SOIL, SURFGEOL
Minimum number of observations before split: 2
Minimum node size: 4
Minimum node deviance: 0.01
Minimum percent for pruning: 0.2
Biomes used for validation: FOOT, IDGRS, IDS

Classification Tree Used in Model Building



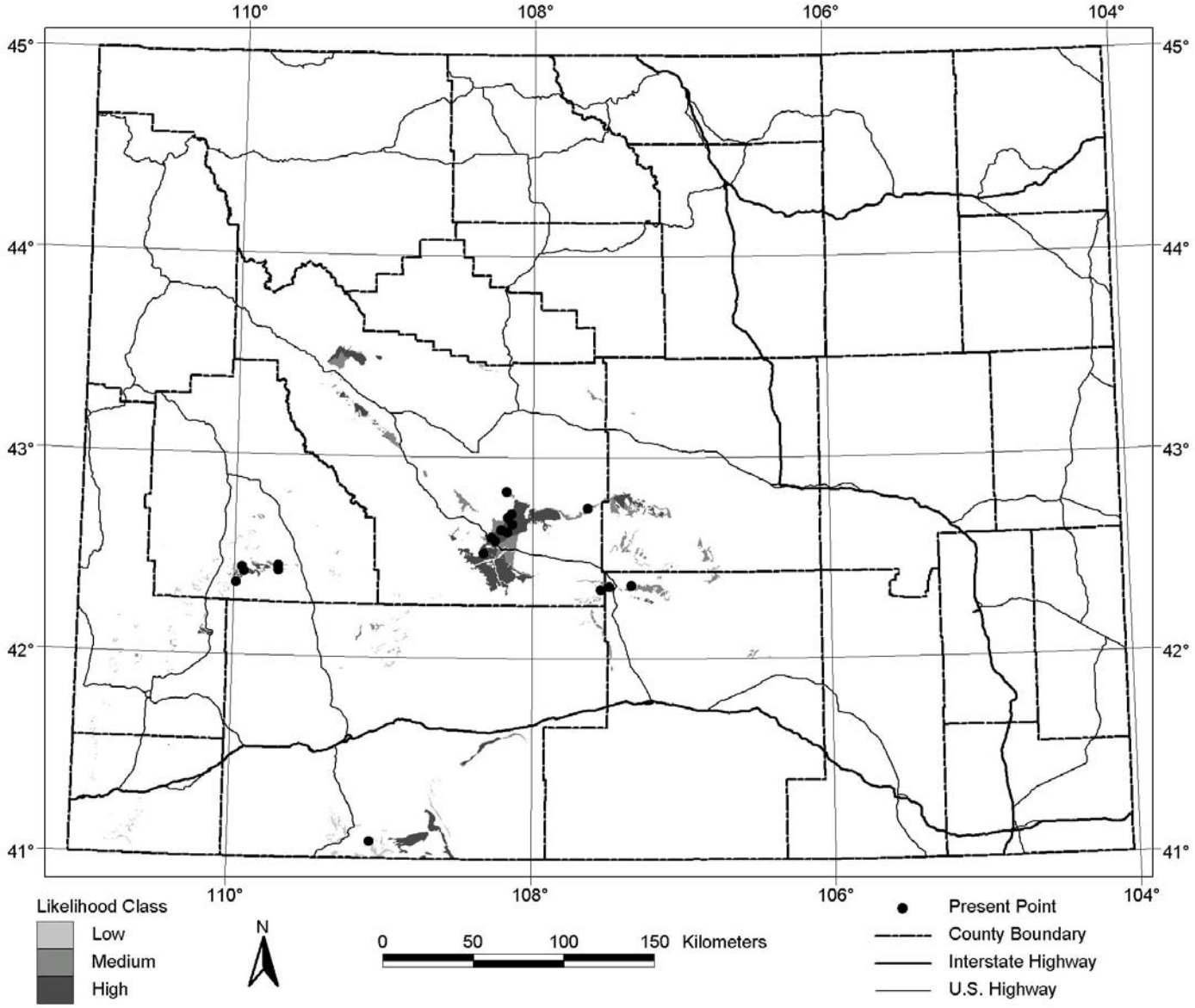
Classification Tree Output

Node_Num) Node_Def Node_Size (Num_No,Num_Yes) (Pct_No,Pct_Yes) Node_Type
1) root 976 (961,15) (100,100) Yes
  2) SOIL:WY34,WY41 67 (55,12) (5.7,80) Yes
    4) NWD<58.5 40 (28,12) (2.9,80) Yes
      8) TA01<-6.99 10 (2,8) (0.2,53.3) **Yes ***
      9) TA01>-6.99 30 (26,4) (2.7,26.7) Yes
        18) BEDGEOL:Eol 2 (0,2) (0,13.3) **Yes ***
        19) BEDGEOL:Eoe,MiPl,Olg,Pal,TQc 28 (26,2) (2.7,13.3) Yes
          38) PT01<1.29 21 (21,0) (2.2,0) No *
          39) PT01>1.29 7 (5,2) (0.5,13.3) Yes
            78) PT04<3.945 3 (1,2) (0.1,13.3) **Yes ***
            79) PT04>3.945 4 (4,0) (0.4,0) No *
    5) NWD>58.5 27 (27,0) (2.8,0) No *
  3) SOIL:WY01,WY06C,WY07C,WY08C,WY10,WY11,WY14, WY15,WY16C,WY17C,WY18,WY20,WY23,WY27,WY31C, WY35,WY36,WY38C,WY40C,WY42,WY44,WY45
    909 (906,3) (94.3,20) No
    6) BEDGEOL:Eoe 179 (176,3) (18.3,20) Yes
      12) TX07<25.83 37 (34,3) (3.5,20) Yes
        24) RT01<7.415 26 (26,0) (2.7,0) No *
        25) RT01>7.415 11 (8,3) (0.8,20) Yes
          50) RT01<7.43 2 (0,2) (0,13.3) **Yes ***
          51) RT01>7.43 9 (8,1) (0.8,6.7) Yes
            102) RELIEF<244 7 (7,0) (0.7,0) No *
            103) RELIEF>244 2 (1,1) (0.1,6.7) **Yes ***
      13) TX07>25.83 142 (142,0) (14.8,0) No *
    7) BEDGEOL:Eex,Ein,Eol,H2O,Kmix,Ksh,Kss,MiPl,Olg,PCf,PCm, PTJ,Pal,Pze,Qal,Qlc,Qls,Qs,Qt,Qvf,TQc,Tlvf
      730 (730,0) (76,0) No *

Path Composition and Likelihood

Yes Path	Node List	% of Present Points	Likelihood Class
a	8, 4, 2	53.3	High
b	18, 9, 4, 2	13.3	Medium
c	78, 39, 19, 9, 4, 2	13.3	Medium
d	50, 25, 12, 6, 3	13.3	Medium
e	103, 51, 25, 12, 6, 3	6.7	Low

Predicted Distribution in Wyoming



Classification Rates

Model-Building Points

	Model Present	Model Absent		
Known Present	14 / 15 93.3%	1 / 15 6.7%	Total Correct	970 / 976 99.4%
Known Absent	5 / 961 0.5%	956 / 961 99.5%	Total Incorrect	6 / 976 0.6%

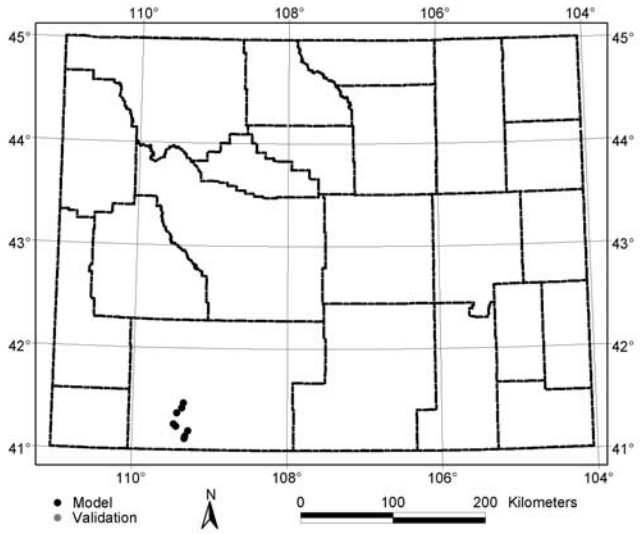
Validation Points

	Model Present	Model Absent		
Known Present	3 / 4 75.0%	1 / 4 25.0%	Total Correct	184 / 189 97.4%
Known Absent	4 / 185 2.2%	181 / 185 97.8%	Total Incorrect	5 / 189 2.6%

Area of Predicted Distribution: 2,204 km^2 (0.87% of WY)

Cirsium ownbeyi Welsh

Known Distribution in Wyoming



Numbers of Points for Modeling

	Model	Validation	Total
Known Present	8	0	8
Known Absent	961	172	1133
Total	969	172	1141

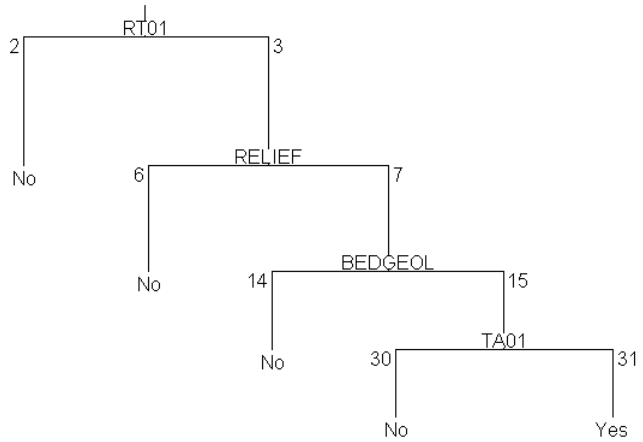
Data Source (Points)

Wyoming Heritage Program (8)

Modeling Notes

Independent variables: ELEV, RELIEF, PT01, PT04, PT07, PT10, NWD, RT01, RT07, TA01, TA04, TA07, TA10, TX07, NFD, GDD, BEDGEOL, LANDCOV, SOIL, SURFGEOL
Minimum number of observations before split: 1
Minimum node size: 2
Minimum node deviance: 0.01
Minimum percent for pruning: 0.7
Biomes used for validation: FOOT, IDGRS

Classification Tree Used in Model Building



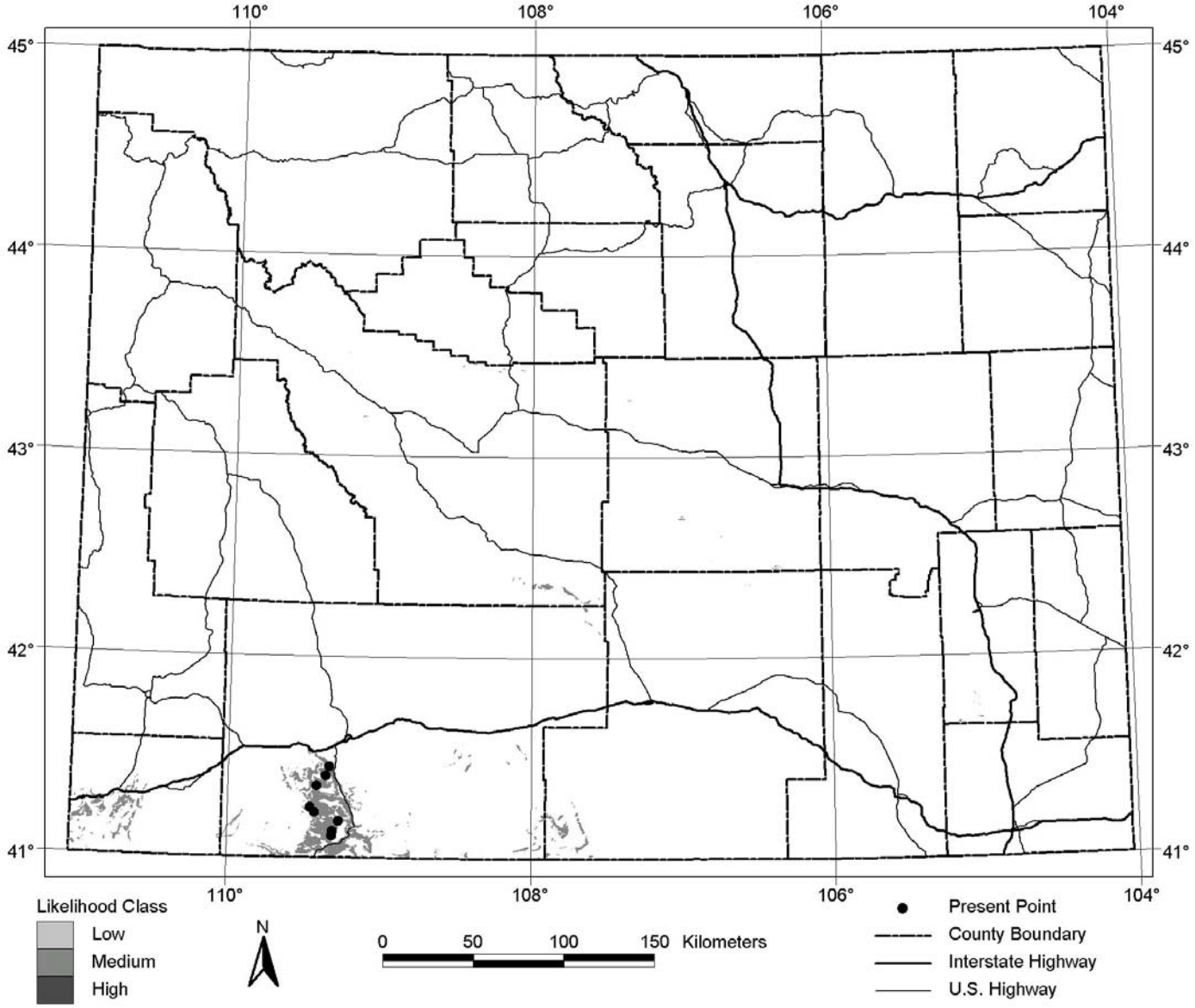
Classification Tree Output

Node_Num) Node_Def Node_Size (Num_No,Num_Yes) (Pct_No,Pct_Yes) Node_Type
1) root 969 (961,8) (100,100) Yes
  2) RT01<7.435 755 (755,0) (78.6,0) No *
  3) RT01>7.435 214 (206,8) (21.4,100) Yes
    6) RELIEF<108.5 150 (150,0) (15.6,0) No *
    7) RELIEF>108.5 64 (56,8) (5.8,100) Yes
      14) BEDGEOL:Eol,Kmix,Kss,MiPl,PCf,PTJ,Pal,Pze,Qt 36 (36,0) (3.7,0) No *
      15) BEDGEOL:Eoe,TQc 28 (20,8) (2.1,100) Yes
        30) TA01<-7.30 13 (13,0) (1.4,0) No *
        31) TA01>-7.30 15 (7,8) (0.7,100) **Yes ***

Path Composition and Likelihood

Yes Path	Node List	% of Present Points	Likelihood Class
a	31, 15, 7, 3	100.0	Medium

Predicted Distribution in Wyoming



Classification Rates

Model-Building Points

	Model Present	Model Absent		
Known Present	7 / 8 87.5%	1 / 8 12.5%	Total Correct	961 / 969 99.2%
Known Absent	7 / 961 0.7%	954 / 961 99.3%	Total Incorrect	8 / 969 0.8%

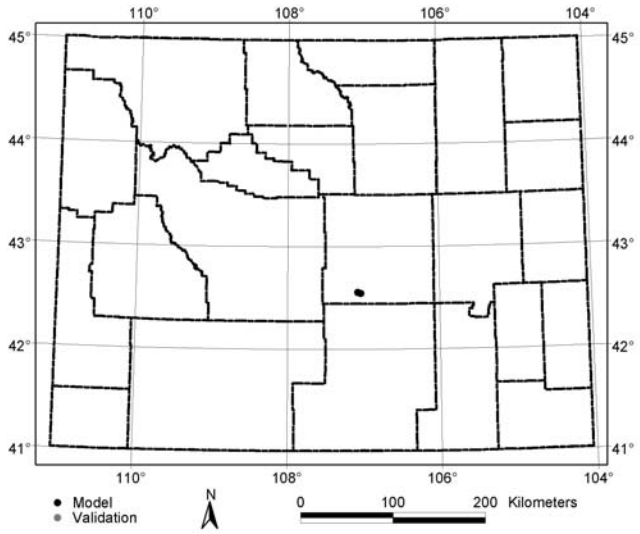
Validation Points

	Model Present	Model Absent		
Known Present	0 / 0	0 / 0	Total Correct	172 / 172 100.0%
Known Absent	0 / 172 0.0%	172 / 172 100.0%	Total Incorrect	0 / 172 0.0%

Area of Predicted Distribution: 1,499 km^2 (0.59% of WY)

Cleome multicaulis DC.

Known Distribution in Wyoming



Numbers of Points for Modeling

	Model	Validation	
Known Present	2	0	2
Known Absent	963	160	1123
Total	965	160	1125

Data Source (Points)

Wyoming Heritage Program (2)

Modeling Notes

Factor used to expand ranges: 0.2
Biomes used for validation: IDGRS, WET
Riparian types: LakRipI, LakRipP

The wetland model is the intersection of the distribution predicted by the range model with the listed types from the riparian/aquatic model.

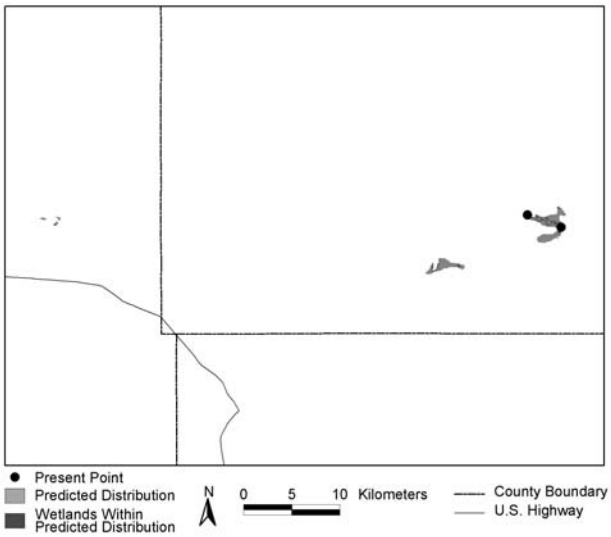
Ranges of Continuous Variables

	MIN	MAX	UNITS
ELEV	1429	2143	m
RELIEF	0	36	m
PT01	0.86	1.33	cm
PT04	2.51	3.90	cm
PT07	1.63	2.52	cm
PT10	2.15	3.26	cm
RT01	5.71	8.58	$MJ/m^2/day$
RT07	19.81	29.75	$MJ/m^2/day$
TA01	-9.22	-1.21	^oC
TA04	1.96	10.04	^oC
TA07	16.32	24.40	^oC
TA10	3.50	11.57	^oC

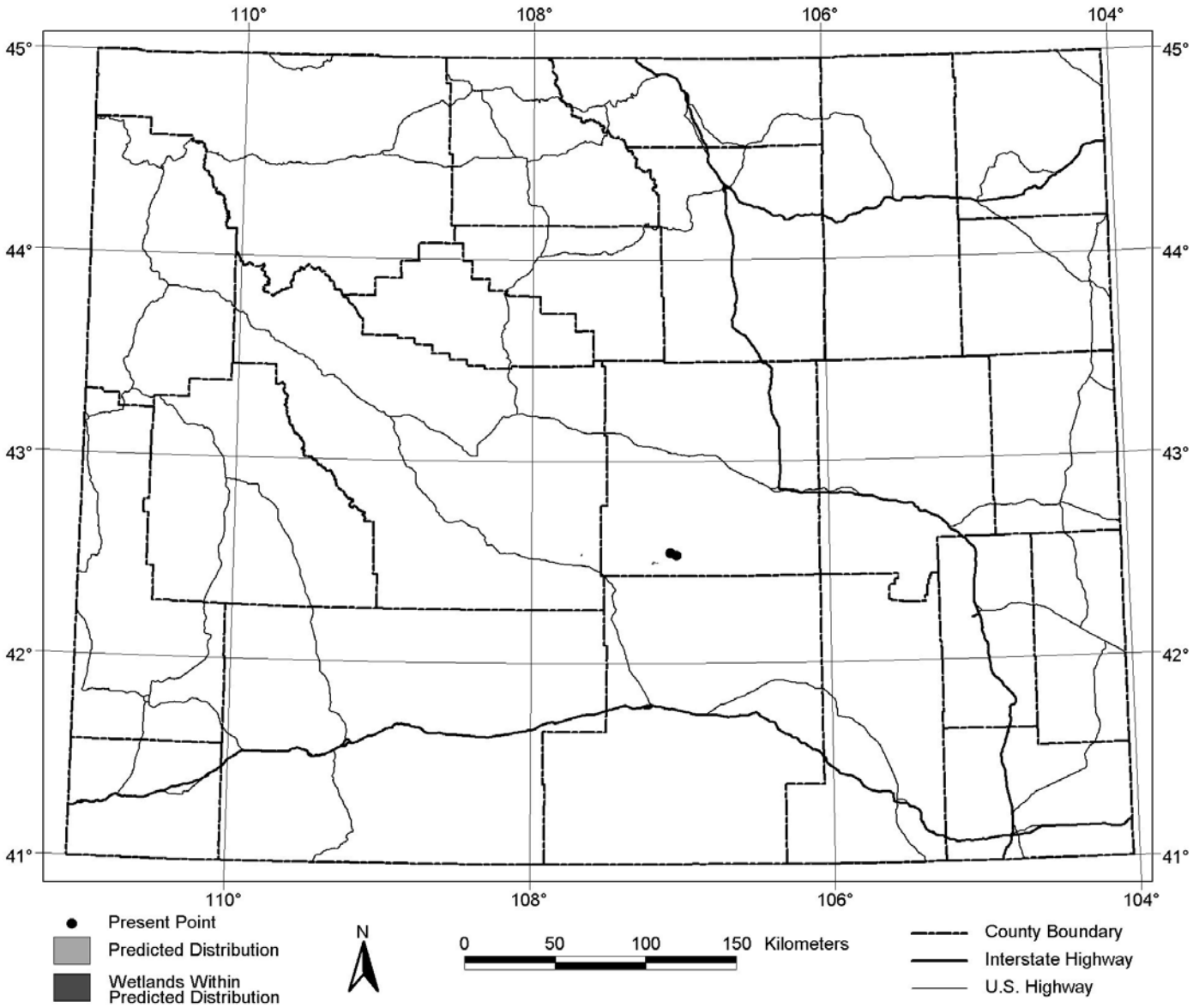
Values of Categorical Variables

BEDGEOL: MiPl, Qlc
LANDCOV: GrsWd, GrWet, Playa
SOIL: WY34
SURFGEOL: pea

Detailed View of Predicted Distribution



Predicted Distribution in Wyoming



Classification Rates for Wyoming Points

Model-Building Points

	Predicted		Wetlands	
	Model Present	Model Absent	Model Present	Model Absent
Known Present	2 / 2 100.0%	0 / 2 0.0%	2 / 2 100.0%	0 / 2 0.0%
Known Absent	0 / 963 0.0%	963 / 963 100.0%	0 / 963 0.0%	963 / 963 100.0%
Total Correct	965 / 965 100.0%		965 / 965 100.0%	
Total Incorrect	0 / 965 0.0%		0 / 965 0.0%	

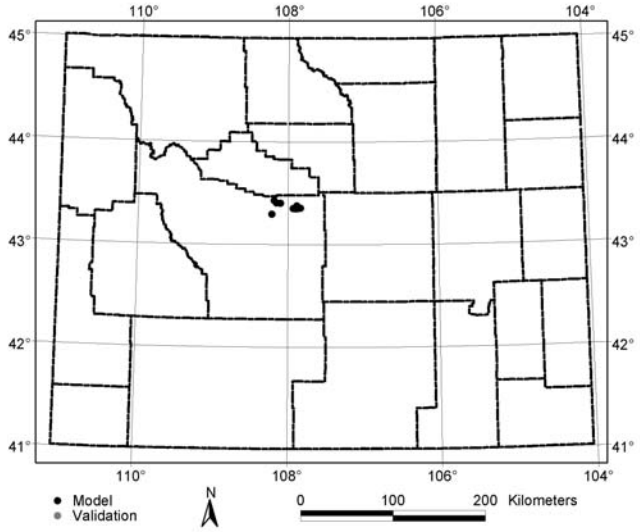
Validation Points

	Predicted		Wetlands	
	Model Present	Model Absent	Model Present	Model Absent
Known Present	0 / 0	0 / 0	0 / 0	0 / 0
Known Absent	0 / 160 0.0%	160 / 160 100.0%	0 / 160 0.0%	160 / 160 100.0%
Total Correct	160 / 160 100.0%		160 / 160 100.0%	
Total Incorrect	0 / 160 0.0%		0 / 160 0.0%	

Area of Predicted Distribution: 8.6 km^2 (0.00% of WY); **Wetlands:** 1.5 km^2 (0.00% of WY)

Cryptantha subcapitata Dorn & Lichvar

Known Distribution in Wyoming



Numbers of Points for Modeling

	Model	Validation	Total
Known Present	9	0	9
Known Absent	962	146	1108
Total	971	146	1117

Data Source (Points)

Rocky Mountain Herbarium (1)
Wyoming Heritage Program (8)

Modeling Notes

Factor used to expand ranges: 0.05
Biomes used for validation: IDGRS, IDS

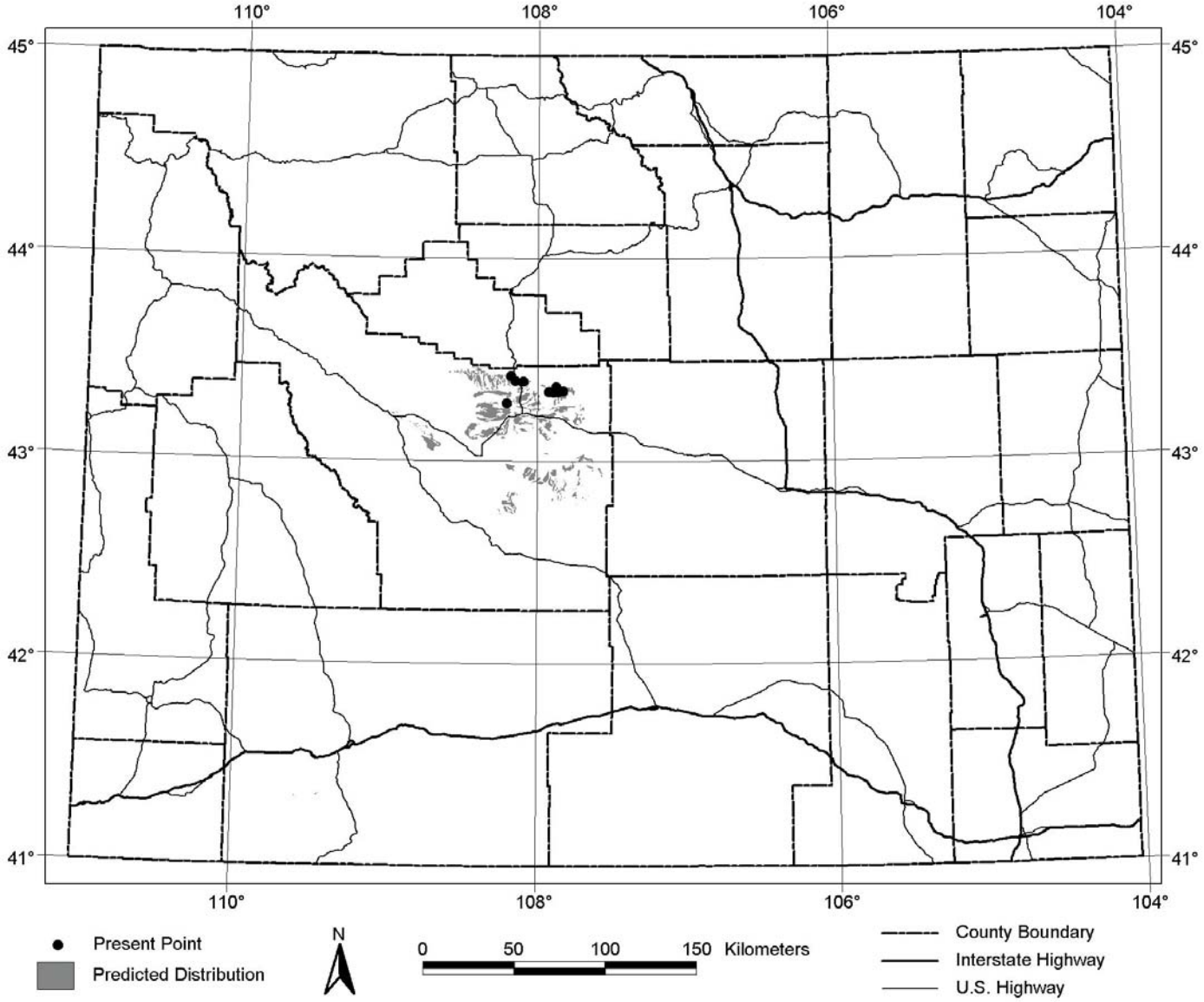
Ranges of Continuous Variables

	MIN	MAX	UNITS
ELEV	1371	1883	m
RELIEF	9	337	m
PT01	0.77	1.20	cm
PT04	2.04	3.28	cm
PT07	1.89	2.62	cm
PT10	1.65	2.59	cm
RT01	6.51	7.71	$MJ/m^2/day$
RT07	23.04	25.89	$MJ/m^2/day$
TA01	-7.59	-5.35	^oC
TA04	4.88	8.93	^oC
TA07	19.09	23.04	^oC
TA10	5.70	9.31	^oC

Values of Categorical Variables

BEDGEOL: Eoe, Eol
LANDCOV: DstSh, MGras, StBsh, WySge
SOIL: WY34, WY42, WY44
SURFGEOL: Ri, fi, sci, ti

Predicted Distribution in Wyoming



Classification Rates

Model-Building Points

	Model Present	Model Absent		
Known Present	8 / 9 88.9%	1 / 9 11.1%	Total Correct	968 / 971 99.7%
Known Absent	2 / 962 0.2%	960 / 962 99.8%	Total Incorrect	3 / 971 0.3%

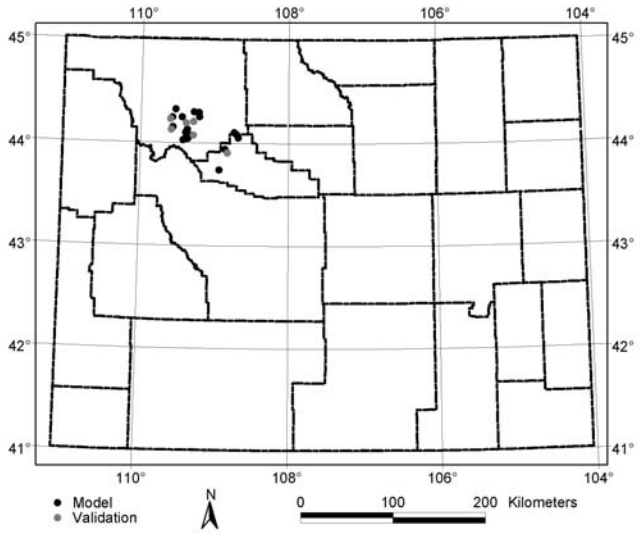
Validation Points

	Model Present	Model Absent		
Known Present	0 / 0	0 / 0	Total Correct	145 / 146 99.3%
Known Absent	1 / 146 0.7%	145 / 146 99.3%	Total Incorrect	1 / 146 0.7%

Area of Predicted Distribution: 847 km^2 (0.33% of WY)

Cymopterus evertii Hartm. & Kirkp.

Known Distribution in Wyoming



Numbers of Points for Modeling

	Model	Validation	Total
Known Present	18	6	24
Known Absent	960	206	1166
Total	978	212	1190

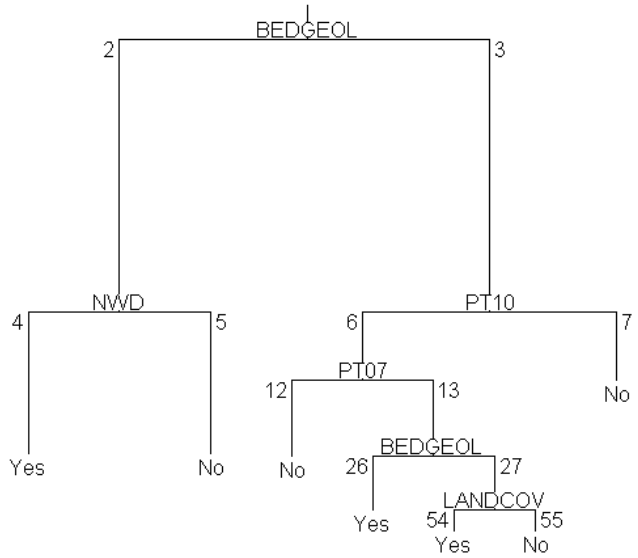
Data Source (Points)

Wyoming Heritage Program (24)

Modeling Notes

Independent variables: ELEV, RELIEF, PT01, PT04, PT07, PT10, NWD, RT01, RT07, TA01, TA04, TA07, TA10, TX07, NFD, GDD, BEDGEOL, LANDCOV, SOIL, SURFGEOL
Minimum number of observations before split: 2
Minimum node size: 4
Minimum node deviance: 0.01
Minimum percent for pruning: 1.3
Biomes used for validation: ALP, FOOT, IDGRS, RMF

Classification Tree Used in Model Building



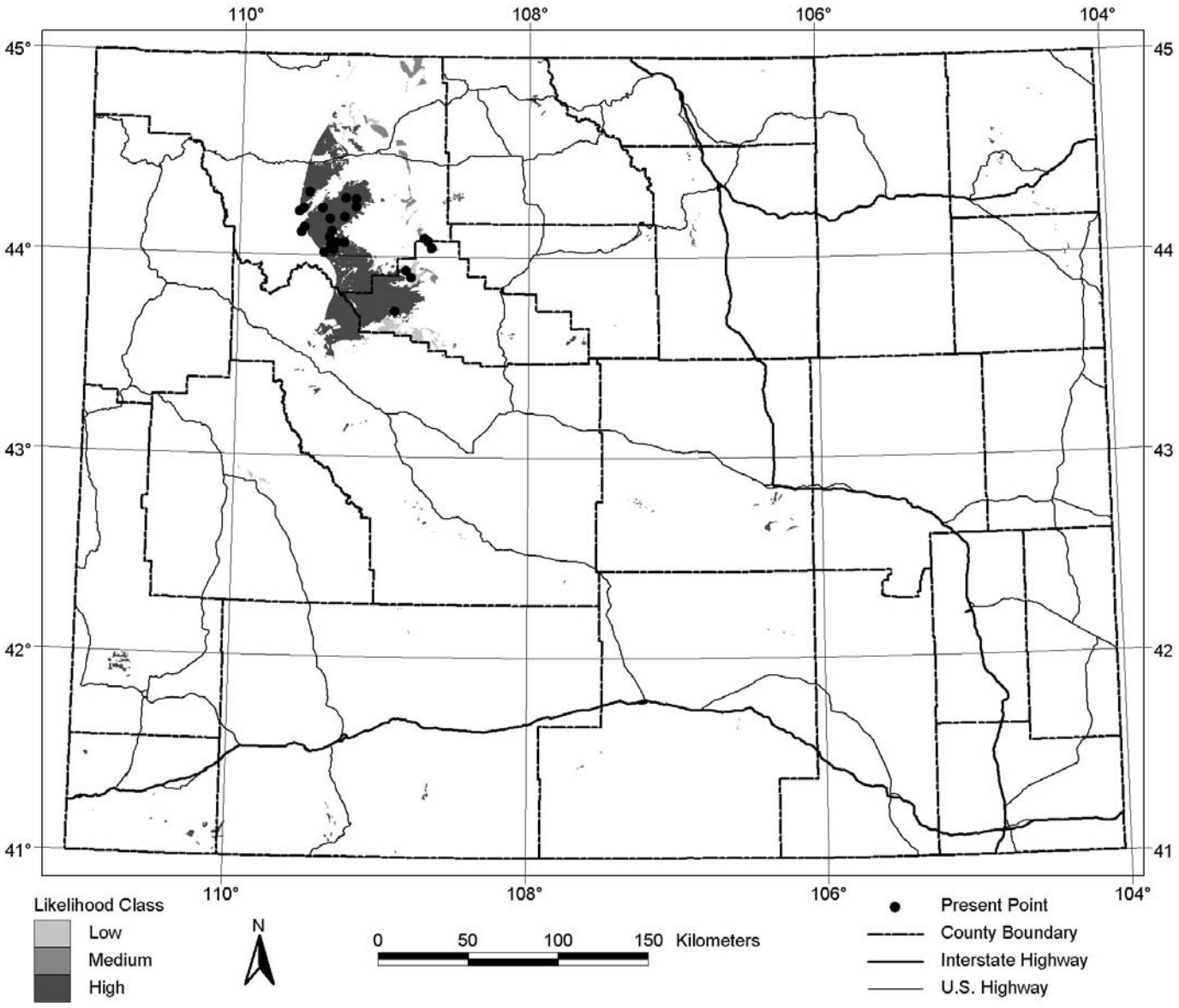
Classification Tree Output

Node_Num) Node_Def Node_Size (Num_No,Num_Yes) (Pct_No,Pct_Yes) Node_Type
1) root 978 (960,18) (100,100) Yes
  2) BEDGEOL:Eex,Qls 64 (50,14) (5.2,77.8) Yes
    4) NWD<744 26 (12,14) (1.3,77.8) **Yes ***
    5) NWD>744 38 (38,0) (4,0) No *
  3) BEDGEOL:Ein,Eoe,Eol,H2O,Kmix,Ksh,Kss,MiPl,Olg,PCf,PCm, PTJ,Pal,Pze,Qal,Qlc,Qs,Qt,Qvf,TQc,Tlvf
    914 (910,4) (94.8,22.2) No
    6) PT10<231.5 141 (137,4) (14.3,22.2) Yes
      12) PT07<301.5 122 (122,0) (12.7,0) No *
      13) PT07>301.5 19 (15,4) (1.6,22.2) Yes
        26) BEDGEOL:Pal 3 (0,3) (0,16.7) **Yes ***
        27) BEDGEOL:Eoe,Kmix,Ksh,Kss,MiPl,Olg,Pze,Qal
          16 (15,1) (1.6,5.6) Yes
          54) LANDCOV:Limbr,MtSge 2 (1,1) (0.1,5.6) **Yes ***
          55) LANDCOV:HmDis,Junpr,SGras,WySge
            14 (14,0) (1.5,0) No *
    7) PT10>231.5 773 (773,0) (80.5,0) No *

Path Composition and Likelihood

Yes Path	Node List	% of Present Points	Likelihood Class
a	4, 2	77.8	High
b	26, 13, 6, 3	16.7	Medium
c	54, 27, 13, 6, 3	5.6	Low

Predicted Distribution in Wyoming



Classification Rates for Wyoming Points

Model-Building Points

	Model Present	Model Absent		
Known Present	18 / 18 100.0%	0 / 18 0.0%	Total Correct	965 / 978 98.7%
Known Absent	13 / 960 1.4%	947 / 960 98.6%	Total Incorrect	13 / 978 1.3%

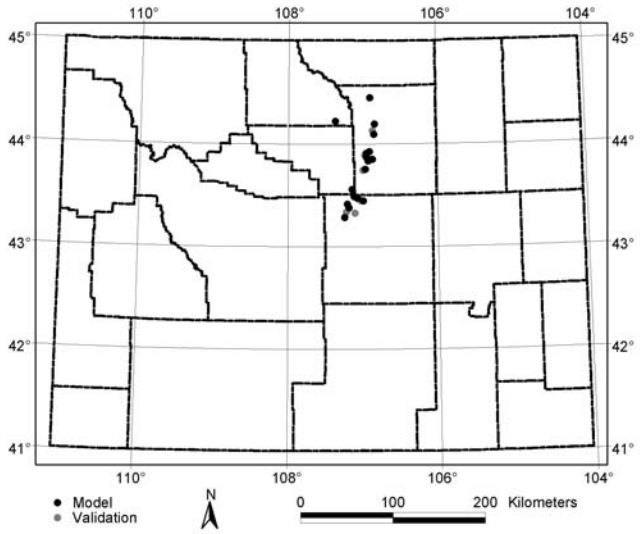
Validation Points

	Model Present	Model Absent		
Known Present	4 / 6 66.7%	2 / 6 33.3%	Total Correct	205 / 212 96.7%
Known Absent	5 / 206 2.4%	201 / 206 97.6%	Total Incorrect	7 / 212 3.3%

Area of Predicted Distribution: 3,935 km^2 (1.6% of WY)

Cymopterus williamsii Hartm. & Const.

Known Distribution in Wyoming



Numbers of Points for Modeling

	Model	Validation	Total
Known Present	18	6	24
Known Absent	960	198	1158
Total	978	204	1182

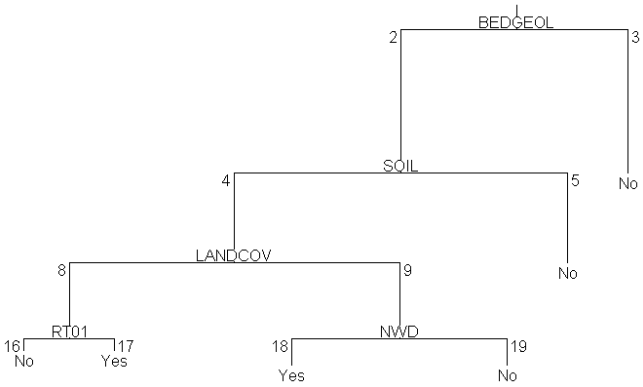
Data Source (Points)

Rocky Mountain Herbarium (2)
Wyoming Heritage Program (22)

Modeling Notes

Independent variables: ELEV, RELIEF, PT01, PT04, PT07, PT10, NWD, RT01, RT07, TA01, TA04, TA07, TA10, TX07, NFD, GDD, BEDGEOL, LANDCOV, SOIL, SURFGEOL
Minimum number of observations before split: 2
Minimum node size: 4
Minimum node deviance: 0.01
Minimum percent for pruning: 0.6
Biomes used for validation: FOOT, IDGRS, RMF

Classification Tree Used in Model Building



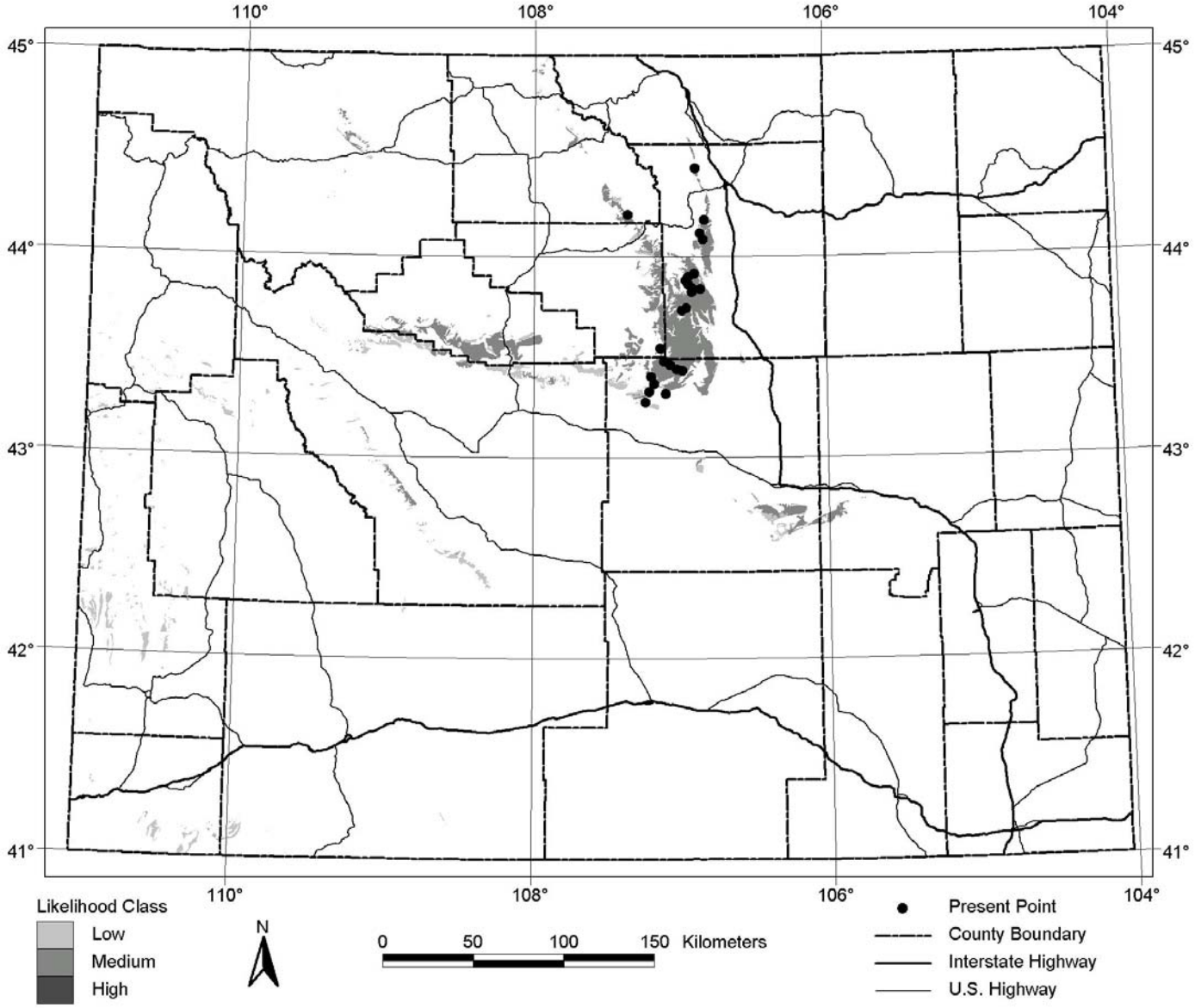
Classification Tree Output

Node_Num) Node_Def Node_Size (Num_No,Num_Yes) (Pct_No,Pct_Yes) Node_Type
1) root 978 (960,18) (100,100) Yes
  2) BEDGEOL:Eol,PTJ,Pze 184 (166,18) (17.3,100) Yes
    4) SOIL:WY06C,WY42 70 (52,18) (5.4,100) Yes
      8) LANDCOV:Aspen,DougF,FrRip,GrWet,HmDis,Junpr,LodgP, MtSge,SbAlp,ShRip,SpFir,StBsh,WhtBk,WySge 42 (41,1) (4.3,5.6) Yes
        16) RT01<6.97 38 (38,0) (4,0) No *
        17) RT01>6.97 4 (3,1) (0.3,5.6) **Yes ***
      9) LANDCOV:AlpRk,Limbr,MGras,Pdosa,XerSh 28 (11,17) (1.1,94.4) Yes
        18) NWD<74.7 23 (6,17) (0.6,94.4) **Yes ***
        19) NWD>74.7 5 (5,0) (0.5,0) No *
    5) SOIL:WY07C,WY08C,WY10,WY14,WY15,WY16C,WY17C, WY20,WY27,WY31C,WY34,WY35,WY36,WY38C,WY40C, WY44,WY45 114 (114,0) (11.9,0) No *
  3) BEDGEOL:Eex,Ein,Eoe,H2O,Kmix,Ksh,Kss,MiPl,Olg,PCf,PCm, Pal,Qal,Qlc,Qls,Qs,Qt,Qvf,TQc,Tlvf 794 (794,0) (82.7,0) No *

Path Composition and Likelihood

Yes Path	Node List	% of Present Points	Likelihood Class
a	17, 8, 4 ,2	5.6	Low
b	18, 9, 4, 2	94.4	Medium

Predicted Distribution in Wyoming



Classification Rates

Model-Building Points

	Model Present	Model Absent		
Known Present	17 / 18 94.4%	1 / 18 5.6%	Total Correct	968 / 978 99.0%
Known Absent	9 / 960 0.9%	951 / 960 99.1%	Total Incorrect	10 / 978 1.0%

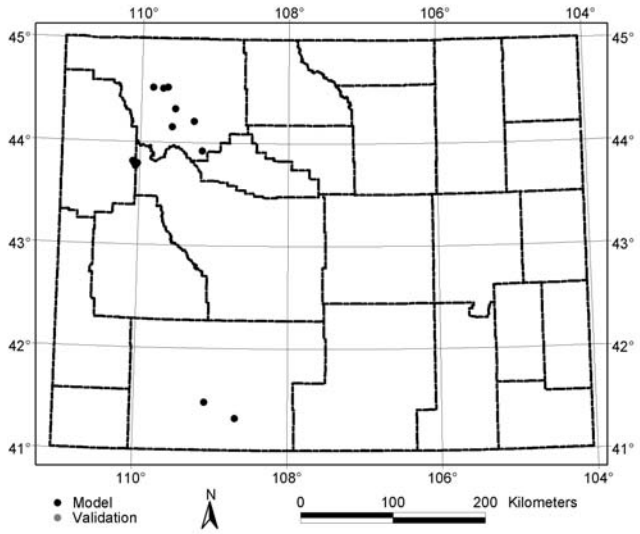
Validation Points

	Model Present	Model Absent		
Known Present	3 / 6 50.0%	3 / 6 50.0%	Total Correct	196 / 204 96.1%
Known Absent	5 / 198 2.5%	193 / 198 97.5%	Total Incorrect	8 / 204 3.9%

Area of Predicted Distribution: 4,535 km^2 (1.8% of WY)

Descurainia torulosa Rollins

Known Distribution in Wyoming



Numbers of Points for Modeling

	Model	Validation	Total
Known Present	13	0	13
Known Absent	960	76	1036
Total	973	76	1049

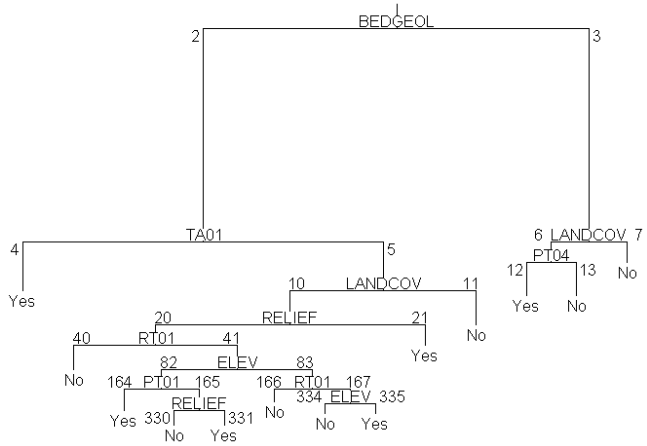
Data Source (Points)

Rocky Mountain Herbarium (1)
Wyoming Heritage Program (12)

Modeling Notes

Independent variables: ELEV, RELIEF, PT01, PT04, PT07, PT10, NWD, RT01, RT07, TA01, TA04, TA07, TA10, TX07, NFD, GDD, BEDGEOL, LANDCOV, SOIL, SURFGEOL
Minimum number of observations before split: 1
Minimum node size: 2
Minimum node deviance: 0.01
Minimum percent for pruning: 0.0
Biomes used for validation: ALP, FOOT, RMF

Classification Tree Used in Model Building



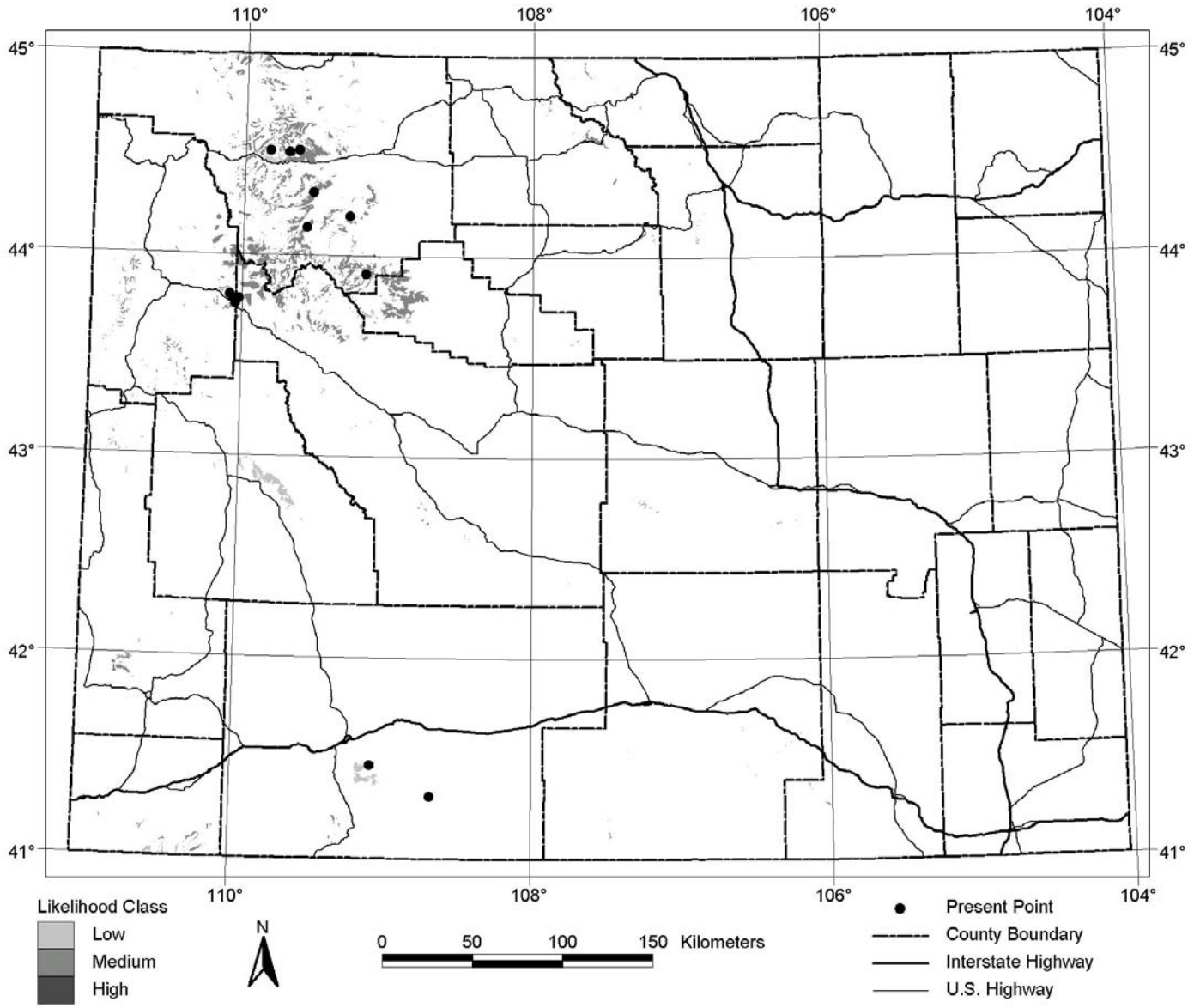
Classification Tree Output

Node_Num) Node_Def Node_Size (Num_No,Num_Yes) (Pct_No,Pct_Yes) Node_Type
1) root 973 (960,13) (100,100) Yes
2) BEDGEOL:Eex,Qls 60 (48,12) (5,92.3) Yes
4) TA01<-1264 4 (0,4) (0,30.8) **Yes ***
5) TA01>-1264 56 (48,8) (5,61.5) Yes
10) LANDCOV:AlpRk,DougF,Junpr,LodgP,MtSge,SbAlp 32 (24,8) (2.5,61.5) Yes
20) RELIEF<572 30 (24,6) (2.5,46.2) Yes
40) RT01<608.5 12 (12,0) (1.3,0) No *
41) RT01>608.5 18 (12,6) (1.3,46.2) Yes
82) ELEV<2554 8 (3,5) (0.3,38.5) Yes
164) PT01<519.5 4 (0,4) (0,30.8) **Yes ***
165) PT01>519.5 4 (3,1) (0.3,7.7) Yes
330) RELIEF<386.5 3 (3,0) (0.3,0) No *
331) RELIEF>386.5 1 (0,1) (0,7.7) **Yes ***
83) ELEV>2554 10 (9,1) (0.9,7.7) Yes
166) RT01<718.5 8 (8,0) (0.8,0) No *
167) RT01>718.5 2 (1,1) (0.1,7.7) Yes
334) ELEV<2791 1 (1,0) (0.1,0) No *
335) ELEV>2791 1 (0,1) (0,7.7) **Yes ***
21) RELIEF>572 2 (0,2) (0,15.4) **Yes ***
11) LANDCOV:AlpTn,Aspen,DstSh,FrRip,HmDis,MGras,Pdosa, ShRip,SpFir,WhtBk,WySge 24 (24,0) (2.5,0) No *
3) BEDGEOL:Ein,Eoe,Eol,H2O,Kmix,Ksh,Kss,MiPl,Olg,PCf,PCm, PTJ,Pal,Pze,Qal,Qlc,Qs,Qt,Qvf,TQc,Tlvf 913 (912,1) (95,7.7) No
6) LANDCOV:MtSge 48 (47,1) (4.9,7.7) Yes
12) PT04<271 1 (0,1) (0,7.7) **Yes ***
13) PT04>271 47 (47,0) (4.9,0) No *
7) LANDCOV:AcDun,AlpRk,AlpTn,Aspen,BkSge,BrOak,BsnRk, DougF,DstSh,FrRip,GrWet,GrsWd,HmDis,Junpr,Limbr, LodgP,MGras,MesSh,Pdosa,Playa,SGras,SbAlp,ShRip,SpFir, StBsh,VgDun,WhtBk,WySge,XerSh 865 (865,0) (90.1,0) No *

Path Composition and Likelihood

Yes Path	Node List	% of Present Points	Likelihood Class
a	4, 2	30.8	Medium
b	164, 82, 41, 20, 10, 5, 2	30.8	Medium
c	331, 165, 82, 41, 20, 10, 5, 2	7.7	Low
d	335, 167, 83, 41, 20, 10, 5, 2	7.7	Low
e	21, 10, 5, 2	15.4	Medium
f	12, 6, 3	7.7	Low

Predicted Distribution in Wyoming



Classification Rates for Wyoming Points

Model-Building Points

	Model Present	Model Absent		
Known Present	12 / 13 92.3%	1 / 13 7.7%	Total Correct	971 / 973 99.8%
Known Absent	1 / 960 0.1%	959 / 960 99.9%	Total Incorrect	2 / 973 0.2%

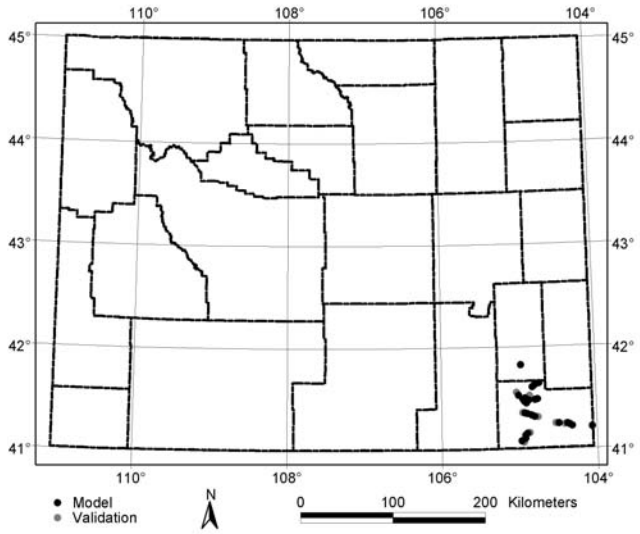
Validation Points

	Model Present	Model Absent		
Known Present	0 / 0	0 / 0	Total Correct	74 / 76 97.4%
Known Absent	2 / 76 2.6%	74 / 76 97.4%	Total Incorrect	2 / 76 2.6%

Area of Predicted Distribution: 2,667 km^2 (1.1% of WY)

Gaura neomexicana Wooton var. *coloradensis* (Rydb.) Munz

Known Distribution in Wyoming



Numbers of Points for Modeling

	Model	Validation	Total
Known Present	26	8	34
Known Absent	957	182	1139
Total	983	190	1173

Data Source (Points)

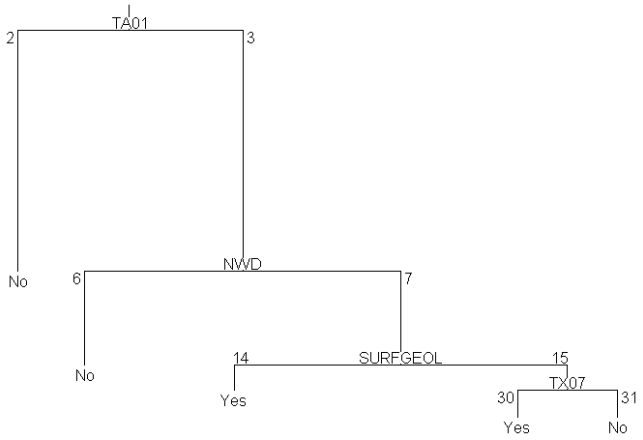
Rocky Mountain Herbarium (1)
Wyoming Heritage Program (33)

Modeling Notes

Independent variables: ELEV, RELIEF, PT01, PT04, PT07, PT10, NWD, RT01, RT07, TA01, TA04, TA07, TA10, TX07, NFD, GDD, BEDGEOL, LANDCOV, SOIL, SURFGEOL
Minimum number of observations before split: 3
Minimum node size: 6
Minimum node deviance: 0.01
Minimum percent for pruning: 0.5
Biomes used for validation: FOOT, IDGRS, WET
Riparian types: StrRipI, StrRipP

The wetland model is the intersection of the classification tree model with the specified riparian types.

Classification Tree Used in Model Building



Classification Tree Output

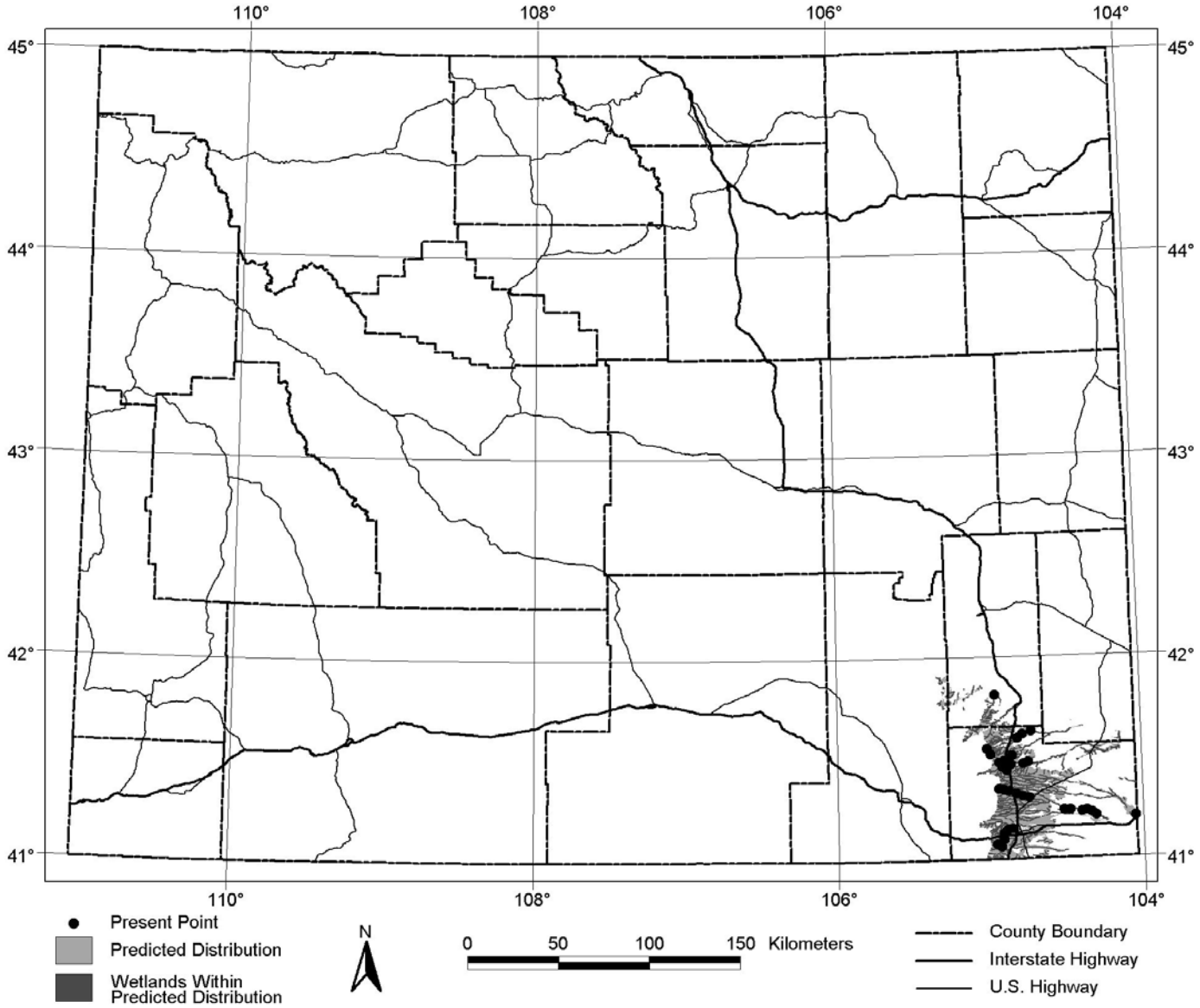
Node_Num) Node_Def Node_Size (Num_No,Num_Yes) (Pct_No,Pct_Yes) Node_Type
1) root 983 (957,26) (100,100) Yes
  2) TA01<-381 885 (885,0) (92.5,0) No *
  3) TA01>-381 98 (72,26) (7.5,100) Yes
    6) NWD<632 51 (51,0) (5.3,0) No *
    7) NWD>632 47 (21,26) (2.2,100) Yes
      14) SURFGEOL:ai,tdi,ti 27 (6,21) (0.6,80.8) **Yes ***
      15) SURFGEOL:Ti,fi,ri,sci,ui 20 (15,5) (1.6,19.2) Yes
        30) TX07<2879 7 (2,5) (0.2,19.2) **Yes ***
        31) TX07>2879 13 (13,0) (1.4,0) No *

Path Composition and Likelihood

Yes Path	Node List	% of Present Points	Likelihood Class
a	14, 7, 3	80.8	Medium
b	30, 15, 7, 3	19.2	Low

COLORADO BUTTERFLY PLANT

Predicted Distribution in Wyoming



Classification Rates

Model-Building Points

	Predicted		Wetlands	
	Model Present	Model Absent	Model Present	Model Absent
Known Present	26 / 26 100.0%	0 / 26 0.0%	24 / 26 92.3%	2 / 26 7.7%
Known Absent	8 / 957 0.8%	949 / 957 99.2%	2 / 957 0.2%	955 / 957 99.8%
Total Correct	975 / 983 99.2%		979 / 983 99.6%	
Total Incorrect	8 / 983 0.8%		4 / 983 0.4%	

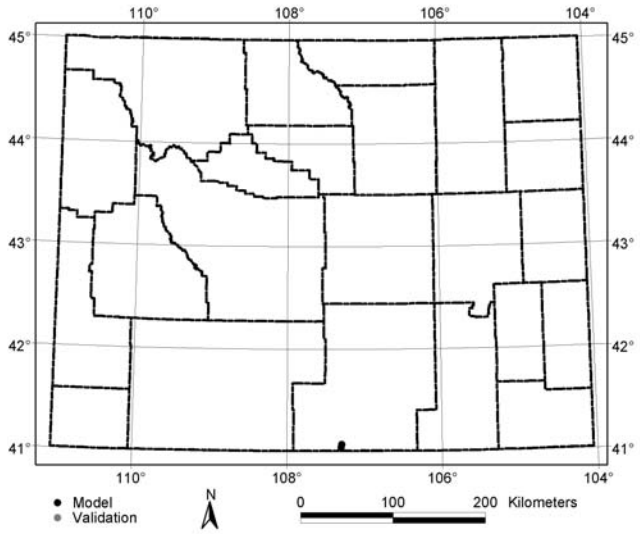
Validation Points

	Predicted		Wetlands	
	Model Present	Model Absent	Model Present	Model Absent
Known Present	7 / 8 87.5%	1 / 8 12.5%	7 / 8 87.5%	1 / 8 12.5%
Known Absent	3 / 182 1.6%	179 / 182 98.4%	1 / 182 0.5%	181 / 182 99.5%
Total Correct	186 / 190 97.9%		188 / 190 98.9%	
Total Incorrect	4 / 190 2.1%		2 / 190 1.1%	

Area of Predicted Distribution: 2,468 km^2 (0.98% of WY); **Wetlands:** 209 km^2 (0.08% of WY)

Ipomopsis aggregata (Pursh) Grant var. w*eberi* (Grant & Wilken) Dorn

Known Distribution in Wyoming



Numbers of Points for Modeling

	Model	Validation	Total
Known Present	2	0	2
Known Absent	963	71	1034
Total	965	71	1036

Data Source (Points)

Wyoming Heritage Program (2)

Modeling Notes

Factor used to expand ranges: 0.05
Biomes used for validation: FOOT, RMF

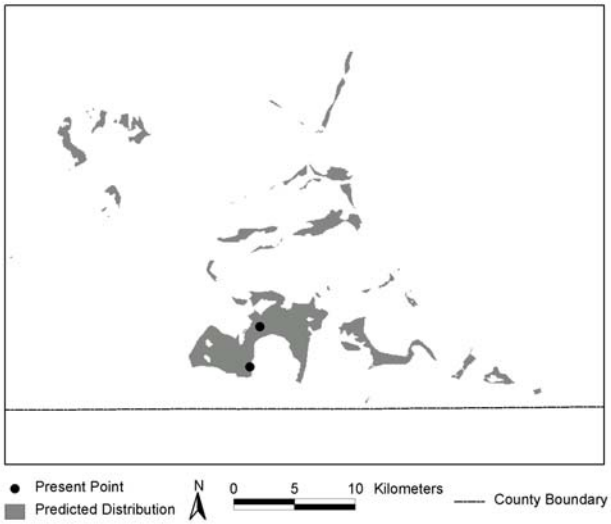
Ranges of Continuous Variables

	MIN	MAX	UNITS
ELEV	2113	2429	m
RELIEF	63	375	m
PT01	5.26	6.72	cm
PT04	5.74	6.86	cm
PT07	3.19	3.71	cm
PT10	5.86	6.85	cm
RT01	6.86	7.70	$MJ/m^2/day$
RT07	23.38	26.11	$MJ/m^2/day$
TA01	-8.21	-5.90	^oC
TA04	2.13	4.75	^oC
TA07	15.58	18.15	^oC
TA10	3.81	6.32	^oC

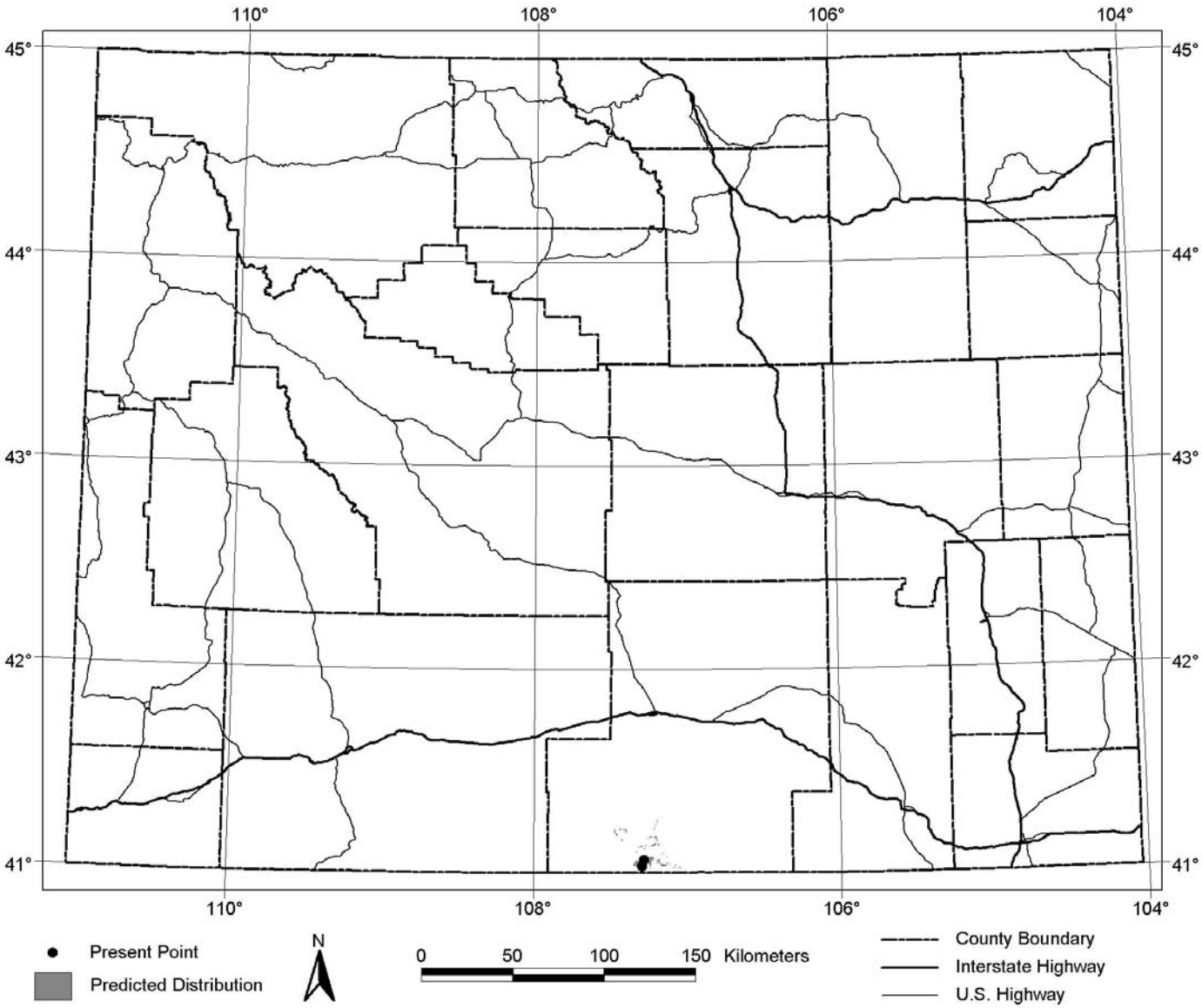
Values of Categorical Variables

BEDGEOL: MiPl
LANDCOV: Aspen, MesSh, MtSge
SOIL: WY31C, WY34
SURFGEOL: li, ri, sci

Detailed View of Predicted Distribution



Predicted Distribution in Wyoming



Classification Rates

Model-Building Points

	Model Present	Model Absent		
Known Present	2 / 2 100.0%	0 / 2 0.0%	Total Correct	965 / 965 100.0%
Known Absent	0 / 963 0.0%	963 / 963 100.0%	Total Incorrect	0 / 965 0.0%

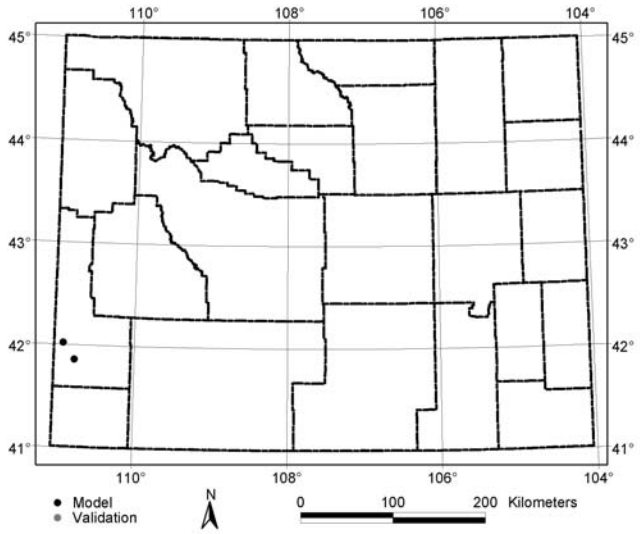
Validation Points

	Model Present	Model Absent		
Known Present	0 / 0	0 / 0	Total Correct	71 / 71 100.0%
Known Absent	0 / 71 0.0%	71 / 71 100.0%	Total Incorrect	0 / 71 0.0%

Area of Predicted Distribution: 68 km^2 (0.03% of WY)

Lepidium integrifolium Nutt. var. *integrifolium*

Known Distribution in Wyoming



Numbers of Points for Modeling

	Model	Validation	Total
Known Present	2	0	2
Known Absent	963	130	1093
Total	965	130	1095

Data Source (Points)

Wyoming Heritage Program (2)

Modeling Notes

Factor used to expand ranges: 0.1
Biomes used for validation: IDGRS

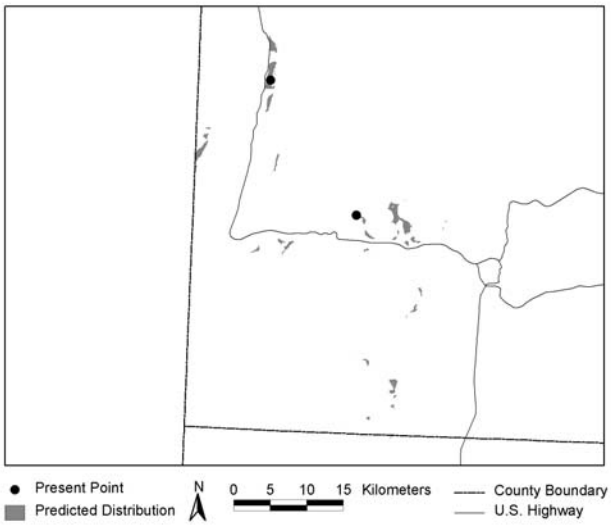
Ranges of Continuous Variables

	MIN	MAX	UNITS
ELEV	1729	2268	m
RELIEF	58	98	m
PT01	2.11	2.83	cm
PT04	2.72	3.38	cm
PT07	1.92	2.44	cm
PT10	2.59	3.20	cm
RT01	6.57	8.31	$MJ/m^2/day$
RT07	23.27	28.46	$MJ/m^2/day$
TA01	-11.24	-6.82	^oC
TA04	1.26	6.08	^oC
TA07	14.22	18.98	^oC
TA10	2.47	7.22	^oC

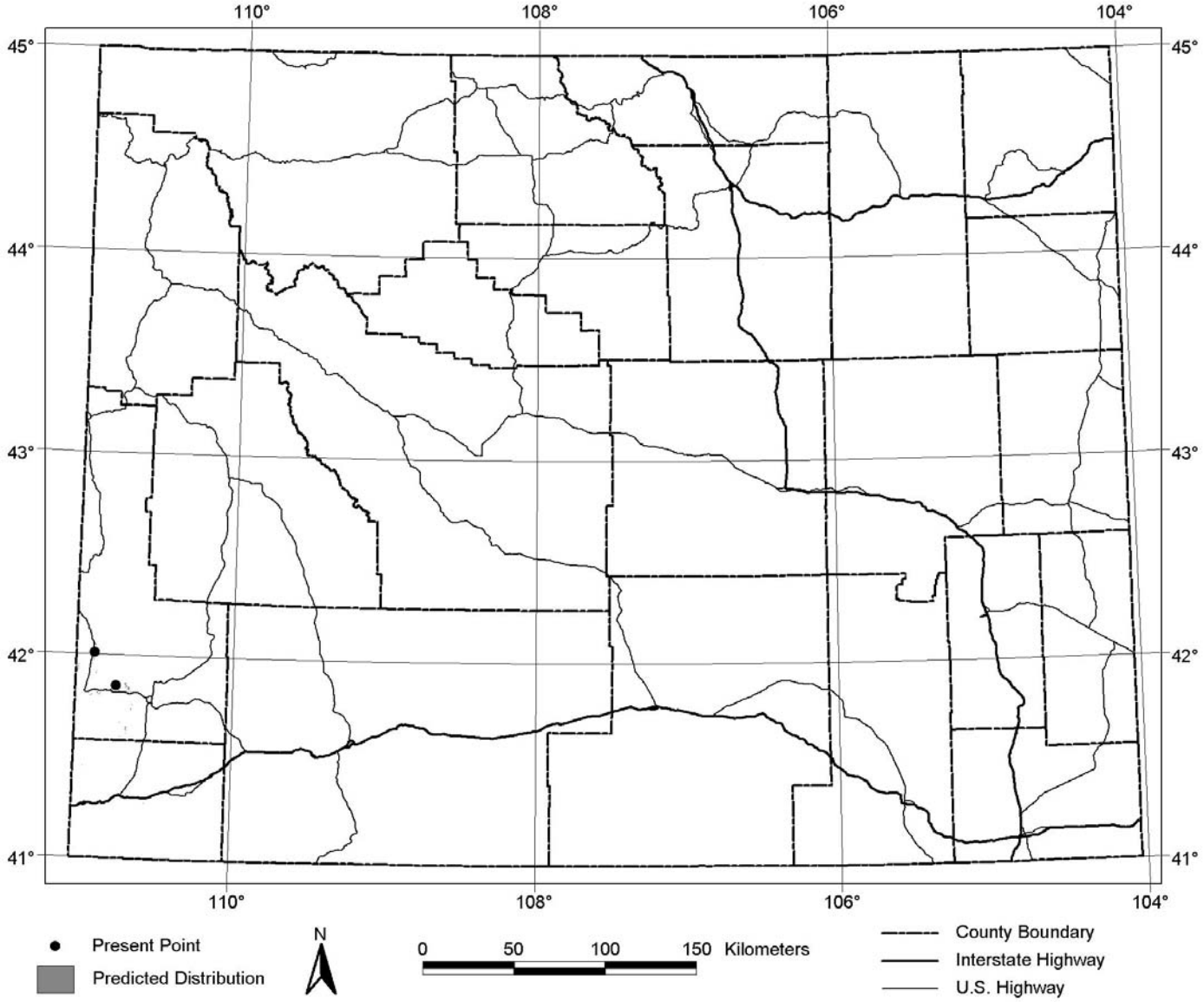
Values of Categorical Variables

BEDGEOL: Eoe, PTJ
LANDCOV: HmDis, WySge
SOIL: WY41, WY44
SURFGEOL: fi, li, sci

Detailed View of Predicted Distribution



Predicted Distribution in Wyoming



Classification Rates

Model-Building Points

	Model Present	Model Absent		
Known Present	2 / 2 100.0%	0 / 2 0.0%	Total Correct	965 / 965 100.0%
Known Absent	0 / 963 0.0%	963 / 963 100.0%	Total Incorrect	0 / 965 0.0%

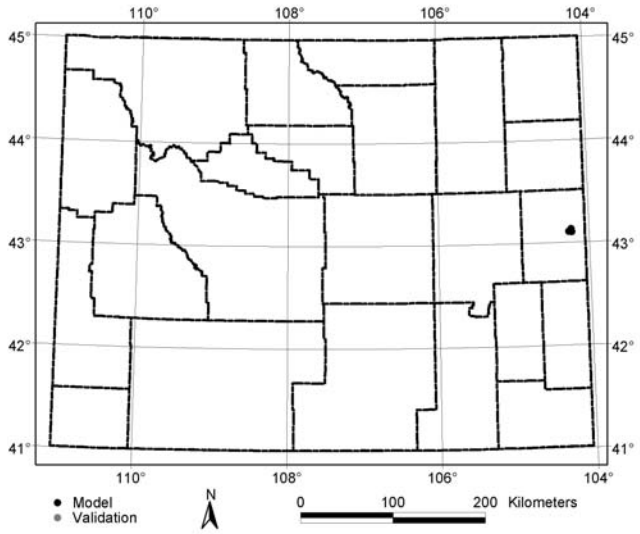
Validation Points

	Model Present	Model Absent		
Known Present	0 / 0	0 / 0	Total Correct	130 / 130 100.0%
Known Absent	0 / 130 0.0%	130 / 130 100.0%	Total Incorrect	0 / 130 0.0%

Area of Predicted Distribution: 19 km^2 (0.01% of WY)

Lesquerella arenosa (Richardson) Rydb. var. *argillosa* Rollins & Shaw

Known Distribution in Wyoming



Numbers of Points for Modeling

	Model	Validation	Total
Known Present	3	0	3
Known Absent	962	161	1123
Total	965	161	1126

Data Source (Points)

Wyoming Heritage Program (3)

Modeling Notes

Factor used to expand ranges: 0.05
Biomes used for validation: FOOT, IDGRS

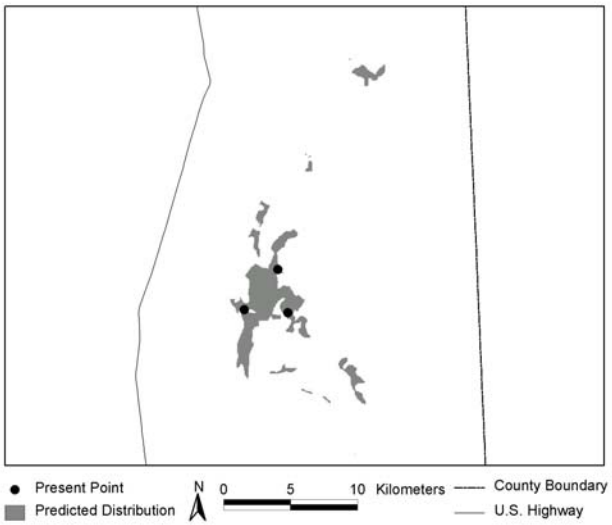
Ranges of Continuous Variables

	MIN	MAX	UNITS
ELEV	1224	1385	m
RELIEF	21	82	m
PT01	0.65	0.77	cm
PT04	4.23	4.75	cm
PT07	4.83	5.46	cm
PT10	3.10	3.54	cm
RT01	6.45	7.17	$MJ/m^2/day$
RT07	21.96	24.32	$MJ/m^2/day$
TA01	-5.85	-3.84	^oC
TA04	5.86	7.99	^oC
TA07	20.71	22.86	^oC
TA10	7.05	9.14	^oC

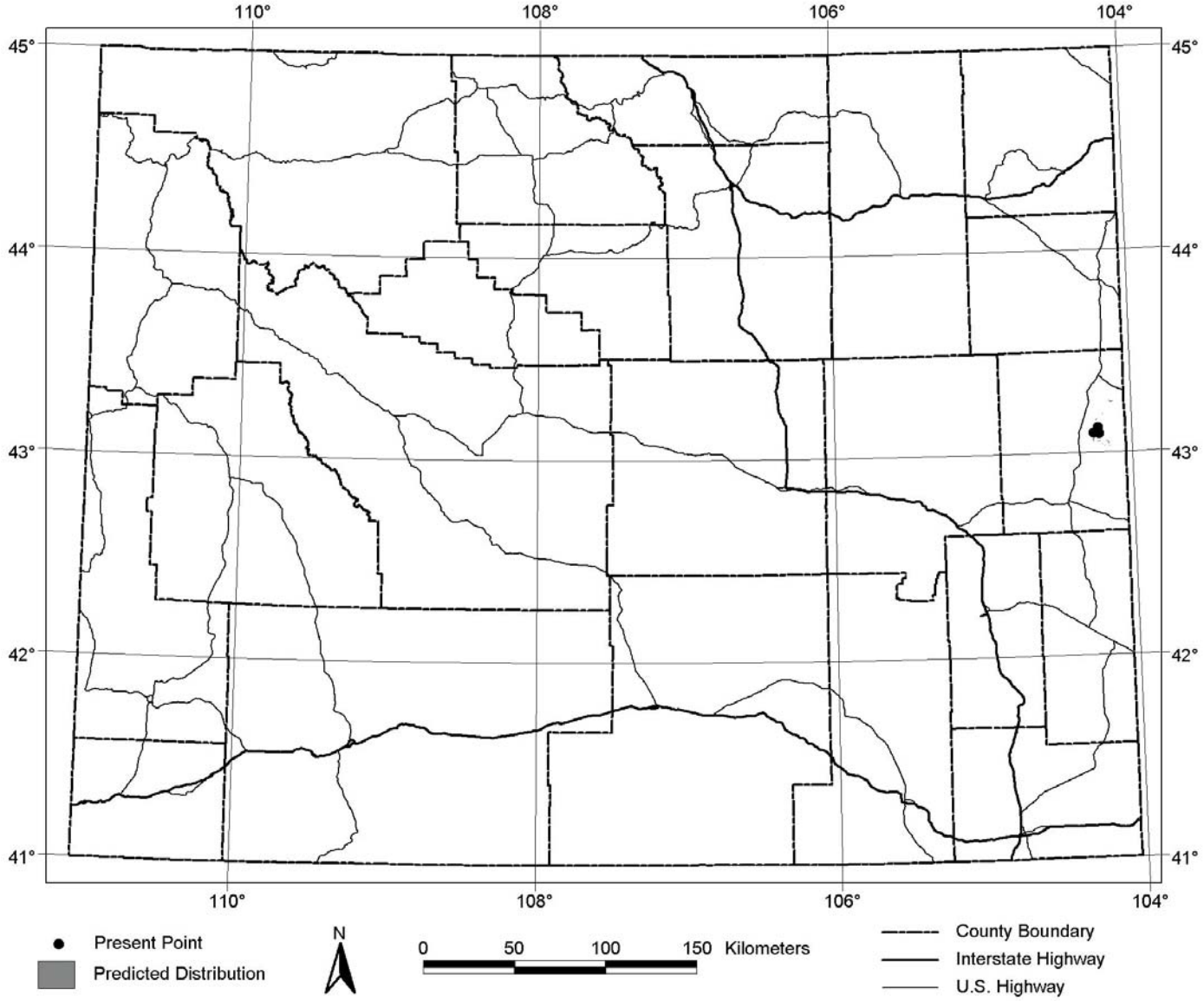
Values of Categorical Variables

BEDGEOL: Kmix, Ksh
LANDCOV: BsnRk, GrsWd, Junpr
SOIL: WY16C
SURFGEOL: ri, sci

Detailed View of Predicted Distribution



Predicted Distribution in Wyoming



Classification Rates

Model-Building Points

	Model Present	Model Absent		
Known Present	3 / 3 100.0%	0 / 3 0.0%	Total Correct	965 / 965 100.0%
Known Absent	0 / 962 0.0%	962 / 962 100.0%	Total Incorrect	0 / 965 0.0%

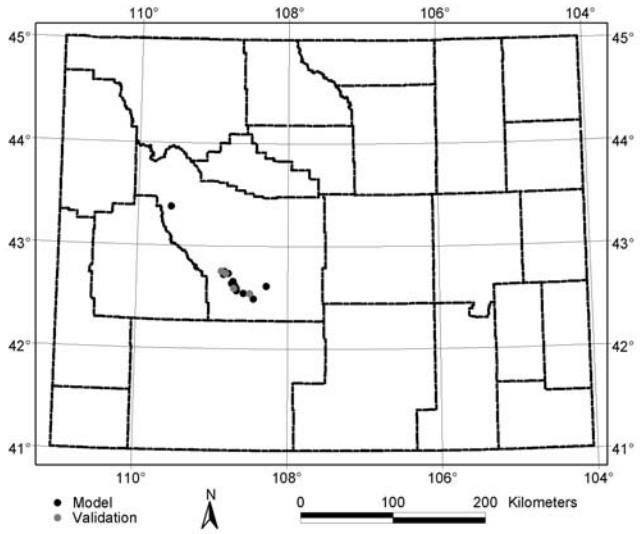
Validation Points

	Model Present	Model Absent		
Known Present	0 / 0	0 / 0	Total Correct	161 / 161 100.0%
Known Absent	0 / 161 0.0%	161 / 161 100.0%	Total Incorrect	0 / 161 0.0%

Area of Predicted Distribution: 26 km^2 (0.01% of WY)

Lesquerella fremontii Rollins & Shaw

Known Distribution in Wyoming



Numbers of Points for Modeling

	Model	Validation	Total
Known Present	12	4	16
Known Absent	961	203	1164
Total	973	207	1180

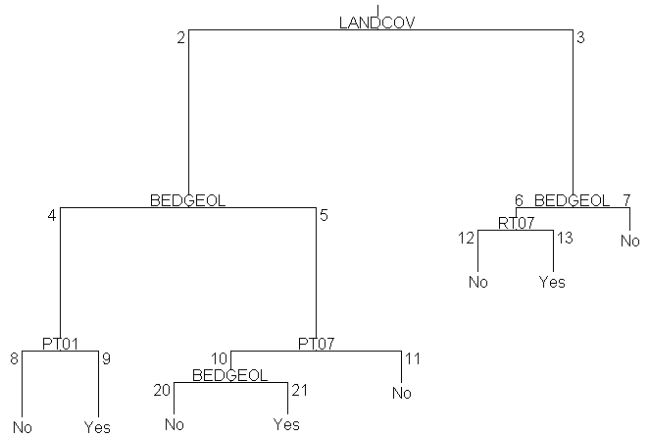
Data Source (Points)

Wyoming Heritage Program (16)

Modeling Notes

Independent variables: ELEV, RELIEF, PT01, PT04, PT07, PT10, NWD, RT01, RT07, TA01, TA04, TA07, TA10, TX07, NFD, GDD, BEDGEOL, LANDCOV, SOIL, SURFGEOL
Minimum number of observations before split: 1
Minimum node size: 2
Minimum node deviance: 0.01
Minimum percent for pruning: 0.1
Biomes used for validation: FOOT, IDGRS, RMF

Classification Tree Used in Model Building



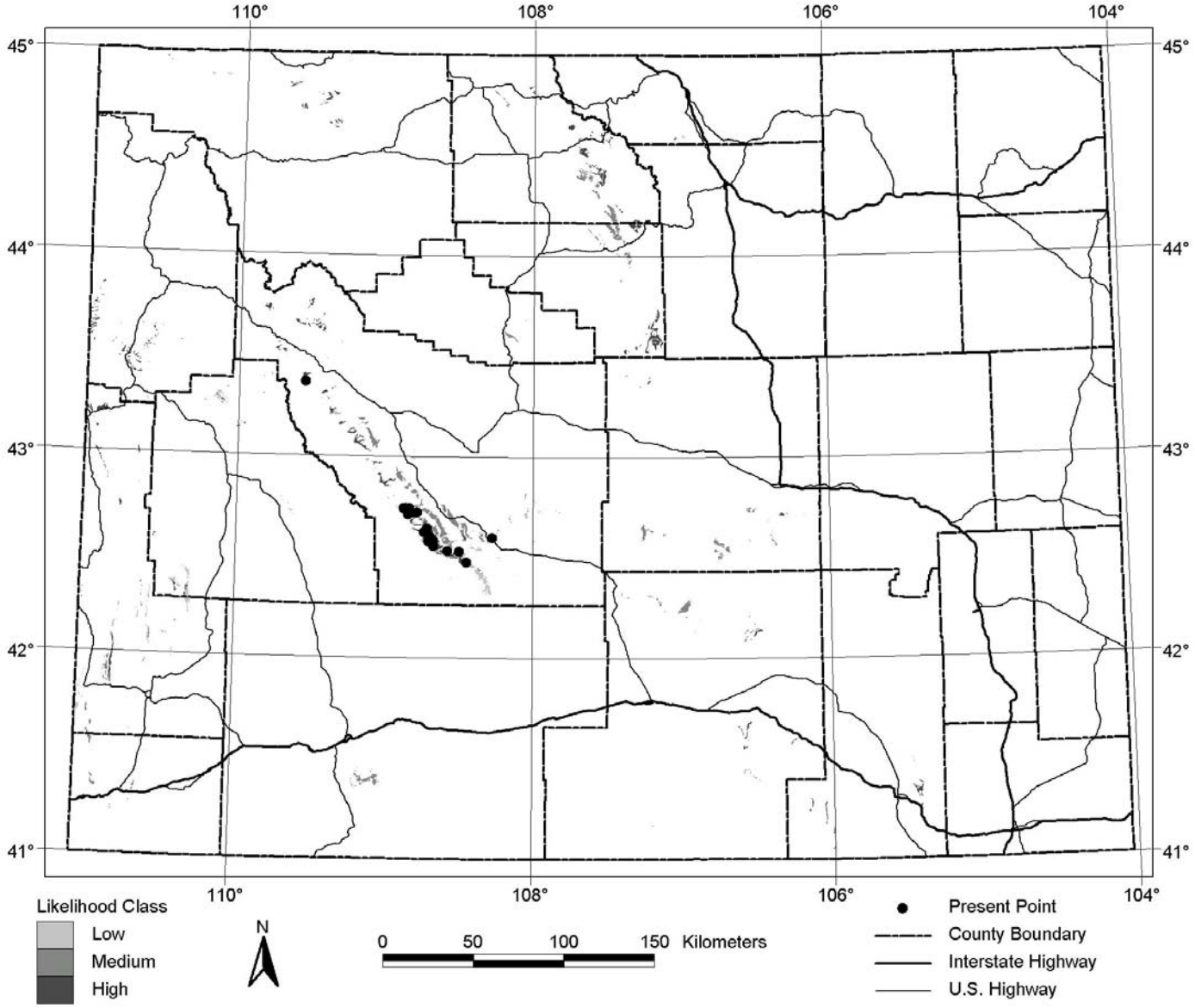
Classification Tree Output

Node_Num) Node_Def Node_Size (Num_No,Num_Yes) (Pct_No,Pct_Yes) Node_Type
1) root 973 (961,12) (100,100) Yes
  2) LANDCOV:Aspen,Junpr,MtSge 104 (93,11) (9.7,91.7) Yes
    4) BEDGEOL:Pze 13 (4,9) (0.4,75) Yes
      8) PT01<2.06 4 (4,0) (0.4,0) No *
      9) PT01>2.06 9 (0,9) (0,75) **Yes ***
    5) BEDGEOL:Eex,Eoe,Eol,Kmix,Ksh,Kss,MiPl,Olg,PCf,PTJ,Pal, Qal,Qls,Qs,Qt,Qvf,TQc,Tlvf 91 (89,2) (9.3,16.7) Yes
      10) PT07<2.52 14 (12,2) (1.2,16.7) Yes
        20) BEDGEOL:Eoe,Kmix,Kss,Olg,PCf 11 (11,0) (1.1,0) No *
        21) BEDGEOL:MiPl,PTJ 3 (1,2) (0.1,16.7) **Yes ***
      11) PT07>2.52 77 (77,0) (8,0) No *
  3) LANDCOV:AcDun,AlpRk,AlpTn,BkSge,BrOak,BsnRk,DougF, DstSh,FrRip,GrWet,GrsWd,HmDis,Limbr,LodgP,MGras,MesSh, Pdosa,Playa,SGras,SbAlp,ShRip,SpFir,StBsh,VgDun,WhtBk, WySge,XerSh 869 (868,1) (90.3,8.3) No
    6) BEDGEOL:Pze 60 (59,1) (6.1,8.3) Yes
      12) RT07<25.155 59 (59,0) (6.1,0) No *
      13) RT07>25.155 1 (0,1) (0,8.3) **Yes ***
    7) BEDGEOL:Eex,Ein,Eoe,Eol,Kmix,Ksh,Kss,MiPl,Olg,PCf,PCm, PTJ,Pal,Qal,Qlc,Qls,Qs,Qt,Qvf,TQc,Tlvf 809 (809,0) (84.2,0) No *

Path Composition and Likelihood

Yes Path	Node List	% of Present Points	Likelihood Class
a	9, 4, 2	75.0	High
b	21, 10, 5, 2	16.7	Medium
c	13, 6, 3	8.3	Low

Predicted Distribution in Wyoming



Classification Rates

Model-Building Points

	Model Present	Model Absent		
Known Present	12 / 12 100.0%	0 / 12 0.0%	Total Correct	972 / 973 99.9%
Known Absent	1 / 961 0.1%	960 / 961 99.9%	Total Incorrect	1 / 973 0.1%

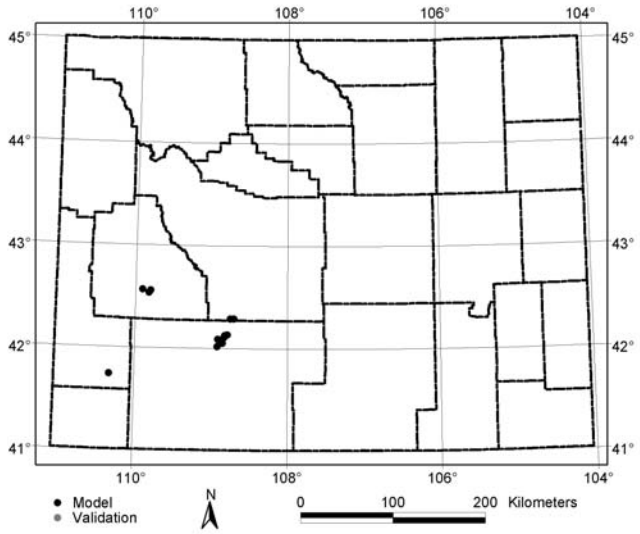
Validation Points

	Model Present	Model Absent		
Known Present	4 / 4 100.0%	0 / 4 0.0%	Total Correct	206 / 207 99.5%
Known Absent	1 / 203 0.5%	202 / 203 99.5%	Total Incorrect	1 / 207 0.5%

Area of Predicted Distribution: 1,349 km^2 (0.53% of WY)

Lesquerella macrocarpa A. Nels.

Known Distribution in Wyoming



Numbers of Points for Modeling

	Model	Validation	Total
Known Present	13	0	13
Known Absent	962	153	1115
Total	975	153	1128

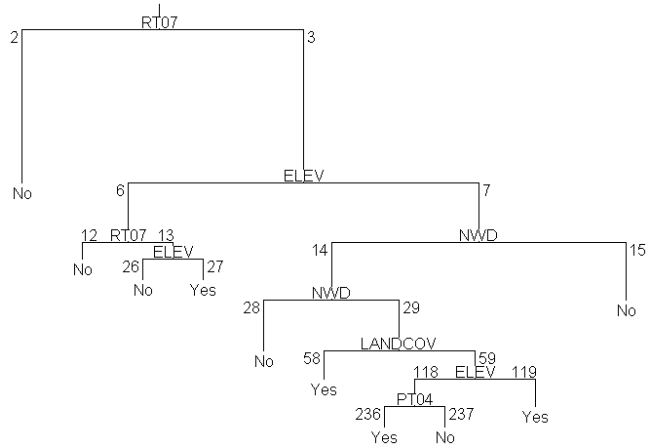
Data Source (Points)

Wyoming Heritage Program (13)

Modeling Notes

Independent variables: ELEV, RELIEF, PT01, PT04, PT07, PT10, NWD, RT01, RT07, TA01, TA04, TA07, TA10, TX07, NFD, GDD, BEDGEOL, LANDCOV, SOIL, SURFGEOL
Minimum number of observations before split: 1
Minimum node size: 2
Minimum node deviance: 0.01
Minimum percent for pruning: 0.1
Biomes used for validation: IDGRS, IDS

Classification Tree Used in Model Building



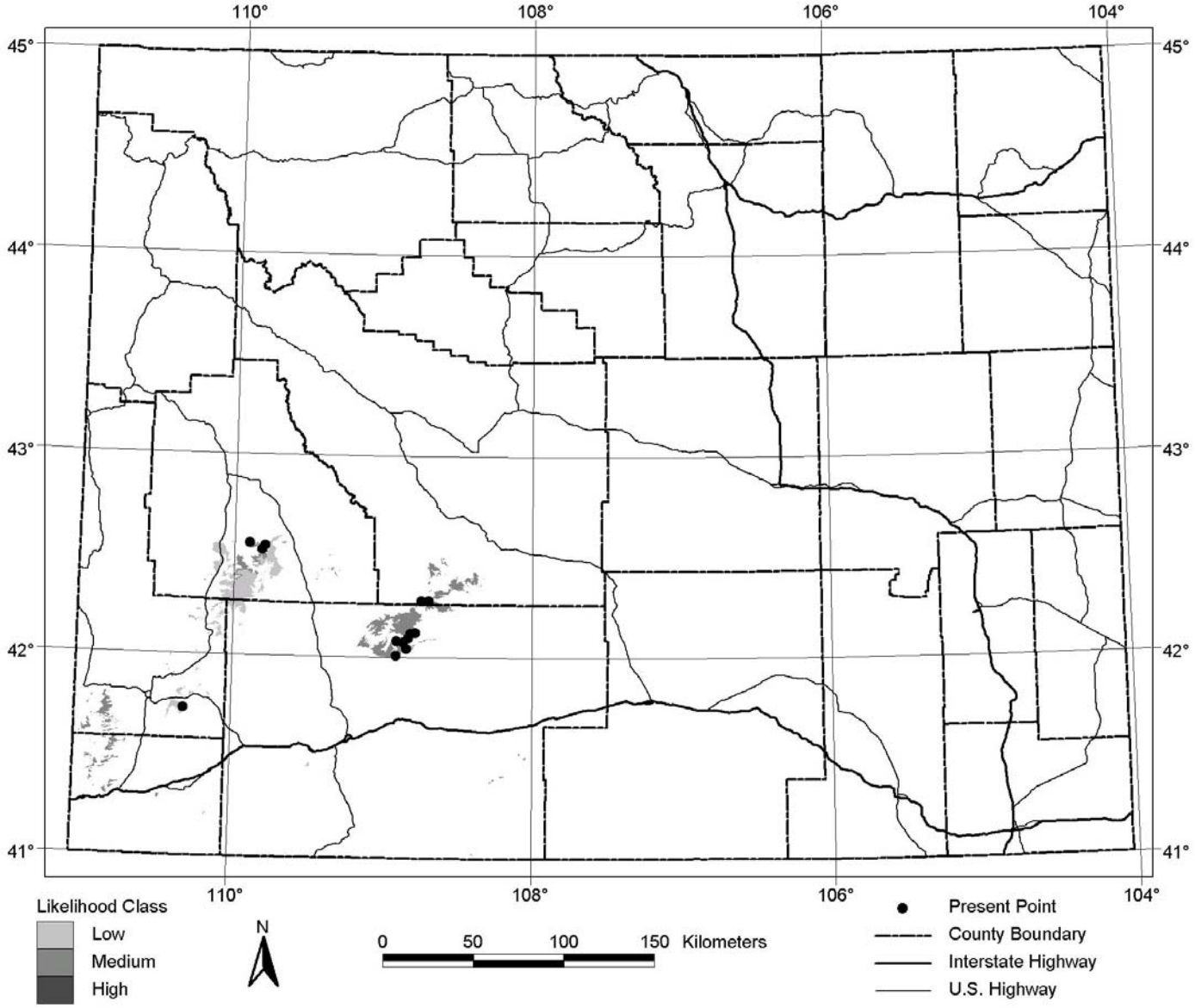
Classification Tree Output

Node_Num) Node_Def Node_Size (Num_No,Num_Yes) (Pct_No,Pct_Yes) Node_Type
1) root 975 (962,13) (100,100) Yes
  2) RT07<25.345 809 (809,0) (84.1,0) No *
  3) RT07>25.345 166 (153,13) (15.9,100) Yes
    6) ELEV<2163 102 (101,1) (10.5,7.7) No
      12) RT07<26.05 93 (93,0) (9.7,0) No *
      13) RT07>26.05 9 (8,1) (0.8,7.7) Yes
        26) ELEV<2050 8 (8,0) (0.8,0) No *
        27) ELEV>2050 1 (0,1) (0,7.7) **Yes ***
    7) ELEV>2163 64 (52,12) (5.4,92.3) Yes
      14) NWD<67.05 34 (22,12) (2.3,92.3) Yes
        28) NWD<51.75 13 (13,0) (1.4,0) No *
        29) NWD>51.75 21 (9,12) (0.9,92.3) Yes
          58) LANDCOV:DstSh,MGras,StBsh 6 (0,6) (0,46.2) **Yes ***
          59) LANDCOV:FrRip,WySge 15 (9,6) (0.9,46.2) Yes
            118) ELEV<2259 9 (8,1) (0.8,7.7) Yes
              236) PT04<2.60 1 (0,1) (0,7.7) **Yes ***
              237) PT04>2.60 8 (8,0) (0.8,0) No *
            119) ELEV>2259 6 (1,5) (0.1,38.5) **Yes ***
      15) NWD>67.05 30 (30,0) (3.1,0) No *

Path Composition and Likelihood

Yes Path	Node List	% of Present Points	Likelihood Class
a	27, 13, 6, 3	7.7	Low
b	58, 29, 14, 7, 3	46.2	Medium
c	236, 118, 59, 29, 14, 7, 3	7.7	Low
d	119, 59, 29, 14, 7, 3	38.5	Medium

Predicted Distribution in Wyoming



Classification Rates

Model-Building Points

	Model Present	Model Absent		
Known Present	13 / 13 100.0%	0 / 13 0.0%	Total Correct	974 / 975 99.9%
Known Absent	1 / 962 0.1%	961 / 962 99.9%	Total Incorrect	1 / 975 0.1%

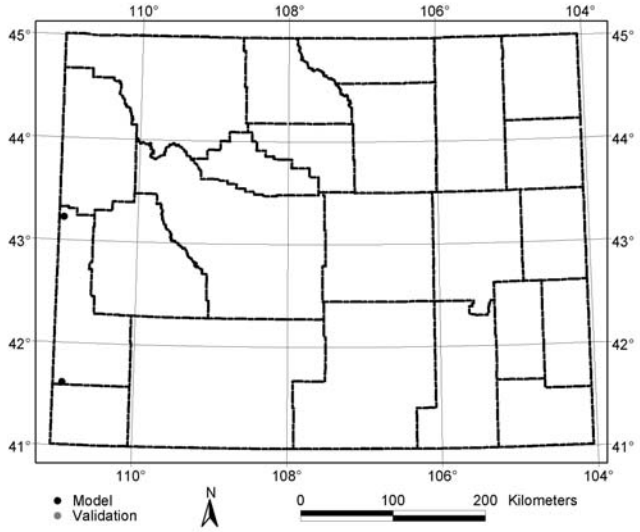
Validation Points

	Model Present	Model Absent		
Known Present	0 / 0	0 / 0	Total Correct	152 / 153 99.3%
Known Absent	1 / 153 0.7%	152 / 153 99.3%	Total Incorrect	1 / 153 0.7%

Area of Predicted Distribution: 1,466 km^2 (0.58% of WY)

Lesquerella multiceps Maguire

Known Distribution in Wyoming



Numbers of Points for Modeling

	Model	Validation	Total
Known Present	2	0	2
Known Absent	963	70	1033
Total	965	70	1035

Data Source (Points)

Wyoming Heritage Program (2)

Modeling Notes

Factor used to expand ranges: 0.1
Biomes used for validation: ALP, FOOT, RMF

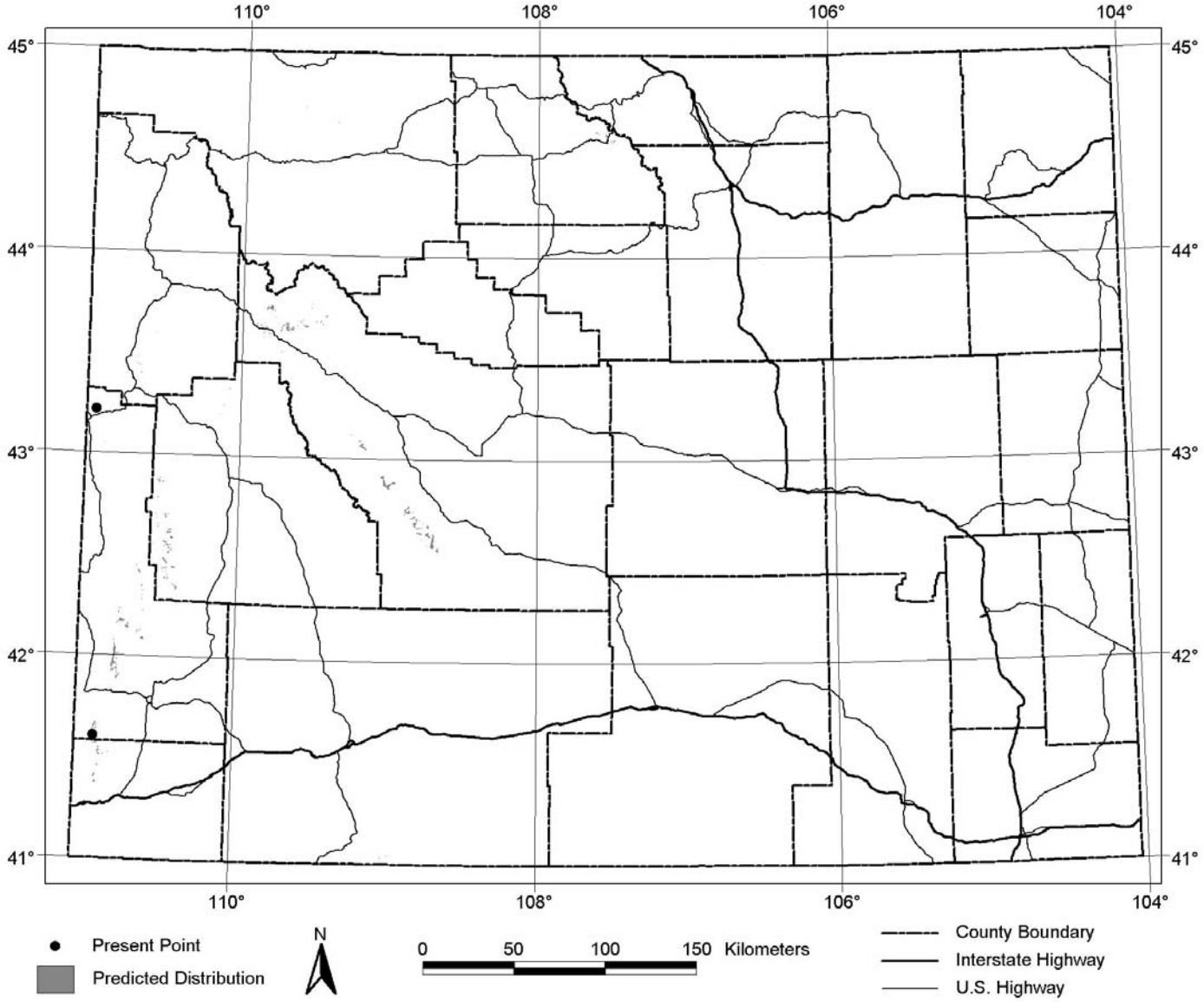
Ranges of Continuous Variables

	MIN	MAX	UNITS
ELEV	2204	3121	m
RELIEF	150	444	m
PT01	2.39	12.68	cm
PT04	3.27	8.66	cm
PT07	1.77	5.13	cm
PT10	3.46	6.55	cm
RT01	6.03	8.26	$MJ/m^2/day$
RT07	21.78	28.32	$MJ/m^2/day$
TA01	-11.67	-7.45	^oC
TA04	-2.19	3.72	^oC
TA07	10.82	16.64	^oC
TA10	-0.43	5.31	^oC

Values of Categorical Variables

BEDGEOL: Eoe, Pze
LANDCOV: AlpRk, MtSge
SOIL: WY06C, WY08C
SURFGEOL: li, ri, Ri

Predicted Distribution in Wyoming



Classification Rates

Model-Building Points

	Model Present	Model Absent		
Known Present	2 / 2 100.0%	0 / 2 0.0%	Total Correct	965 / 965 100.0%
Known Absent	0 / 963 0.0%	963 / 963 100.0%	Total Incorrect	0 / 965 0.0%

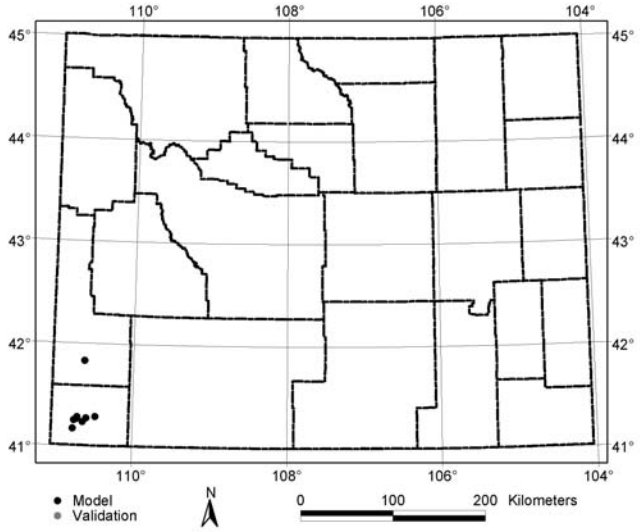
Validation Points

	Model Present	Model Absent		
Known Present	0 / 0	0 / 0	Total Correct	70 / 70 100.0%
Known Absent	0 / 70 0.0%	70 / 70 100.0%	Total Incorrect	0 / 70 0.0%

Area of Predicted Distribution: 167 km^2 (0.07% of WY)

Lesquerella prostrata A. Nels.

Known Distribution in Wyoming



Numbers of Points for Modeling

	Model	Validation	Total
Known Present	8	0	8
Known Absent	960	156	1116
Total	968	156	1124

Data Source (Points)

Wyoming Heritage Program (8)

Modeling Notes

Factor used to expand ranges: 0.05
Biomes used for validation: FOOT, IDGRS

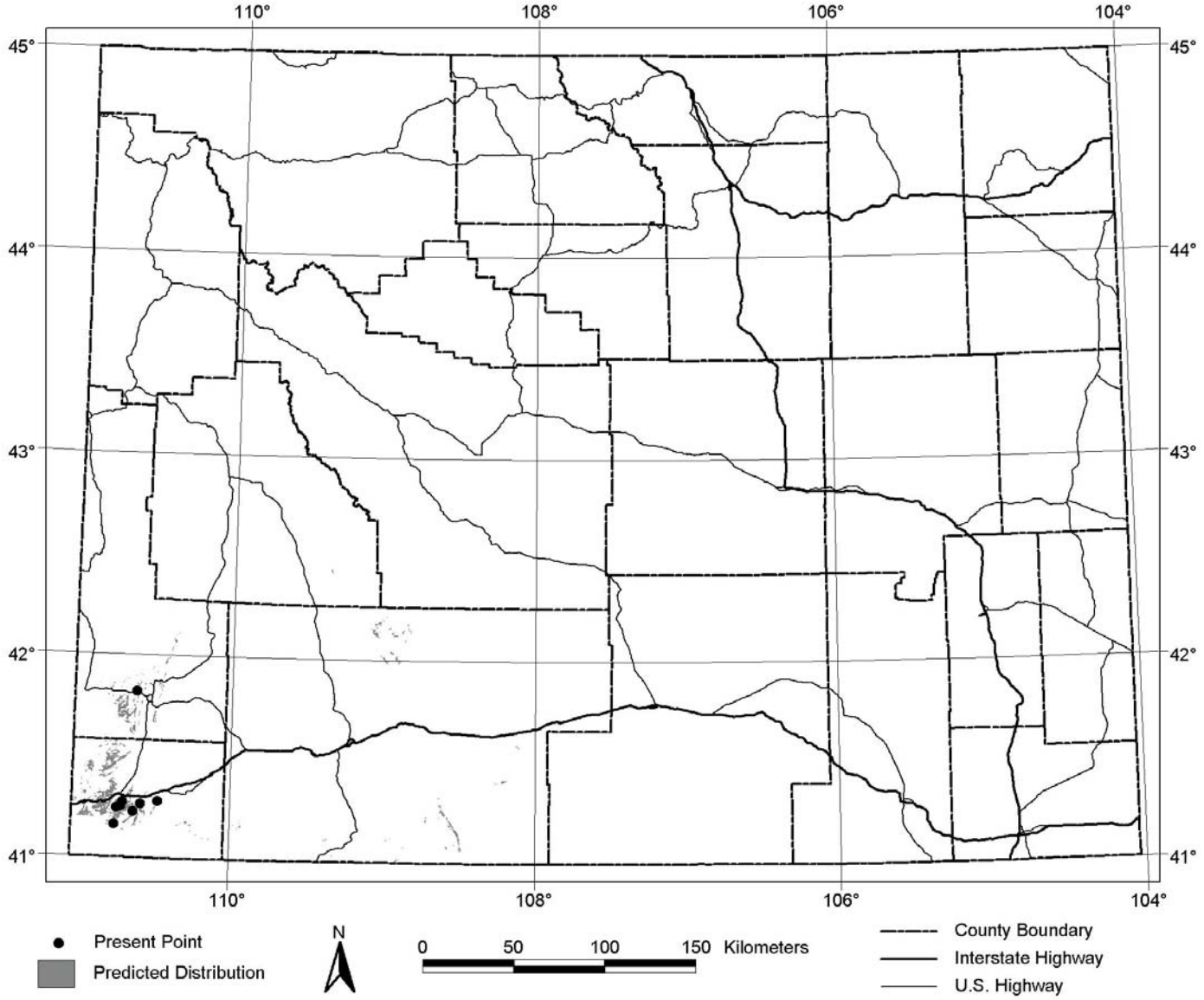
Ranges of Continuous Variables

	MIN	MAX	UNITS
ELEV	2124	2434	m
RELIEF	96	169	m
PT01	1.89	3.05	cm
PT04	2.96	4.65	cm
PT07	2.18	2.80	cm
PT10	2.54	4.11	cm
RT01	7.11	8.27	$MJ/m^2/day$
RT07	24.13	27.20	$MJ/m^2/day$
TA01	-10.33	-5.59	^oC
TA04	1.78	4.78	^oC
TA07	14.92	17.74	^oC
TA10	3.08	6.49	^oC

Values of Categorical Variables

BEDGEOL: Eoe, Eol, Ksh, Pal
LANDCOV: Junpr, WySge
SOIL: WY17C, WY40C, WY41
SURFGEOL: Ri, li, ri

Predicted Distribution in Wyoming



Classification Rates

Model-Building Points

	Model Present	Model Absent		
Known Present	8 / 8 100.0%	0 / 8 0.0%	Total Correct	968 / 968 100.0%
Known Absent	0 / 960 0.0%	960 / 960 100.0%	Total Incorrect	0 / 968 0.0%

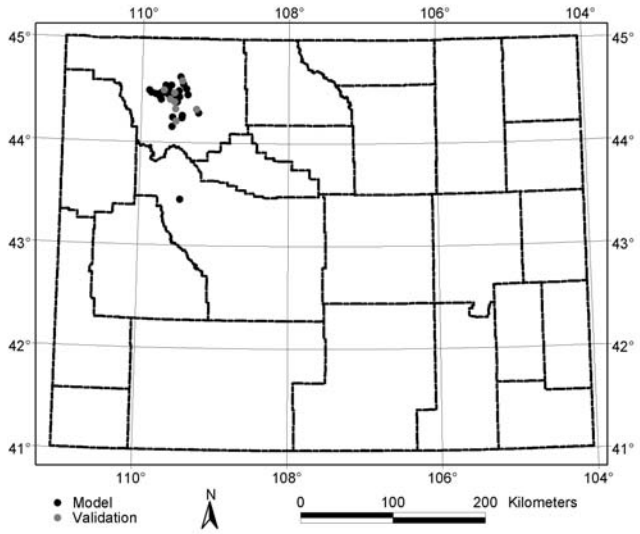
Validation Points

	Model Present	Model Absent		
Known Present	0 / 0	0 / 0	Total Correct	156 / 156 100.0%
Known Absent	0 / 156 0.0%	156 / 156 100.0%	Total Incorrect	0 / 156 0.0%

Area of Predicted Distribution: 511 km^2 (0.20% of WY)

Penstemon absarokensis Evert

Known Distribution in Wyoming



Numbers of Points for Modeling

	Model	Validation	Total
Known Present	27	8	35
Known Absent	957	211	1168
Total	984	219	1203

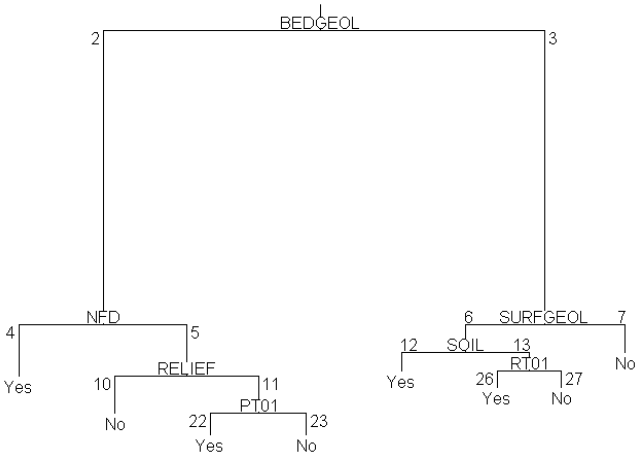
Data Source (Points)

Rocky Mountain Herbarium (5)
Wyoming Heritage Program (30)

Modeling Notes

Independent variables: ELEV, RELIEF, PT01, PT04, PT07, PT10, NWD, RT01, RT07, TA01, TA04, TA07, TA10, TX07, NFD, GDD, BEDGEOL, LANDCOV, SOIL, SURFGEOL
Minimum number of observations before split: 3
Minimum node size: 6
Minimum node deviance: 0.01
Minimum percent for pruning: 0.4
Biomes used for validation: ALP, FOOT, IDGRS, RMF

Classification Tree Used in Model Building



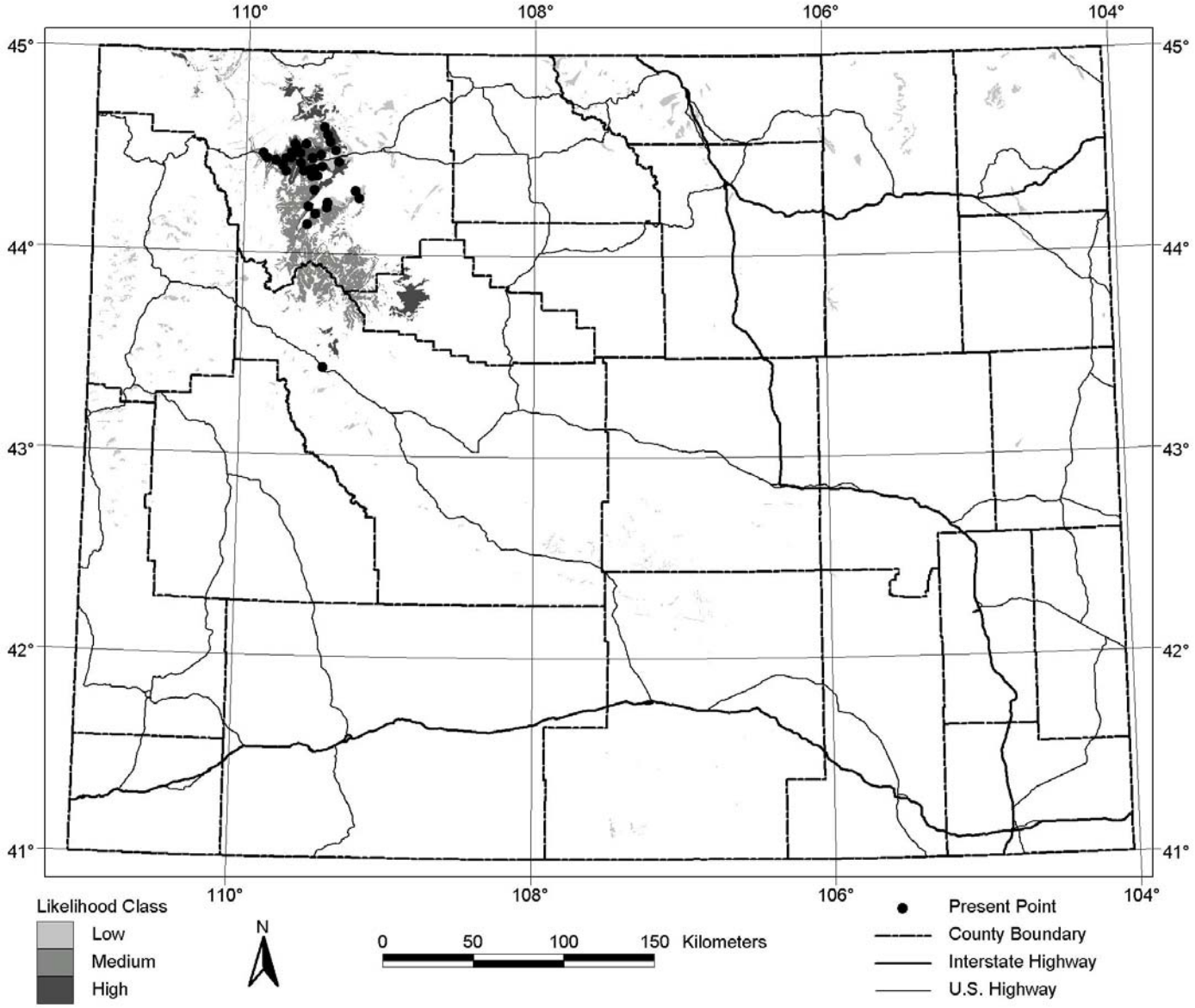
Classification Tree Output

Node_Num) Node_Def Node_Size (Num_No,Num_Yes) (Pct_No,Pct_Yes) Node_Type
1) root 984 (957,27) (100,100) Yes
  2) BEDGEOL:Eex 52 (28,24) (2.9,88.9) Yes
    4) NFD<242.35 16 (1,15) (0.1,55.6) **Yes ***
    5) NFD>242.35 36 (27,9) (2.8,33.3) Yes
      10) RELIEF<416 19 (19,0) (2,0) No *
      11) RELIEF>416 17 (8,9) (0.8,33.3) Yes
        22) PT01<7.135 12 (3,9) (0.3,33.3) **Yes ***
        23) PT01>7.135 5 (5,0) (0.5,0) No *
  3) BEDGEOL:Ein,Eoe,Eol,H2O,Kmix,Ksh,Kss,MiPl,Olg,PCf,PCm, PTJ,Pal,Pze,Qal,Qlc,Qls,Qs,Qt,Qvf,TQc,Tlvf 932 (929,3) (97.1,11.1) No
    6) SURFGEOL:fi,li,ti 108 (105,3) (11,11.1) Yes
      12) SOIL:WY08C,WY16C 6 (4,2) (0.4,7.4) **Yes ***
      13) SOIL:WY06C,WY07C,WY14,WY15,WY20,WY27,WY34, WY35,WY38C,WY40C,WY42,WY44 102 (101,1) (10.6,3.7) No
        26) RT01<5.61 3 (2,1) (0.2,3.7) **Yes ***
        27) RT01>5.61 99 (99,0) (10.3,0) No *
    7) SURFGEOL:LAKE,Mi,Ri,Ti,aR,ai,bdi,bi,ei,fdi,gi,ki,mi,oai,pea,ri, sci,tdi,tre,ui 824 (824,0) (86.1,0) No *

Path Composition and Likelihood

Yes Path	Node List	% of Present Points	Likelihood Class
a	4, 2	55.6	High
b	22, 11, 5, 2	33.3	Medium
c	12, 6, 3	7.4	Low
d	26, 13, 6, 3	3.7	Low

Predicted Distribution in Wyoming



Classification Rates

Model-Building Points

	Model Present	Model Absent		
Known Present	27 / 27 100.0%	0 / 27 0.0%	Total Correct	974 / 984 99.0%
Known Absent	10 / 957 1.0%	947 / 957 99.0%	Total Incorrect	10 / 984 1.0%

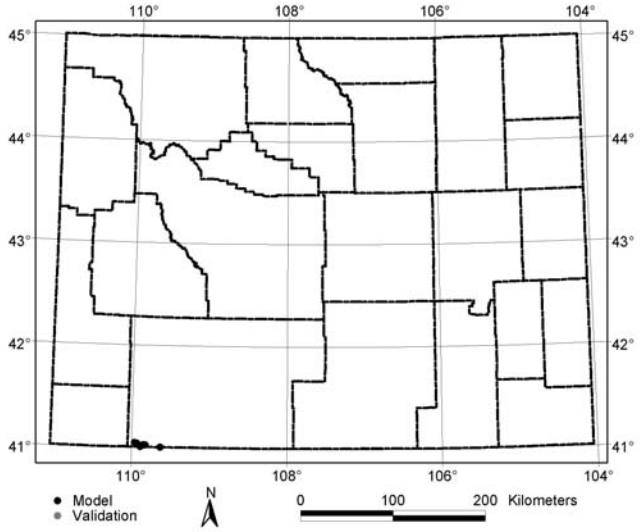
Validation Points

	Model Present	Model Absent		
Known Present	6 / 8 75.0%	2 / 8 25.0%	Total Correct	211 / 219 96.3%
Known Absent	6 / 211 2.8%	205 / 211 97.2%	Total Incorrect	8 / 219 3.7%

Area of Predicted Distribution: 4,569 km^2 (1.8% of WY)

Penstemon acaulis Wms. var. *acaulis*

Known Distribution in Wyoming



Numbers of Points for Modeling

	Model	Validation	Total
Known Present	6	0	6
Known Absent	961	132	1093
Total	967	132	1099

Data Source (Points)

Wyoming Heritage Program (6)

Modeling Notes

Factor used to expand ranges: 0.05
Biomes used for validation: IDGRS

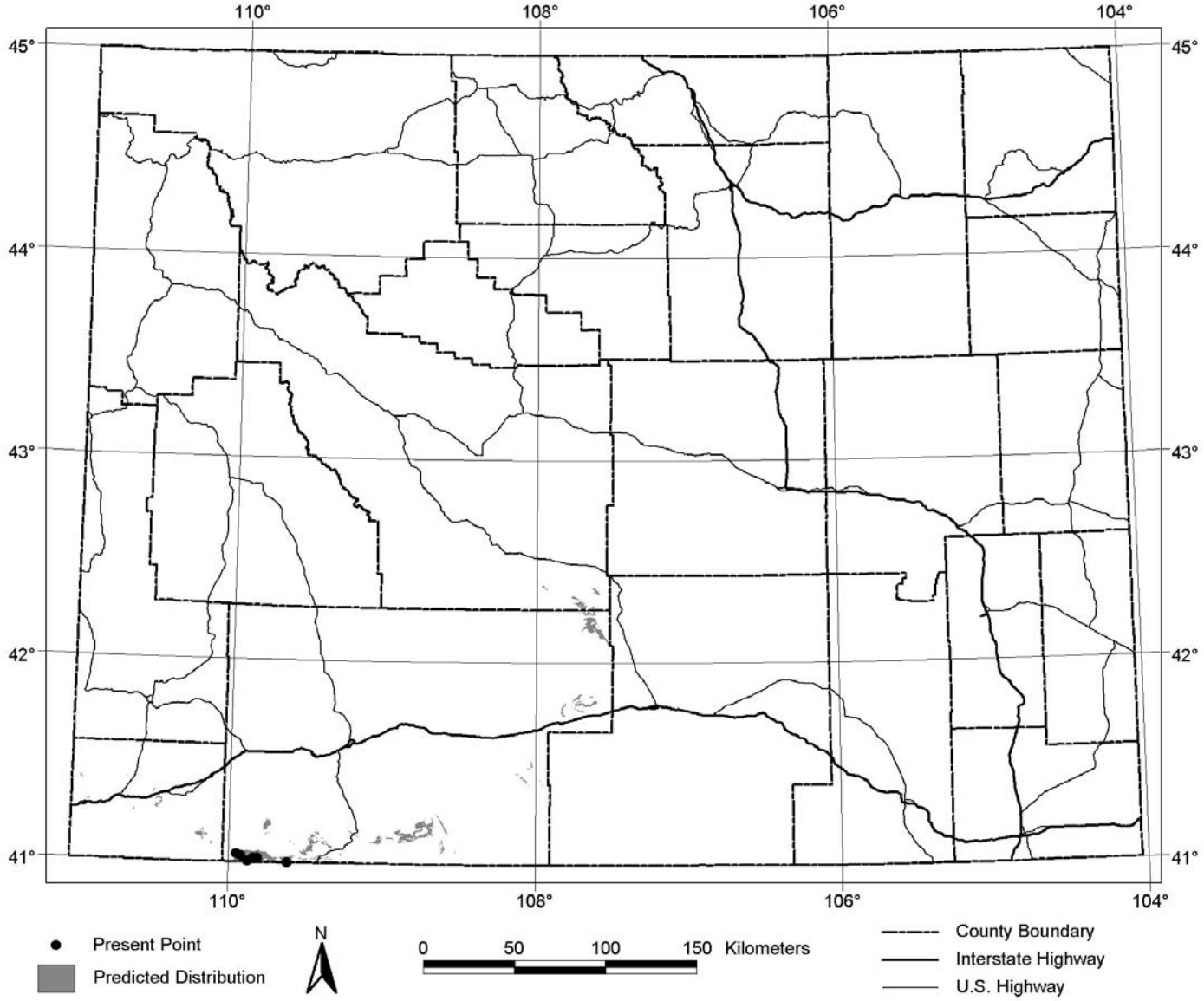
Ranges of Continuous Variables

	MIN	MAX	UNITS
ELEV	1756	2494	m
RELIEF	53	181	m
PT01	1.27	2.15	cm
PT04	2.90	4.37	cm
PT07	1.79	3.11	cm
PT10	2.90	4.29	cm
RT01	6.63	8.47	$MJ/m^2/day$
RT07	23.30	26.45	$MJ/m^2/day$
TA01	-7.74	-4.94	^oC
TA04	2.00	7.46	^oC
TA07	15.40	20.82	^oC
TA10	4.05	8.56	^oC

Values of Categorical Variables

BEDGEOL: Eoe,Eol
LANDCOV: HmDis,WySge
SOIL: WY40C,WY44
SURFGEOL: sci

Predicted Distribution in Wyoming



Classification Rates

Model-Building Points

	Model Present	Model Absent		
Known Present	6 / 6 100.0%	0 / 6 0.0%	Total Correct	966 / 967 99.9%
Known Absent	1 / 961 0.1%	960 / 961 99.9%	Total Incorrect	1 / 967 0.1%

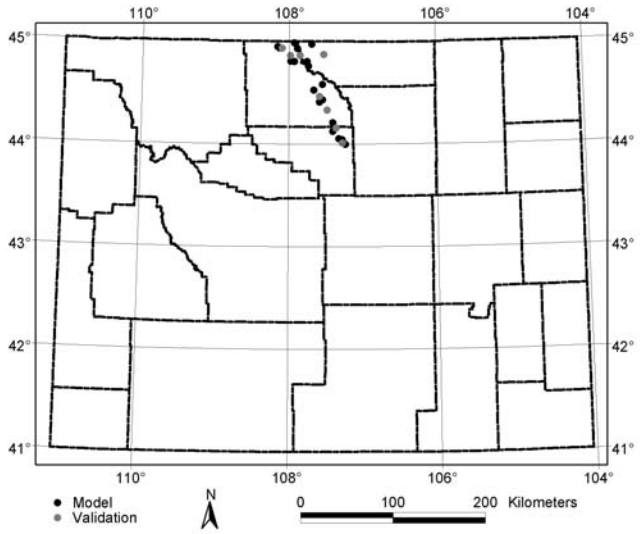
Validation Points

	Model Present	Model Absent		
Known Present	0 / 0	0 / 0	Total Correct	132 / 132 100.0%
Known Absent	0 / 132 0.0%	132 / 132 100.0%	Total Incorrect	0 / 132 0.0%

Area of Predicted Distribution: 484 km^2 (0.19% of WY)

Penstemon caryi Pennell

Known Distribution in Wyoming



Numbers of Points for Modeling

	Model	Validation	Total
Known Present	18	8	26
Known Absent	960	206	1166
Total	978	214	1192

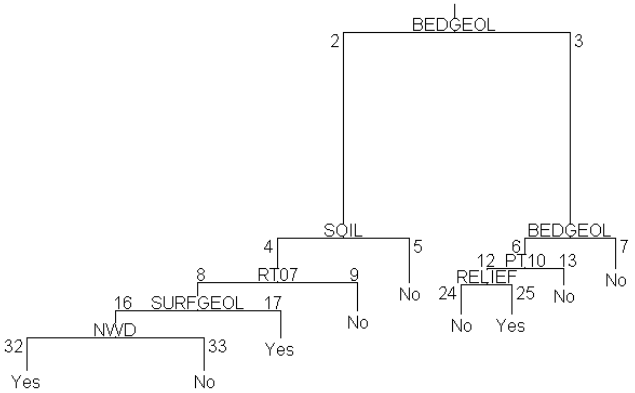
Data Source (Points)

Rocky Mountain Herbarium (5)
Wyoming Heritage Program (21)

Modeling Notes

Independent variables: ELEV, RELIEF, PT01, PT04, PT07, PT10, NWD, RT01, RT07, TA01, TA04, TA07, TA10, TX07, NFD, GDD, BEDGEOL, LANDCOV, SOIL, SURFGEOL
Minimum number of observations before split: 2
Minimum node size: 4
Minimum node deviance: 0.01
Minimum percent for pruning: 1.5
Biomes used for validation: FOOT, IDGRS, RMF

Classification Tree Used in Model Building



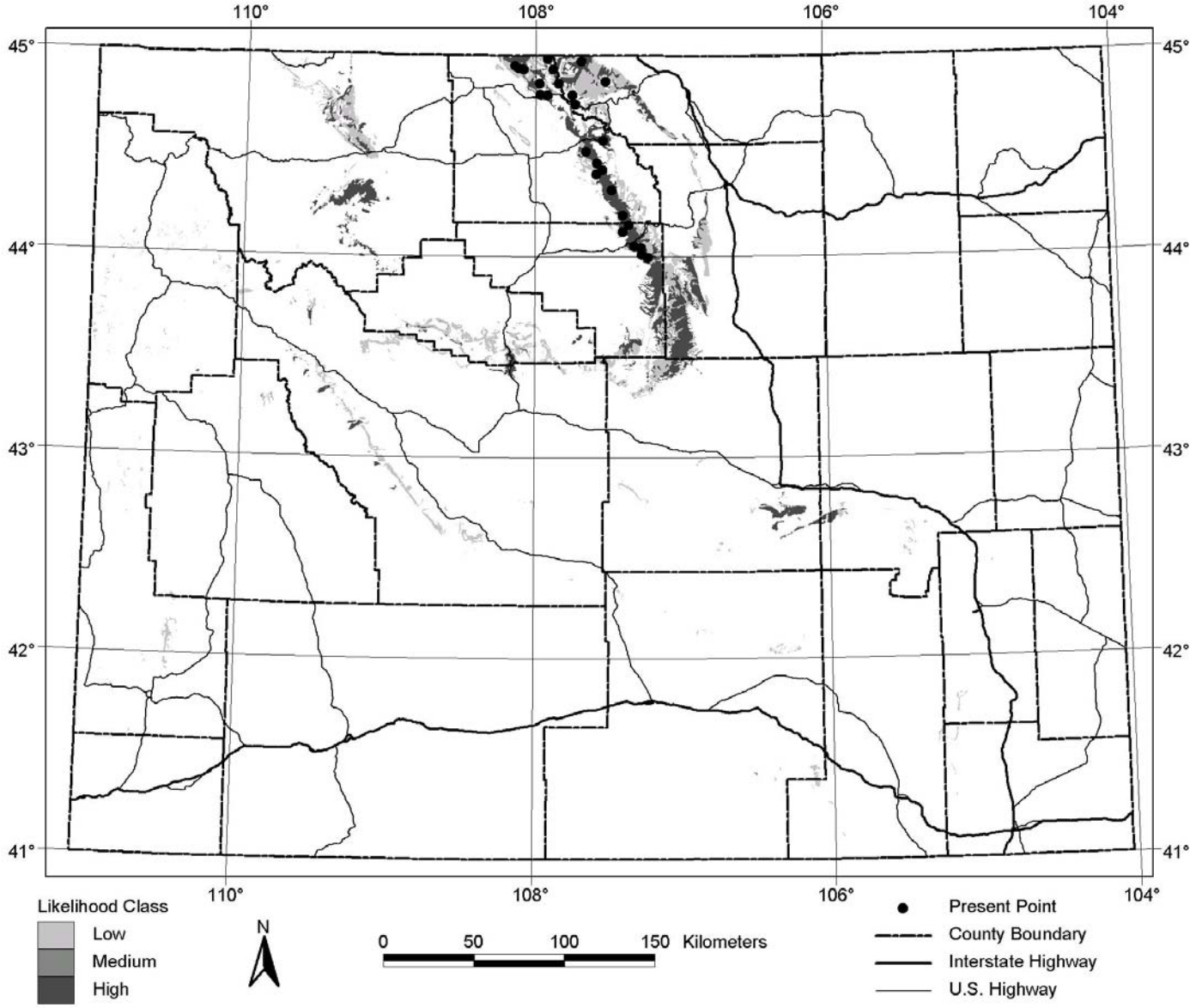
Classification Tree Output

Node_Num) Node_Def Node_Size (Num_No,Num_Yes) (Pct_No,Pct_Yes) Node_Type
1) root 978 (960,18) (100,100) Yes
2) BEDGEOL:Pze,Qls 89 (73,16) (7.6,88.9) Yes
4) SOIL:WY06C,WY42 60 (44,16) (4.6,88.9) Yes
8) RT07<24.435 47 (31,16) (3.2,88.9) Yes
16) SURFGEOL:Ri,li,ri 32 (17,15) (1.8,83.3) Yes
32) NWD<94.85 25 (10,15) (1,83.3) **Yes ***
33) NWD>94.85 7 (7,0) (0.7,0) No *
17) SURFGEOL:ai,gi,sci 15 (14,1) (1.5,5.6) **Yes ***
9) RT07>24.435 13 (13,0) (1.4,0) No *
5) SOIL:WY08C,WY14,WY16C,WY20,WY31C,WY36,WY38C, WY44 29 (29,0) (3,0) No *
3) BEDGEOL:Eex,Ein,Eoe,Eol,H2O,Kmix,Ksh,Kss,MiPl,Olg,PCf, PCm,PTJ,Pal,Qal,Qlc,Qs,Qt,Qvf,TQc,Tlvf 889 (887,2) (92.4,11.1) No
6) BEDGEOL:PTJ 78 (76,2) (7.9,11.1) Yes
12) PT10<3.02 21 (19,2) (2,11.1) Yes
24) RELIEF<180 18 (18,0) (1.9,0) No *
25) RELIEF>180 3 (1,2) (0.1,11.1) **Yes ***
13) PT10>3.02 57 (57,0) (5.9,0) No *
7) BEDGEOL:Eex,Ein,Eoe,Eol,H2O,Kmix,Ksh,Kss,MiPl,Olg,PCf, PCm,Pal,Qal,Qlc,Qs,Qt,Qvf,TQc,Tlvf 811 (811,0) (84.5,0) No *

Path Composition and Likelihood

Yes Path	Node List	% of Present Points	Likelihood Class
a	32, 16, 8, 4, 2	83.3	High
b	17,8,4,2	5.6	Low
c	25,12,6,3	11.1	Low

Predicted Distribution in Wyoming



Classification Rates

Model-Building Points

	Model Present	Model Absent		
Known Present	18 / 18 100.0%	0 / 18 0.0%	Total Correct	953 / 978 97.4%
Known Absent	25 / 960 2.6%	935 / 960 97.4%	Total Incorrect	25 / 978 2.6%

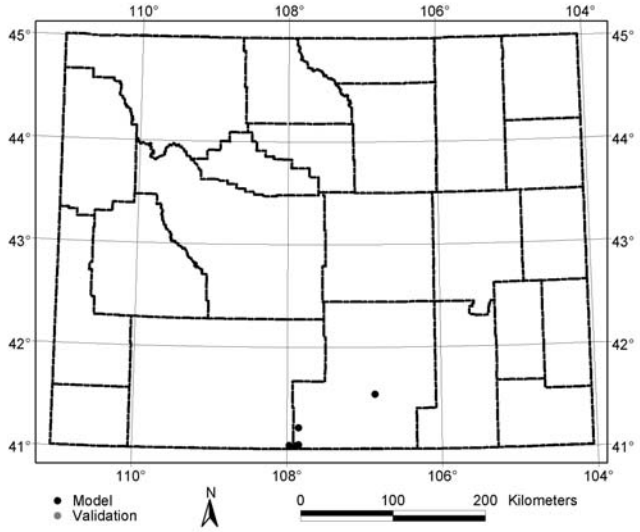
Validation Points

	Model Present	Model Absent		
Known Present	7 / 8 87.5%	1 / 8 12.5%	Total Correct	211 / 214 98.6%
Known Absent	2 / 206 1.0%	204 / 206 99.0%	Total Incorrect	3 / 214 1.4%

Area of Predicted Distribution: 6,498 km^2 (2.6% of WY)

Penstemon gibbensii Dorn

Known Distribution in Wyoming



Numbers of Points for Modeling

	Model	Validation	Total
Known Present	5	0	5
Known Absent	961	127	1088
Total	966	127	1093

Data Source (Points)

Wyoming Heritage Program (5)

Modeling Notes

Factor used to expand ranges: 0.05
Biomes used for validation: IDGRS

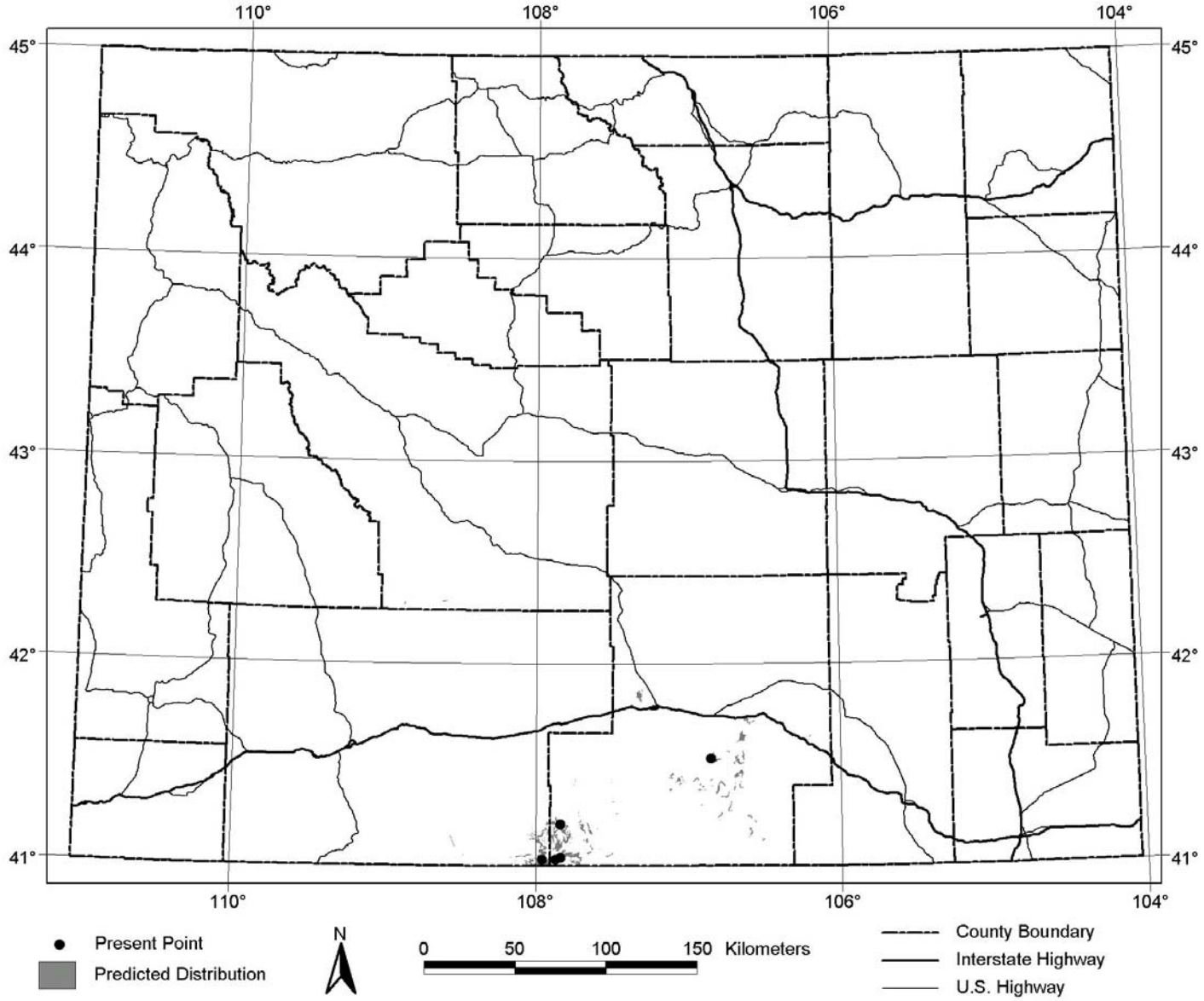
Ranges of Continuous Variables

	MIN	MAX	UNITS
ELEV	1813	2412	m
RELIEF	70	205	m
PT01	2.09	4.96	cm
PT04	3.47	5.80	cm
PT07	2.39	3.70	cm
PT10	2.93	5.68	cm
RT01	7.14	8.06	$MJ/m^2/day$
RT07	23.75	26.71	$MJ/m^2/day$
TA01	-8.45	-4.56	^oC
TA04	2.52	6.90	^oC
TA07	16.17	20.29	^oC
TA10	4.05	7.91	^oC

Values of Categorical Variables

BEDGEOL: Eoe, MiPl
LANDCOV: WySge
SOIL: WY34, WY40C, WY44
SURFGEOL: Ri, ri, sci

Predicted Distribution in Wyoming



Classification Rates

Model-Building Points

	Model Present	Model Absent		
Known Present	5 / 5 100.0%	0 / 5 0.0%	Total Correct	965 / 966 99.9%
Known Absent	1 / 961 0.1%	960 / 961 99.9%	Total Incorrect	1 / 966 0.1%

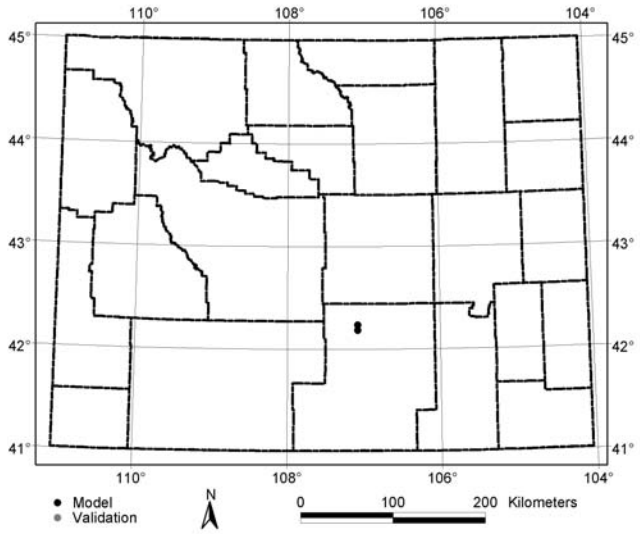
Validation Points

	Model Present	Model Absent		
Known Present	0 / 0	0 / 0	Total Correct	127 / 127 100.0%
Known Absent	0 / 127 0.0%	127 / 127 100.0%	Total Incorrect	0 / 127 0.0%

Area of Predicted Distribution: 346 km^2 (0.14% of WY)

Penstemon haydenii Wats.

Known Distribution in Wyoming



Numbers of Points for Modeling

	Model	Validation	Total
Known Present	2	0	2
Known Absent	962	189	1151
Total	964	189	1153

Data Source (Points)

Wyoming Heritage Program (2)

Modeling Notes

Factor used to expand ranges: 0.1
Biomes used for validation: FOOT, IDGRS, IDS

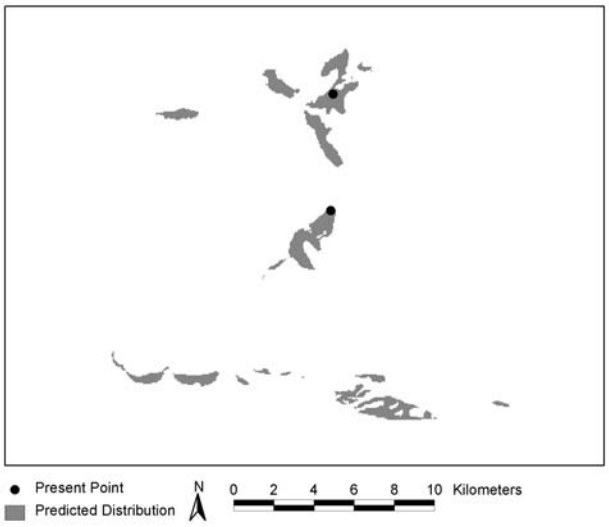
Ranges of Continuous Variables

	MIN	MAX	UNITS
ELEV	1835	2450	m
RELIEF	127	281	m
PT01	1.38	1.96	cm
PT04	3.62	5.15	cm
PT07	2.19	2.96	cm
PT10	2.75	3.73	cm
RT01	6.11	7.68	$MJ/m^2/day$
RT07	21.99	27.11	$MJ/m^2/day$
TA01	-8.86	-4.25	^oC
TA04	1.31	6.23	^oC
TA07	15.75	20.61	^oC
TA10	3.28	8.07	^oC

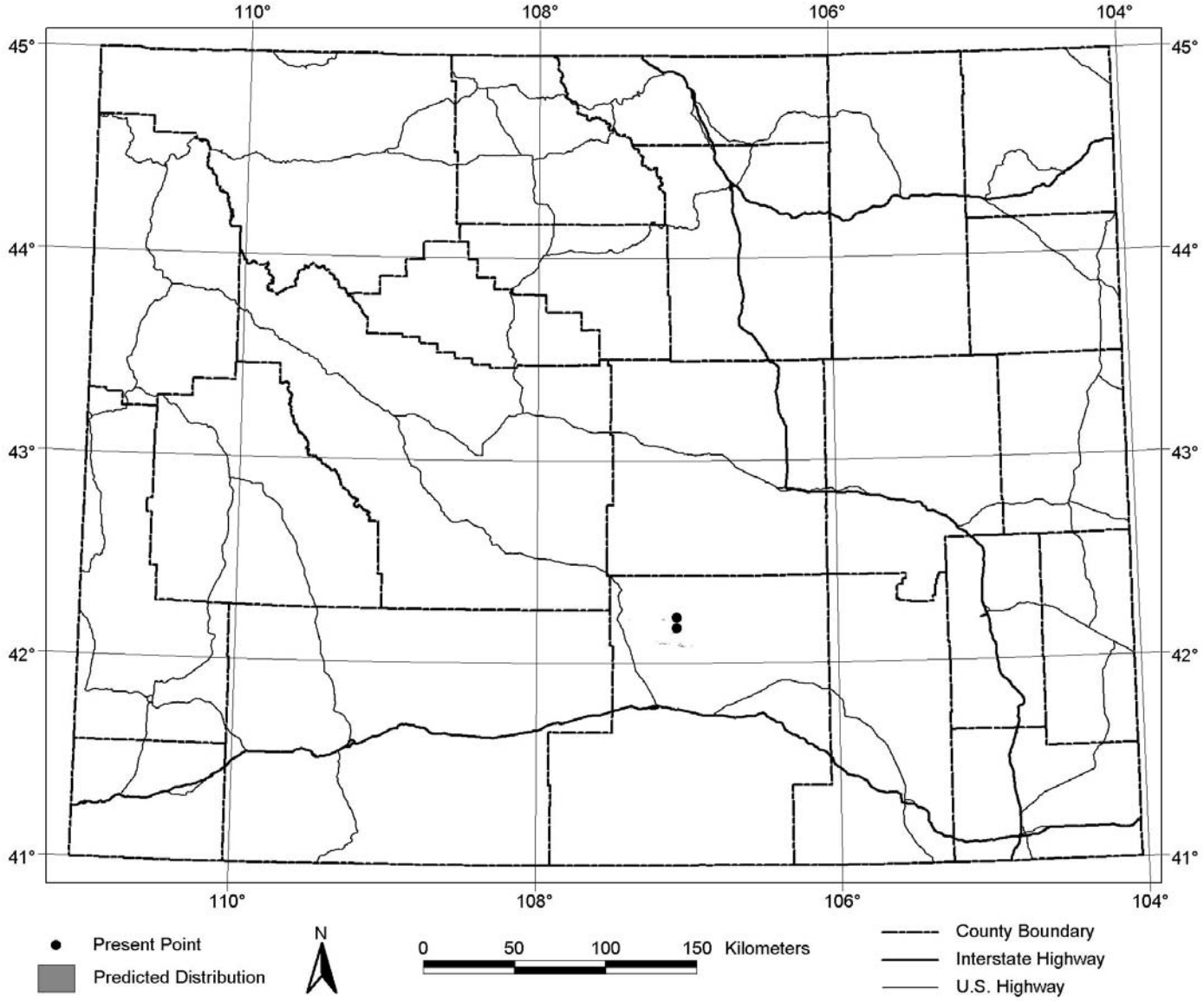
Values of Categorical Variables

BEDGEOL: Qs
LANDCOV: MtSge, VgDun, WySge
SOIL: WY10
SURFGEOL: ei

Detailed View of Predicted Distribution



Predicted Distribution in Wyoming



Classification Rates

Model-Building Points

	Model Present	Model Absent		
Known Present	2 / 2 100.0%	0 / 2 0.0%	Total Correct	964 / 964 100.0%
Known Absent	0 / 962 0.0%	962 / 962 100.0%	Total Incorrect	0 / 964 0.0%

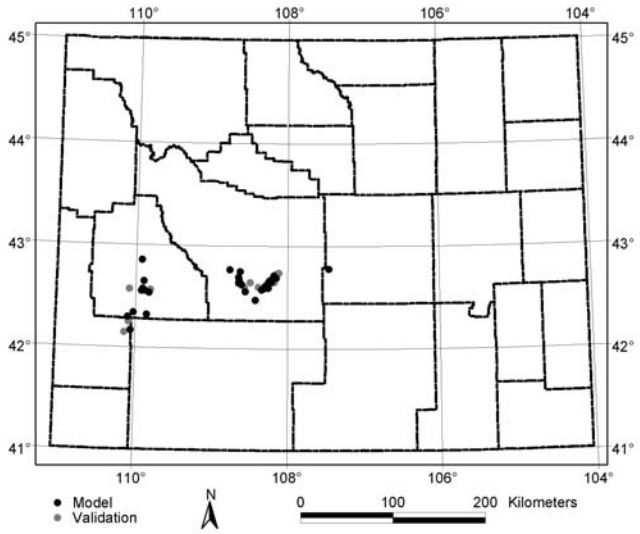
Validation Points

	Model Present	Model Absent		
Known Present	0 / 0	0 / 0	Total Correct	189 / 189 100.0%
Known Absent	0 / 189 0.0%	189 / 189 100.0%	Total Incorrect	0 / 189 0.0%

Area of Predicted Distribution: 15 km^2 (0.01% of WY)

Phlox pungens Dorn

Known Distribution in Wyoming



Numbers of Points for Modeling

	Model	Validation	Total
Known Present	30	10	40
Known Absent	957	179	1136
Total	987	189	1176

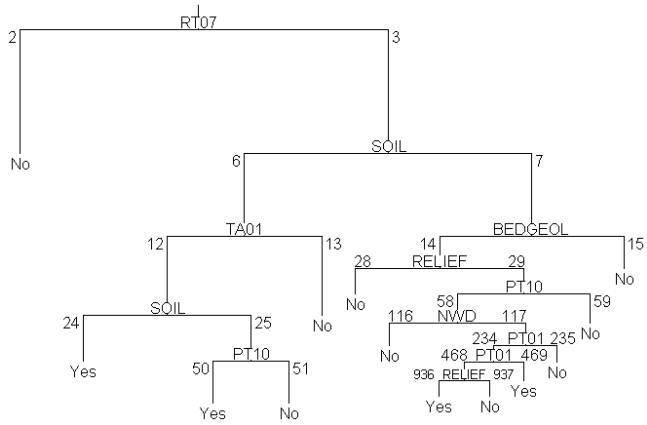
Data Source (Points)

Rocky Mountain Herbarium (2)
Wyoming Heritage Program (38)

Modeling Notes

Independent variables: ELEV, RELIEF, PT01, PT04, PT07, PT10, NWD, RT01, RT07, TA01, TA04, TA07, TA10, TX07, NFD, GDD, BEDGEOL, LANDCOV, SOIL, SURFGEOL
Minimum number of observations before split: 3
Minimum node size: 6
Minimum node deviance: 0.01
Minimum percent for pruning: 0.6
Biomes used for validation: FOOT, IDGRS, IDS

Classification Tree Used in Model Building



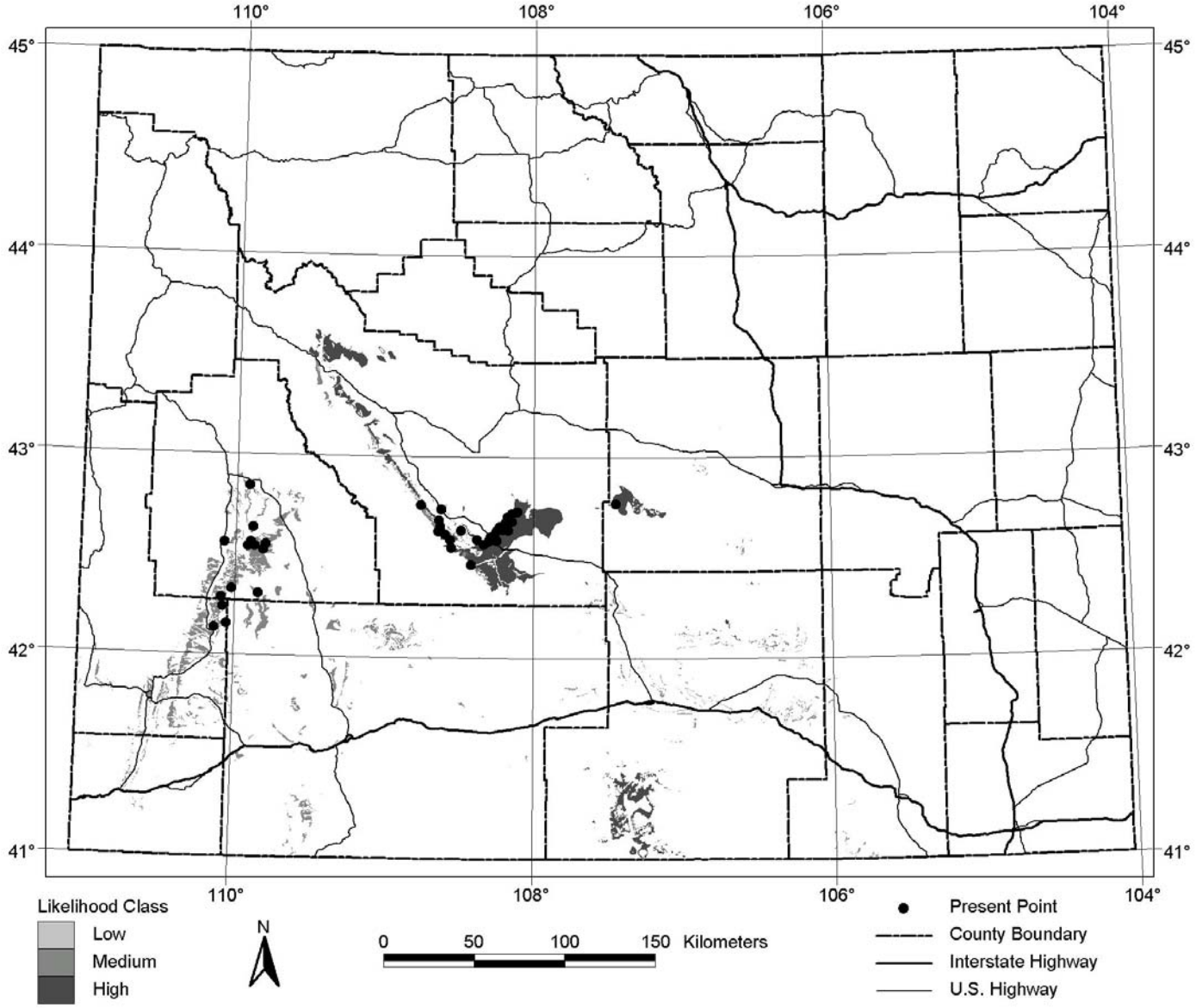
Classification Tree Output

Node_Num) Node_Def Node_Size (Num_No,Num_Yes) (Pct_No,Pct_Yes) Node_Type
1) root 987 (957,30) (100,100) Yes
  2) RT07<24.655 553 (553,0) (57.8,0) No *
  3) RT07>24.655 434 (404,30) (42.2,100) Yes
    6) SOIL:WY16C,WY34,WY40C,WY41 108 (86,22) (9,73.3) Yes
      12) TA01<-6.905 58 (36,22) (3.8,73.3) Yes
        24) SOIL:WY16C,WY34 22 (6,16) (0.6,53.3) **Yes ***
        25) SOIL:WY40C,WY41 36 (30,6) (3.1,20) Yes
          50) PT10<2.255 11 (5,6) (0.5,20) **Yes ***
          51) PT10>2.255 25 (25,0) (2.6,0) No *
      13) TA01>-6.905 50 (50,0) (5.2,0) No *
    7) SOIL:WY06C,WY07C,WY08C,WY10,WY11,WY15,WY17C, WY27,WY31C,WY35,WY38C,WY42,WY44,WY45 326 (318,8) (33.2,26.7) No
      14) BEDGEOL:Eoe,Ksh,PTJ,Pze 144 (136,8) (14.2,26.7) Yes
        28) RELIEF<83.5 66 (66,0) (6.9,0) No *
        29) RELIEF>83.5 78 (70,8) (7.3,26.7) Yes
          58) PT10<3.08 39 (31,8) (3.2,26.7) Yes
            116) NWD<52.95 15 (15,0) (1.6,0) No *
            117) NWD>52.95 24 (16,8) (1.7,26.7) Yes
              234) PT01<2.625 17 (9,8) (0.9,26.7) Yes
                468) PT01<2.285 13 (9,4) (0.9,13.3) Yes
                936) RELIEF<107 7 (3,4) (0.3,13.3) **Yes ***
                937) RELIEF>107 6 (6,0) (0.6,0) No *
                469) PT01>2.285 4 (0,4) (0,13.3) **Yes ***
              235) PT01>2.625 7 (7,0) (0.7,0) No *
          59) PT10>3.08 39 (39,0) (4.1,0) No *
      15) BEDGEOL:Eex,Eol,H2O,Kmix,Kss,MiPl,Olg,PCf,Pal,Qal,Qlc, Qls,Qs,Qt,Qvf,TQc 182 (182,0) (19,0) No *

Path Composition and Likelihood

Yes Path	Node List	% of Present Points	Likelihood Class
a	24, 12, 6, 3	53.3	High
b	50, 25, 12, 6, 3	20.0	Medium
c	936, 468, 234, 117, 58, 29, 14, 7, 3	13.3	Medium
d	469, 234, 117, 58, 29, 14, 7, 3	13.3	Medium

Predicted Distribution in Wyoming



Classification Rates

Model-Building Points

	Model Present	Model Absent		
Known Present	29 / 30 96.7%	1 / 30 3.3%	Total Correct	972 / 987 98.5%
Known Absent	14 / 957 1.5%	943 / 957 98.5%	Total Incorrect	15 / 987 1.5%

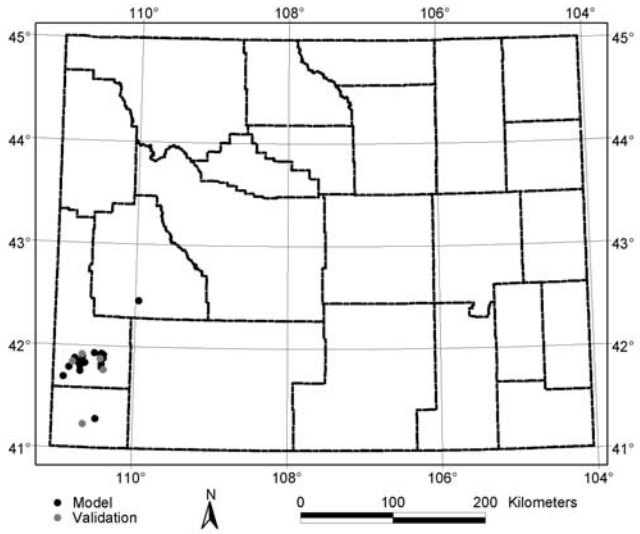
Validation Points

	Model Present	Model Absent		
Known Present	8 / 10 80.0%	2 / 10 20.0%	Total Correct	186 / 189 98.4%
Known Absent	1 / 179 0.6%	178 / 179 99.4%	Total Incorrect	3 / 189 1.6%

Area of Predicted Distribution: 4,159 km^2 (1.6% of WY)

Physaria condensata Rollins

Known Distribution in Wyoming



Numbers of Points for Modeling

	Model	Validation	Total
Known Present	18	5	23
Known Absent	960	175	1135
Total	978	180	1158

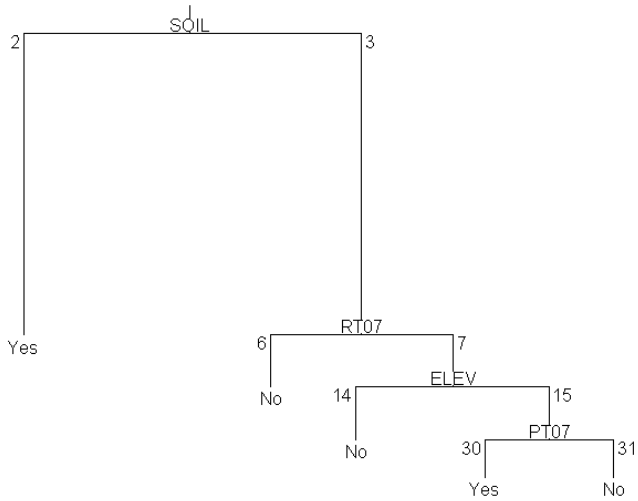
Data Source (Points)

Wyoming Heritage Program (23)

Modeling Notes

Independent variables: ELEV, RELIEF, PT01, PT04, PT07, PT10, NWD, RT01, RT07, TA01, TA04, TA07, TA10, TX07, NFD, GDD, BEDGEOL, LANDCOV, SOIL, SURFGEOL
Minimum number of observations before split: 2
Minimum node size: 4
Minimum node deviance: 0.01
Minimum percent for pruning: 0.8
Biomes used for validation: FOOT, IDGRS, IDS

Classification Tree Used in Model Building



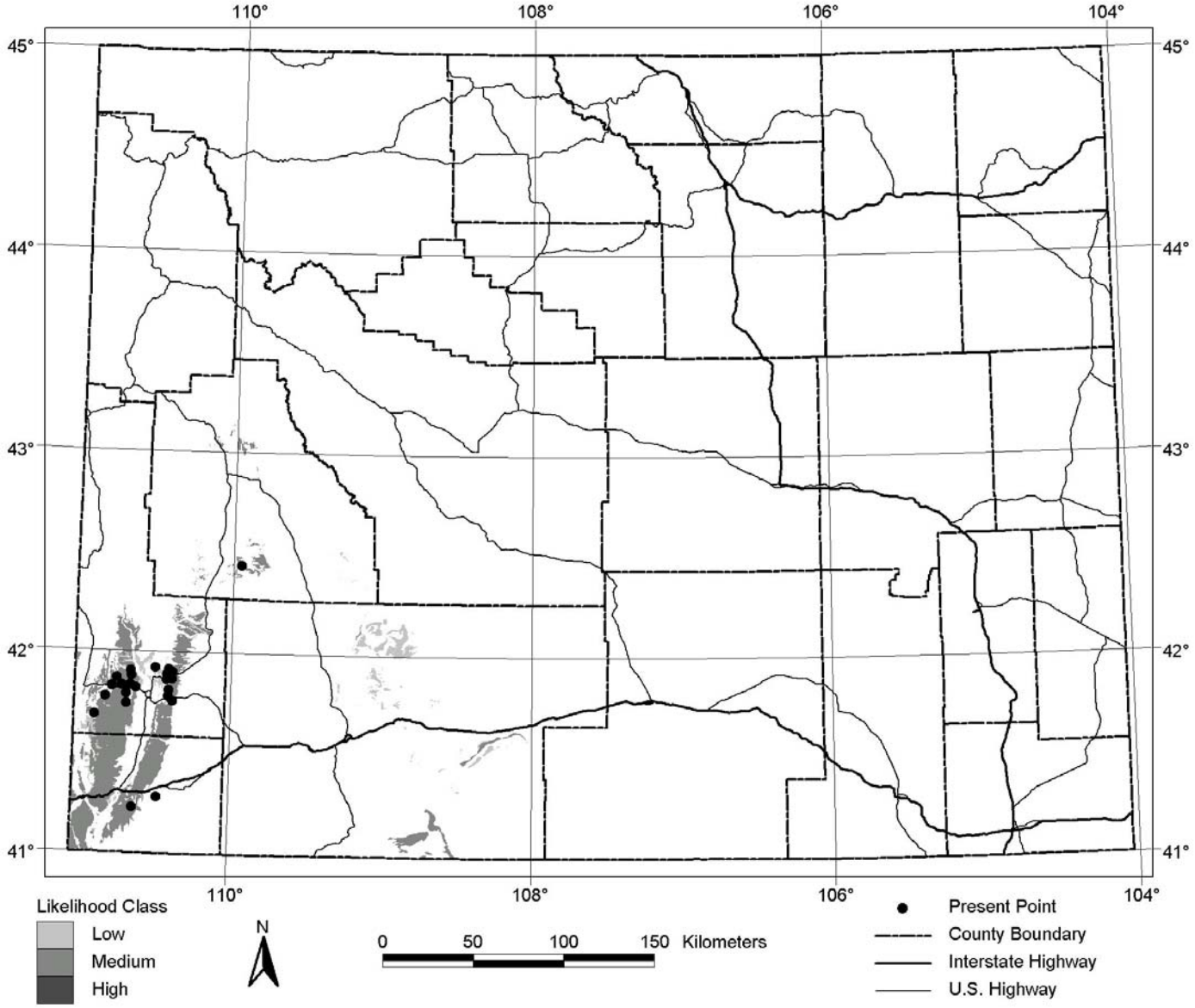
Classification Tree Output

Node_Num) Node_Def Node_Size (Num_No,Num_Yes) (Pct_No,Pct_Yes) Node_Type
1) root 978 (960,18) (100,100) Yes
  2) SOIL:WY41 22 (8,14) (0.8,77.8) **Yes ***
  3) SOIL:WY01,WY06C,WY07C,WY08C,WY10,WY11,WY14, WY15,WY16C,WY17C,WY18,WY20,WY23,WY27,WY31C, WY34,WY35,WY36,WY38C,WY40C,WY42,WY44,WY45 956 (952,4) (99.2,22.2) No
    6) RT07<25.505 842 (842,0) (87.7,0) No *
    7) RT07>25.505 114 (110,4) (11.5,22.2) Yes
      14) ELEV<2230 99 (99,0) (10.3,0) No *
      15) ELEV>2230 15 (11,4) (1.1,22.2) Yes
        30) PT07<2.39 5 (1,4) (0.1,22.2) **Yes ***
        31) PT07>2.39 10 (10,0) (1,0) No *

Path Composition and Likelihood

Yes Path	Node List	% of Present Points	Likelihood Class
a	2	77.8	Medium
b	30, 15, 7, 3	22.2	Low

Predicted Distribution in Wyoming



Classification Rates

Model-Building Points

	Model Present	Model Absent		
Known Present	18 / 18 100.0%	0 / 18 0.0%	Total Correct	969 / 978 99.1%
Known Absent	9 / 960 0.9%	951 / 960 99.1%	Total Incorrect	9 / 978 0.9%

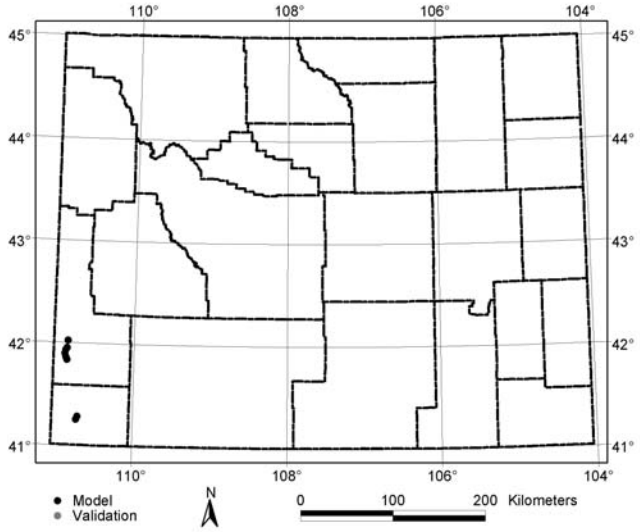
Validation Points

	Model Present	Model Absent		
Known Present	4 / 5 80.0%	1 / 5 20.0%	Total Correct	178 / 180 98.9%
Known Absent	1 / 175 0.6%	174 / 175 99.4%	Total Incorrect	2 / 180 1.1%

Area of Predicted Distribution: 4,012 km^2 (1.6% of WY)

Physaria dornii Lichvar

Known Distribution in Wyoming



Numbers of Points for Modeling

	Model	Validation	Total
Known Present	8	0	8
Known Absent	961	162	1123
Total	969	162	1131

Data Source (Points)

Wyoming Heritage Program (8)

Modeling Notes

Biomes used for validation: FOOT, IDGRS

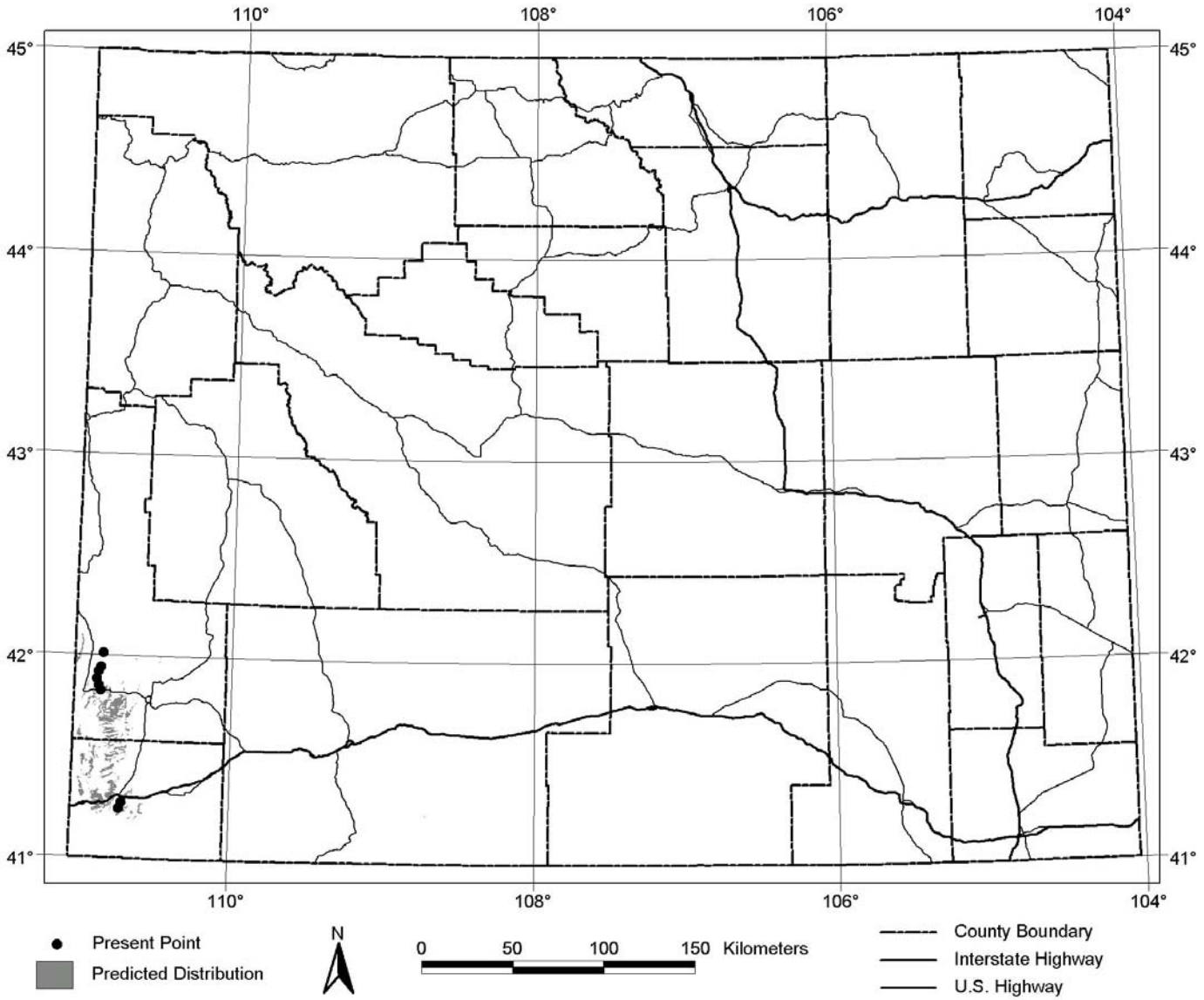
Ranges of Continuous Variables

	MIN	MAX
ELEV	1910	2428
RELIEF	110	263
PT01	1.93	3.71
PT04	2.83	3.96
PT07	1.96	2.59
PT10	2.76	3.71
RT01	6.74	8.26
RT07	24.19	27.13
TA01	-10.45	-6.03
TA04	1.83	4.64
TA07	14.74	17.51
TA10	3.14	6.02

Values of Categorical Variables

BEDGEOL: Eoe, PTJ
LANDCOV: Junpr, WySge
SOIL: WY17C, WY41
SURFGEOL: Ri

Predicted Distribution in Wyoming



Classification Rates for Wyoming Points

Model-Building Points

	Model Present	Model Absent		
Known Present	8 / 8 100.0%	0 / 8 0.0%	Total Correct	968 / 969 99.9%
Known Absent	1 / 961 0.1%	960 / 961 99.9%	Total Incorrect	1 / 969 0.1%

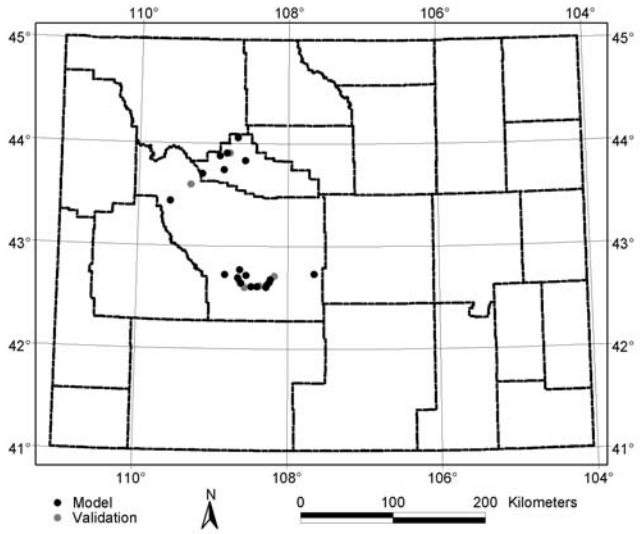
Validation Points

	Model Present	Model Absent		
Known Present	0 / 0	0 / 0	Total Correct	162 / 162 100.0%
Known Absent	0 / 162 0.0%	162 / 162 100.0%	Total Incorrect	0 / 162 0.0%

Area of Predicted Distribution: 508 km^2 (0.2% of WY)

Physaria saximontana Rollins var. *saximontana*

Known Distribution in Wyoming



Numbers of Points for Modeling

	Model	Validation	Total
Known Present	19	6	25
Known Absent	962	170	1132
Total	981	176	1157

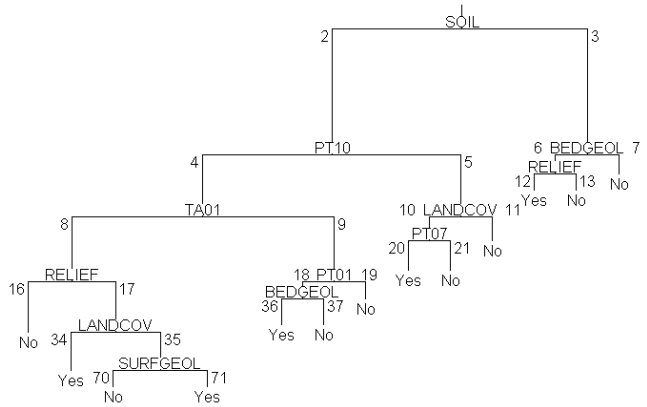
Data Source (Points)

Wyoming Heritage Program (25)

Modeling Notes

Independent variables: ELEV, RELIEF, PT01, PT04, PT07, PT10, NWD, RT01, RT07, TA01, TA04, TA07, TA10, TX07, NFD, GDD, BEDGEOL, LANDCOV, SOIL, SURFGEOL
Minimum number of observations before split: 3
Minimum node size: 6
Minimum node deviance: 0.01
Minimum percent for pruning: 0.6
Biomes used for validation: FOOT, IDGRS

Classification Tree Used in Model Building



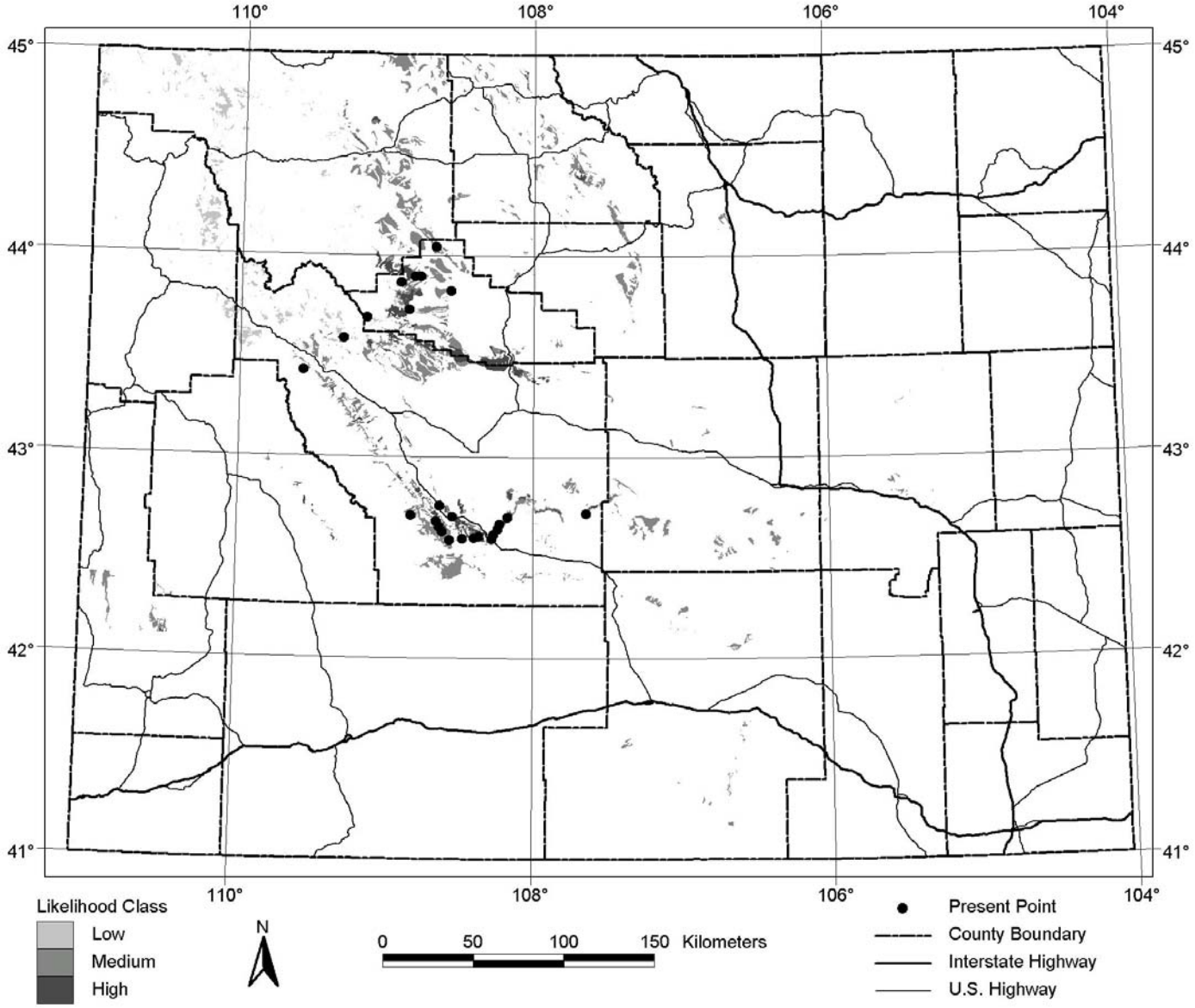
Classification Tree Output

Node_Num) Node_Def Node_Size (Num_No,Num_Yes) (Pct_No,Pct_Yes) Node_Type
1) root 981 (962,19) (100,100) Yes
2) SOIL:WY14,WY34,WY35,WY42 263 (245,18) (25.5,94.7) Yes
4) PT10<2.805 106 (90,16) (9.4,84.2) Yes
8) TA01<-6.635 39 (25,14) (2.6,73.7) Yes
16) RELIEF<113.5 14 (14,0) (1.5,0) No *
17) RELIEF>113.5 25 (11,14) (1.1,73.7) Yes
34) LANDCOV:HmDis,Junpr,MtSge,ShRip 8 (0,8) (0,42.1) **Yes ***
35) LANDCOV:Aspen,Limbr,MGras,StBsh,WySge 17 (11,6) (1.1,31.6) Yes
70) SURFGEOL:fi,gi,ri 5 (5,0) (0.5,0) No *
71) SURFGEOL:Ri,li,sci 12 (6,6) (0.6,31.6) **Yes ***
9) TA01>-6.635 67 (65,2) (6.8,10.5) Yes
18) PT01<0.805 17 (15,2) (1.6,10.5) Yes
36) BEDGEOL:Ksh,Pal 3 (1,2) (0.1,10.5) **Yes ***
37) BEDGEOL:Eoe,Kmix,Pze,Qal 14 (14,0) (1.5,0) No *
19) PT01>0.805 50 (50,0) (5.2,0) No *
5) PT10>2.805 157 (155,2) (16.1,10.5) No
10) LANDCOV:Junpr,MtSge 22 (20,2) (2.1,10.5) Yes
20) PT07<2.81 3 (1,2) (0.1,10.5) **Yes ***
21) PT07>2.81 19 (19,0) (2,0) No *
11) LANDCOV:Aspen,BkSge,BsnRk,DougF,DstSh,FrRip,GrsWd, HmDis,Limbr,LodgP,MGras,MesSh,Pdosa,SbAlp,ShRip, SpFir,StBsh,WySge,XerSh 135 (135,0) (14,0) No *
3) SOIL:WY01,WY06C,WY07C,WY08C,WY10,WY11,WY15, WY16C,WY17C,WY18,WY20,WY23,WY27,WY31C,WY36, WY38C,WY40C,WY41,WY44,WY45 718 (717,1) (74.5,5.3) No
6) BEDGEOL:Eex 32 (31,1) (3.2,5.3) Yes
12) RELIEF<205.5 3 (2,1) (0.2,5.3) **Yes ***
13) RELIEF>205.5 29 (29,0) (3,0) No *
7) BEDGEOL:Ein,Eoe,Eol,H2O,Kmix,Ksh,Kss,MiPl,Olg,PCf,PCm, PTJ,Pal,Pze,Qal,Qlc,Qls,Qs,Qt,Qvf,TQc 686 (686,0) (71.3,0) No *

Path Composition and Likelihood

Yes Path	Node List	% of Present Points	Likelihood Class
a	34, 17, 8, 4, 2	42.1	High
b	71, 35, 17, 8, 4, 2	31.6	Medium
c	36, 18, 9, 4, 2	10.5	Medium
d	20, 10, 5, 2	10.5	Medium
e	12, 6, 3	5.3	Low

Predicted Distribution in Wyoming



Classification Rates

Model-Building Points

	Model Present	Model Absent		
Known Present	17 / 19 89.5%	2 / 19 10.5%	Total Correct	968 / 981 98.7%
Known Absent	11 / 962 1.1%	951 / 962 98.9%	Total Incorrect	13 / 981 1.3%

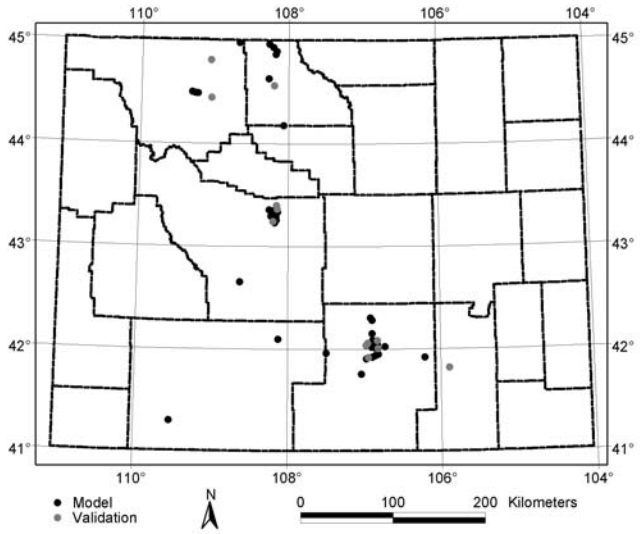
Validation Points

	Model Present	Model Absent		
Known Present	3 / 6 50.0%	3 / 6 50.0%	Total Correct	169 / 176 96.0%
Known Absent	4 / 170 2.4%	166 / 170 97.6%	Total Incorrect	7 / 176 4.0%

Area of Predicted Distribution: 4,679 km^2 (1.9% of WY)

Rorippa calycina (Engelm.) Rydb.

Known Distribution in Wyoming



Numbers of Points for Modeling

	Model	Validation	
Known Present	37	12	49
Known Absent	957	202	1159
Total	994	214	1208

Data Source (Points)

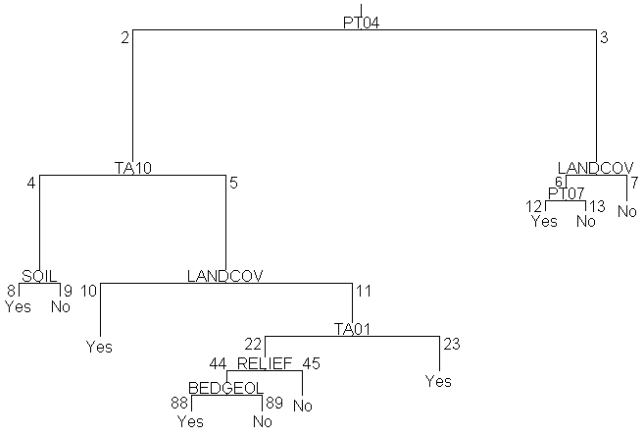
Rocky Mountain Herbarium (4)
Wyoming Heritage Program (45)

Modeling Notes

Independent variables: ELEV, RELIEF, PT01, PT04, PT07, PT10, NWD, RT01, RT07, TA01, TA04, TA07, TA10, TX07, NFD, GDD, BEDGEOL, LANDCOV, SOIL, SURFGEOL
Minimum number of observations before split: 4
Minimum node size: 8
Minimum node deviance: 0.01
Minimum percent for pruning: 1.0
Biomes used for validation: FOOT, IDGRS, IDS, WET
Riparian types: LakRipI, ResRipI, ResRipP, StrRipI, StrRipP, WRivRip

The wetland model is the intersection of the classification tree model with the specified riparian types.

Classification Tree Used in Model Building



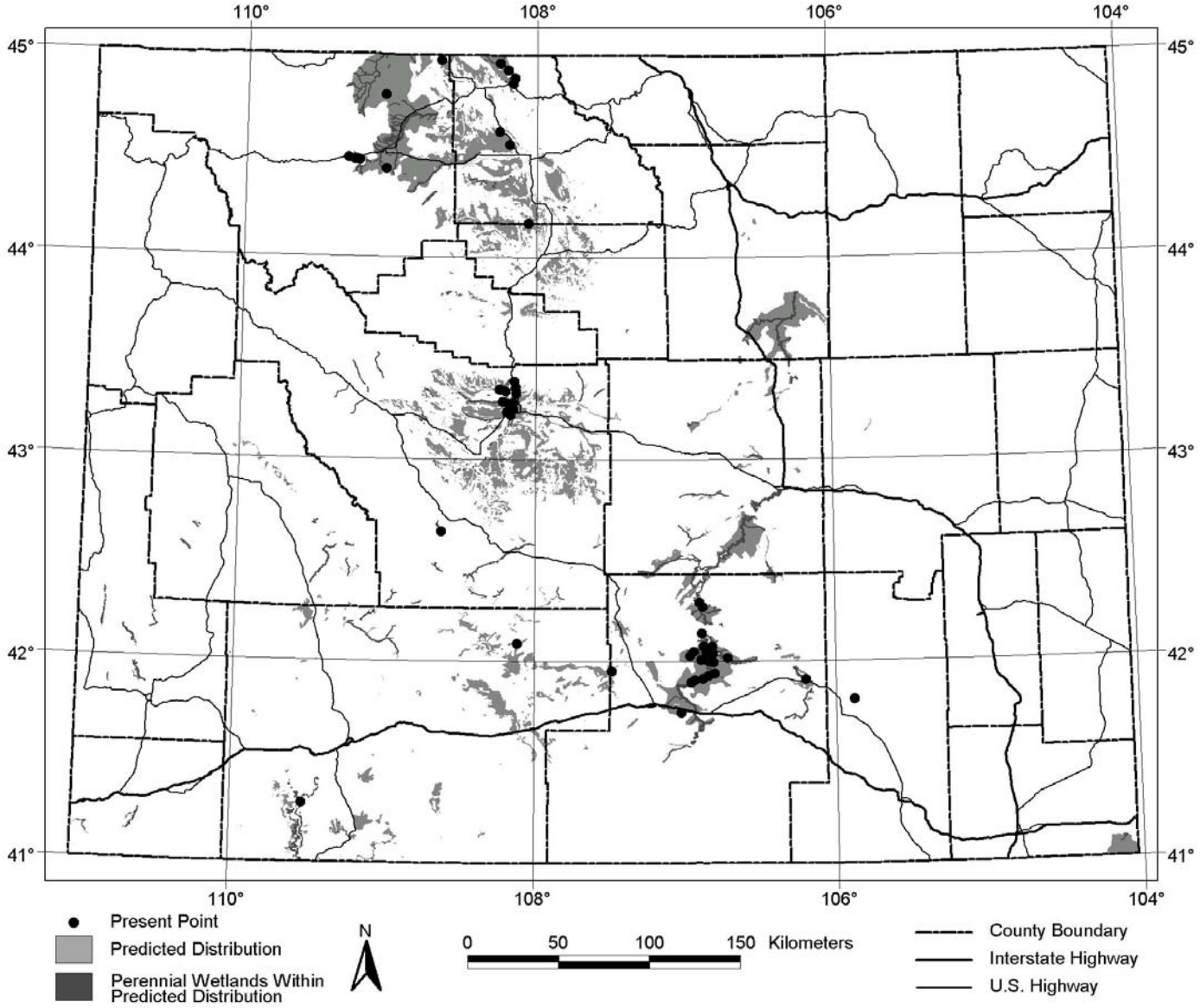
Classification Tree Output

Node_Num) Node_Def Node_Size (Num_No,Num_Yes) (Pct_No,Pct_Yes) Node_Type
1) root 994 (957,37) (100,100) Yes
  2) PT04<3.21 260 (225,35) (23.5,94.6) Yes
    4) TA10<6.69 155 (154,1) (16.1,2.7) No
      8) SOIL:WY06C,WY11 4 (3,1) (0.3,2.7) **Yes ***
      9) SOIL:WY10,WY14,WY17C,WY27,WY34,WY35,WY38C, WY40C,WY41,WY42,WY44 151 (151,0) (15.8,0) No *
    5) TA10>6.69 105 (71,34) (7.4,91.9) Yes
      10) LANDCOV:Playa,Water 12 (0,12) (0,32.4) **Yes ***
      11) LANDCOV:BsnRk,DstSh,FrRip,GrsWd,HmDis,Junpr,MGras, MtSge,SGras,ShRip,StBsh,WySge 93 (71,22) (7.4,59.5) Yes
        22) TA01<-5.64 62 (56,6) (5.9,16.2) Yes
          44) RELIEF<47.5 21 (15,6) (1.6,16.2) Yes
            88) BEDGEOL:Eoe,H2O,Ksh,Pal 12 (6,6) (0.6,16.2) **Yes ***
            89) BEDGEOL:MiPl,Qal,Qs 9 (9,0) (0.9,0) No *
          45) RELIEF>47.5 41 (41,0) (4.3,0) No *
        23) TA01>-5.64 31 (15,16) (1.6,43.2) **Yes ***
  3) PT04>3.21 734 (732,2) (76.5,5.4) No
    6) LANDCOV:GrsWd,ShRip 20 (18,2) (1.9,5.4) Yes
      12) PT07<2.73 6 (4,2) (0.4,5.4) **Yes ***
      13) PT07>2.73 14 (14,0) (1.5,0) No *
    7) LANDCOV:AlpRk,AlpTn,Aspen,BkSge,BrOak,BsnRk,DougF, DstSh,FrRip,GrWet,HmDis,Junpr,Limbr,LodgP,MGras,MesSh, MtSge,Pdosa,Playa,SGras,SbAlp,SpFir,StBsh,VgDun,WhtBk, WySge,XerSh 714 (714,0) (74.6,0) No *

Path Composition and Likelihood

Yes Path	Node List	% of Present Points	Likelihood Class
a	8, 4, 2	2.7	Low
b	10, 5, 2	32.4	Medium
c	88, 44, 22, 11, 5, 2	16.2	Medium
d	23, 11, 5, 2	43.2	High
e	12, 6, 3	5.4	Low

Predicted Distribution in Wyoming



Classification Rates

Model-Building Points

	Predicted		Wetlands	
	Model Present	Model Absent	Model Present	Model Absent
Known Present	37 / 37 100.0%	0 / 37 0.0%	32 / 37 86.5%	5 / 37 13.5%
Known Absent	29 / 957 3.0%	928 / 957 97.0%	7 / 957 0.7%	950 / 957 99.3%
Total Correct	965 / 994 97.1%		982 / 994 98.8%	
Total Incorrect	29 / 994 2.9%		12 / 994 1.2%	

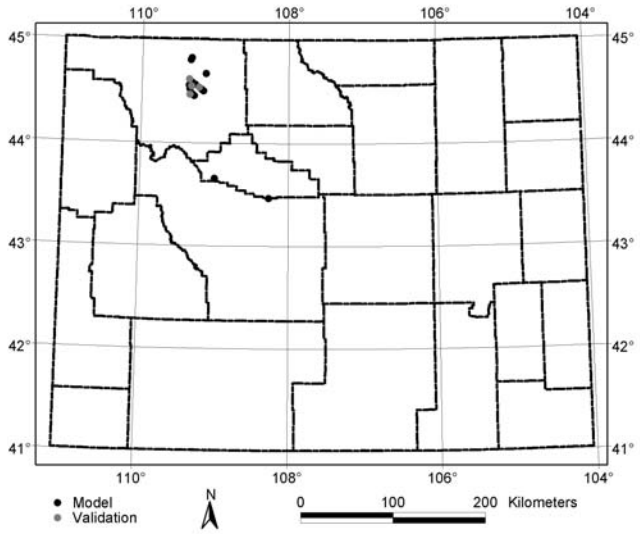
Validation Points

	Predicted		Wetlands	
	Model Present	Model Absent	Model Present	Model Absent
Known Present	11 / 12 91.7%	1 / 12 8.3%	9 / 12 75.0%	3 / 12 25.0%
Known Absent	10 / 202 5.0%	192 / 202 95.0%	4 / 202 2.0%	198 / 202 98.0%
Total Correct	203 / 214 94.9%		207 / 214 96.7%	
Total Incorrect	11 / 214 5.1%		7 / 214 3.3%	

Area of Predicted Distribution: 11,150 km^2 (4.4% of WY); **Wetlands:** 1,114 km^2 (0.44% of WY)

Shoshonea pulvinata Evert & Const.

Known Distribution in Wyoming



Numbers of Points for Modeling

	Model	Validation	Total
Known Present	13	4	17
Known Absent	960	205	1165
Total	973	209	1182

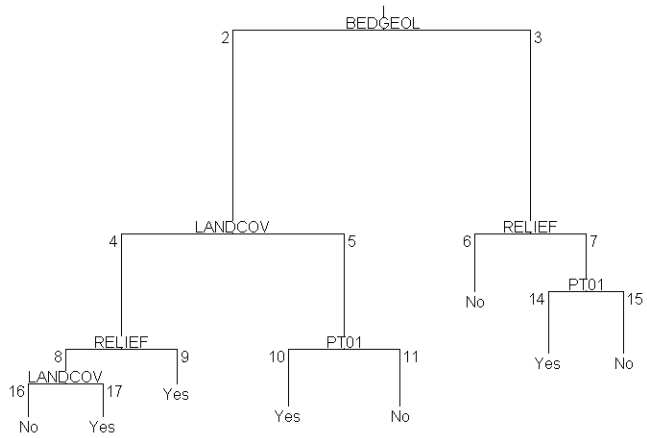
Data Source (Points)

Wyoming Heritage Program (17)

Modeling Notes

Independent variables: ELEV, RELIEF, PT01, PT04, PT07, PT10, NWD, RT01, RT07, TA01, TA04, TA07, TA10, TX07, NFD, GDD, BEDGEOL, LANDCOV, SOIL, SURFGEOL
Minimum number of observations before split: 1
Minimum node size: 2
Minimum node deviance: 0.01
Minimum percent for pruning: 0.1
Biomes used for validation: FOOT, IDGRS, RMF

Classification Tree Used in Model Building



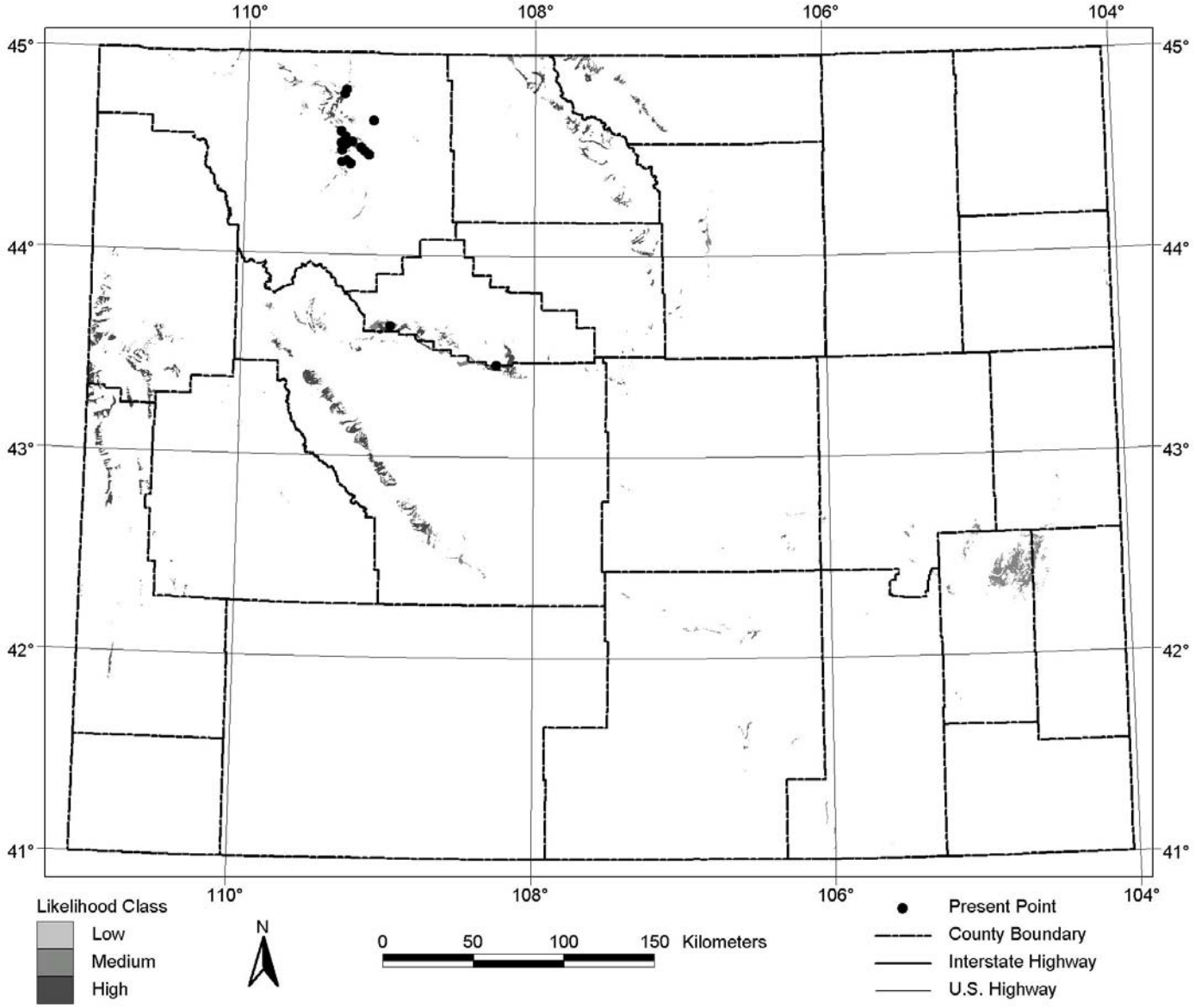
Classification Tree Output

Node_Num) Node_Def Node_Size (Num_No,Num_Yes) (Pct_No,Pct_Yes) Node_Type
1) root 973 (960,13) (100,100) Yes
  2) BEDGEOL:Pze 70 (59,11) (6.1,84.6) Yes
    4) LANDCOV:DougF,Junpr,Limbr,MtSge 13 (4,9) (0.4,69.2) Yes
      8) RELIEF<308.5 6 (4,2) (0.4,15.4) Yes
        16) LANDCOV:DougF,Junpr,Limbr 4 (4,0) (0.4,0) No *
        17) LANDCOV:MtSge 2 (0,2) (0,15.4) **Yes ***
      9) RELIEF>308.5 7 (0,7) (0,53.8) **Yes ***
    5) LANDCOV:AlpRk,FrRip,GrWet,HmDis,LodgP,MGras,MesSh, Pdosa,SbAlp,SpFir,WhtBk,WySge 57 (55,2) (5.7,15.4) Yes
      10) PT01<1.015 3 (1,2) (0.1,15.4) **Yes ***
      11) PT01>1.015 54 (54,0) (5.6,0) No *
  3) BEDGEOL:Eex,Ein,Eoe,Eol,H2O,Kmix,Ksh,Kss,MiPl,Olg,PCf, PCm,PTJ,Pal,Qal,Qlc,Qls,Qs,Qt,Qvf,TQc,Tlvf 903 (901,2) (93.9,15.4) No
    6) RELIEF<408 873 (873,0) (90.9,0) No *
    7) RELIEF>408 30 (28,2) (2.9,15.4) Yes
      14) PT01<1.195 2 (0,2) (0,15.4) **Yes ***
      15) PT01>1.195 28 (28,0) (2.9,0) No *

Path Composition and Likelihood

Yes Path	Node List	% of Present Points	Likelihood Class
a	17, 8, 4, 2	15.4	Medium
b	9, 4, 2	53.8	High
c	10, 5, 2	15.4	Medium
d	14, 7, 3	15.4	Medium

Predicted Distribution in Wyoming



Classification Rates

Model-Building Points

	Model Present	Model Absent		
Known Present	13 / 13 100.0%	0 / 13 0.0%	Total Correct	972 / 973 99.9%
Known Absent	1 / 960 0.1%	959 / 960 99.9%	Total Incorrect	1 / 973 0.1%

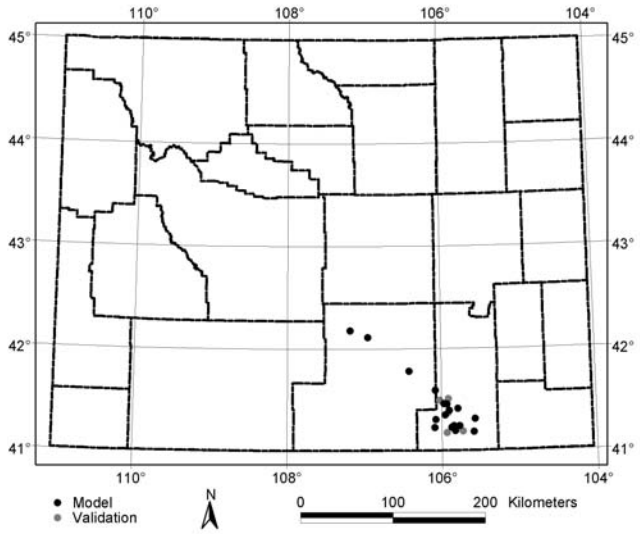
Validation Points

	Model Present	Model Absent		
Known Present	2 / 4 50.0%	2 / 4 50.0%	Total Correct	206 / 209 98.6%
Known Absent	1 / 205 0.5%	204 / 205 99.5%	Total Incorrect	3 / 209 1.4%

Area of Predicted Distribution: 2,167 km^2 (0.86% of WY)

Sisyrinchium pallidum Cholewa & Henderson

Known Distribution in Wyoming



Numbers of Points for Modeling

	Model	Validation	
Known Present	18	5	23
Known Absent	962	162	1124
Total	980	167	1147

Data Source (Points)

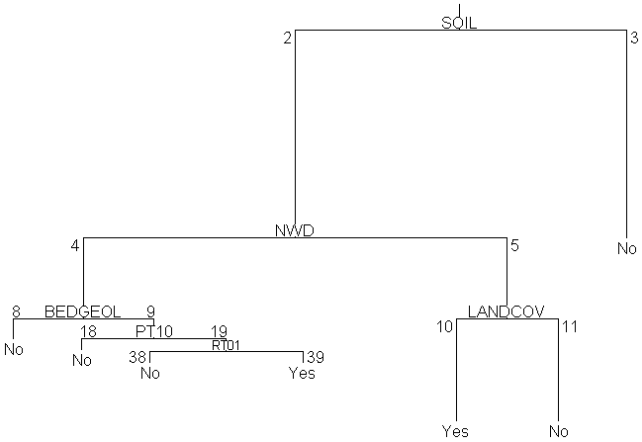
Rocky Mountain Herbarium (5)
Wyoming Heritage Program (18)

Modeling Notes

Independent variables: ELEV, RELIEF, PT01, PT04, PT07, PT10, NWD, RT01, RT07, TA01, TA04, TA07, TA10, TX07, NFD, GDD, BEDGEOL, LANDCOV, SOIL, SURFGEOL
Minimum number of observations before split: 2
Minimum node size: 4
Minimum node deviance: 0.01
Minimum percent for pruning: 0.5
Biomes used for validation: IDGRS, IDS, WET
Riparian types: LakRipI, LakRipP, StrRipI, StrRipP

The wetland model is the intersection of the classification tree model with the specified riparian types.

Classification Tree Used in Model Building



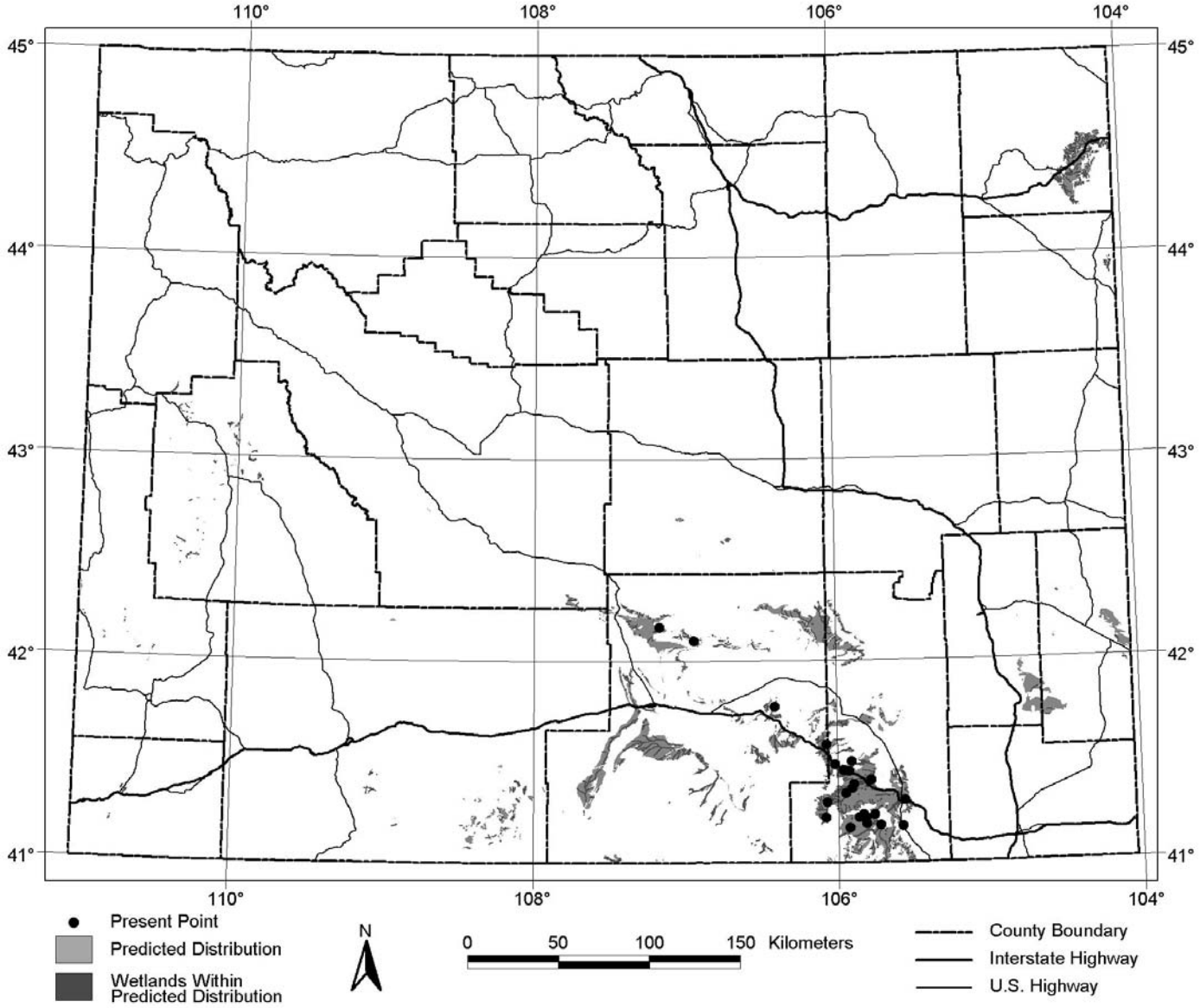
Classification Tree Output

Node_Num) Node_Def Node_Size (Num_No,Num_Yes) (Pct_No,Pct_Yes) Node_Type
1) root 980 (962,18) (100,100) Yes
  2) SOIL:WY10,WY31C,WY35,WY37,WY38C 121 (103,18) (10.7,100) Yes
    4) NWD<778.5 88 (85,3) (8.8,16.7) Yes
      8) BEDGEOL:Eol,H2O,Kmix,MiPl,Olg,PCf,PCm,PTJ,Pal,Pze, Qal,Qls 61 (61,0) (6.3,0) No *
      9) BEDGEOL:Ksh,Qs 27 (24,3) (2.5,16.7) Yes
        18) PT10<279.5 13 (13,0) (1.4,0) No *
        19) PT10>279.5 14 (11,3) (1.1,16.7) Yes
          38) RT01<722 6 (6,0) (0.6,0) No *
          39) RT01>722 8 (5,3) (0.5,16.7) **Yes ***
    5) NWD>778.5 33 (18,15) (1.9,83.3) Yes
      10) LANDCOV:HmDis,MGras,ShRip 16 (1,15) (0.1,83.3) **Yes ***
      11) LANDCOV:Aspen,BkSge,Junpr,LodgP,MtSge,Pdosa,WySge 17 (17,0) (1.8,0) No *
  3) SOIL:WY01,WY06C,WY07C,WY08C,WY14,WY15,WY16C, WY17C,WY18,WY20,WY23,WY27,WY34,WY36,WY40C, WY41,WY42,WY44,WY45 859 (859,0) (89.3,0) No *

Path Composition and Likelihood

Yes Path	Node List	% of Present Points	Likelihood Class
a	39, 19, 9, 4, 2	16.7	Low
b	10, 5, 2	83.3	Medium

Predicted Distribution in Wyoming



Classification Rates

Model-Building Points

	Predicted		Wetlands	
	Model Present	Model Absent	Model Present	Model Absent
Known Present	17 / 18 94.4%	1 / 18 5.6%	9 / 18 50.0%	9 / 18 50.0%
Known Absent	5 / 962 0.5%	957 / 962 99.5%	1 / 962 0.1%	961 / 962 99.9%
Total Correct	974 / 980 99.4%		970 / 980 99.0%	
Total Incorrect	6 / 980 0.6%		10 / 980 1.0%	

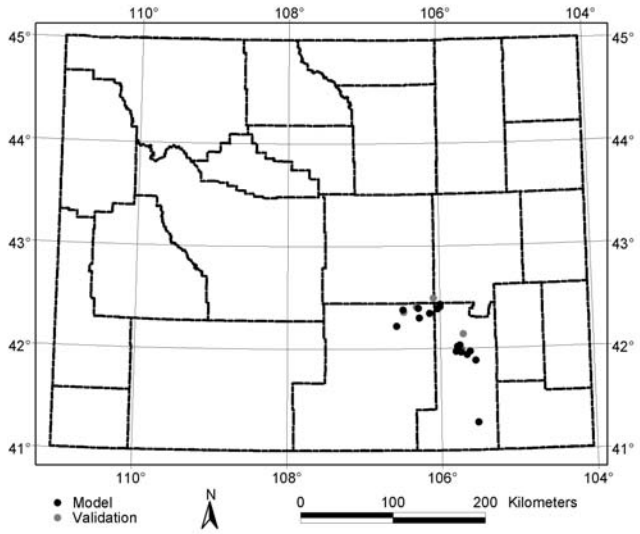
Validation Points

	Predicted		Wetlands	
	Model Present	Model Absent	Model Present	Model Absent
Known Present	2 / 5 40.0%	3 / 5 60.0%	0 / 5 0.0%	5 / 5 100.0%
Known Absent	4 / 162 2.5%	158 / 162 97.5%	1 / 162 0.6%	161 / 162 99.4%
Total Correct	160 / 167 95.8%		161 / 167 96.4%	
Total Incorrect	7 / 167 4.2%		6 / 167 3.6%	

Area of Predicted Distribution: 4,774 km^2 (1.9% of WY); **Wetlands:** 258 km^2 (0.10% of WY)

Sphaeromeria simplex (A. Nels.) Heller

Known Distribution in Wyoming



Numbers of Points for Modeling

	Model	Validation	Total
Known Present	16	5	21
Known Absent	956	180	1136
Total	972	185	1157

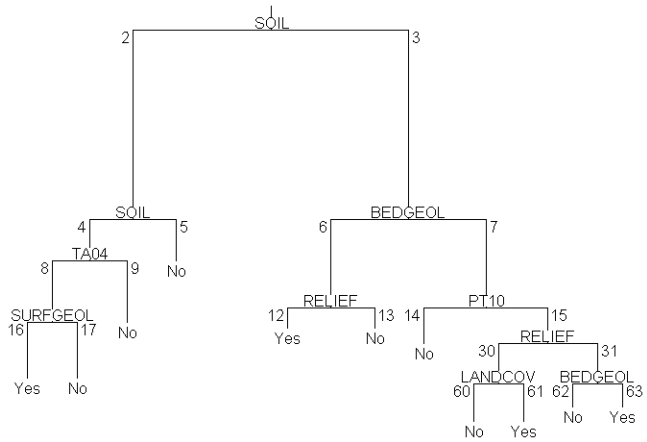
Data Source (Points)

Rocky Mountain Herbarium (3)
Wyoming Heritage Program (18)

Modeling Notes

Independent variables: ELEV, RELIEF, PT01, PT04, PT07, PT10, NWD, RT01, RT07, TA01, TA04, TA07, TA10, TX07, NFD, GDD, BEDGEOL, LANDCOV, SOIL, SURFGEOL
Minimum number of observations before split: 2
Minimum node size: 4
Minimum node deviance: 0.01
Minimum percent for pruning: 0.2
Biomes used for validation: FOOT, IDGRS, IDS

Classification Tree Used in Model Building



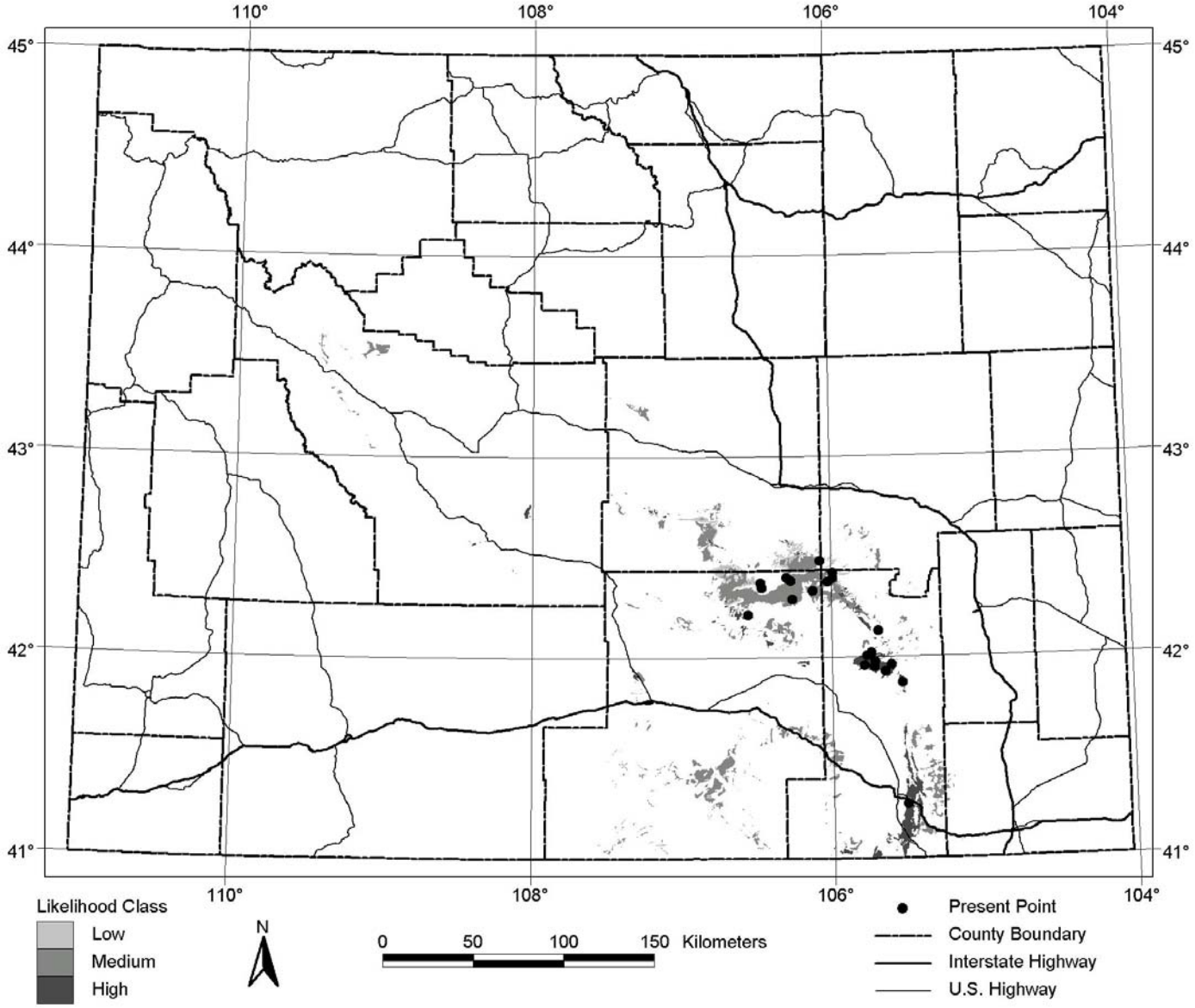
Classification Tree Output

Node_Num) Node_Def Node_Size (Num_No,Num_Yes) (Pct_No,Pct_Yes) Node_Type
1) root 972 (956,16) (100,100) Yes
  2) SOIL:WY01,WY06C,WY07C,WY08C,WY10,WY11,WY14, WY15,WY16C,WY17C,WY18,WY20,WY23,WY27,WY35, WY38C,WY40C,WY41,WY42,WY44 880 (877,3) (91.7,18.8) No
    4) SOIL:WY16C,WY35,WY38C 160 (157,3) (16.4,18.8) Yes
      8) TA04<3.10 13 (10,3) (1,18.8) Yes
        16) SURFGEOL:Ri,ai,ri 3 (0,3) (0,18.8) **Yes ***
        17) SURFGEOL:fi,gi,li,sci,tdi 10 (10,0) (1,0) No *
      9) TA04>3.10 147 (147,0) (15.4,0) No *
    5) SOIL:WY01,WY06C,WY07C,WY08C,WY10,WY11,WY14, WY15,WY17C,WY18,WY20,WY23,WY27,WY40C,WY41, WY42,WY44 720 (720,0) (75.3,0) No *
  3) SOIL:WY31C,WY34,WY36,WY45 92 (79,13) (8.3,81.3) Yes
    6) BEDGEOL:Pze 12 (4,8) (0.4,50) Yes
      12) RELIEF<154 10 (2,8) (0.2,50) **Yes ***
      13) RELIEF>154 2 (2,0) (0.2,0) No *
    7) BEDGEOL:Eoe,Eol,Kmix,MiPl,Olg,PCf,PCm,PTJ,Pal,TQc 80 (75,5) (7.8,31.3) Yes
      14) PT10<3.15 46 (46,0) (4.8,0) No *
      15) PT10>3.15 34 (29,5) (3,31.3) Yes
        30) RELIEF<65 7 (3,4) (0.3,25) Yes
          60) LANDCOV:Aspen,DstSh,MtSge 3 (3,0) (0.3,0) No *
          61) LANDCOV:Limbr,MGras,WySge 4 (0,4) (0,25) **Yes ***
        31) RELIEF>65 27 (26,1) (2.7,6.3) Yes
          62) BEDGEOL:Eoe,Kmix,MiPl,Olg,PCf,PCm,PTJ 25 (25,0) (2.6,0) No *
          63) BEDGEOL:TQc 2 (1,1) (0.1,6.3) **Yes ***

Path Composition and Likelihood

Yes Path	Node List	% of Present Points	Likelihood Class
a	16, 8, 4, 2	18.8	Medium
b	12, 6, 3	50.0	High
c	61, 30, 15, 7, 3	25.0	Medium
d	63, 31, 15, 7, 3	6.3	Low

Predicted Distribution in Wyoming



Classification Rates

Model-Building Points

	Model Present	Model Absent		
Known Present	16 / 16 100.0%	0 / 16 0.0%	Total Correct	969 / 972 99.7%
Known Absent	3 / 956 0.3%	953 / 956 99.7%	Total Incorrect	3 / 972 0.3%

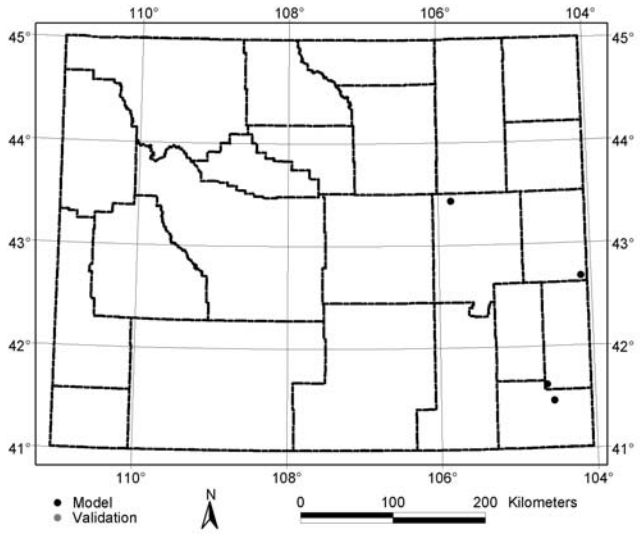
Validation Points

	Model Present	Model Absent		
Known Present	2 / 5 40.0%	3 / 5 60.0%	Total Correct	178 / 185 96.2%
Known Absent	4 / 180 2.2%	176 / 180 97.8%	Total Incorrect	7 / 185 3.8%

Area of Predicted Distribution: 3,126 km^2 (1.2% of WY)

Spiranthes diluvialis Sheviak

Known Distribution in Wyoming



Numbers of Points for Modeling

	Model	Validation	Total
Known Present	4	0	4
Known Absent	962	144	1106
Total	966	144	1110

Data Source (Points)

Wyoming Heritage Program (4)

Modeling Notes

Factor used to expand ranges: 0.05
Biomes used for validation: IDGRS, WET
Riparian types: StrRipI, StrRipP

The wetland model is the intersection of the distribution predicted by the range model with the listed types from the riparian/aquatic model.
.

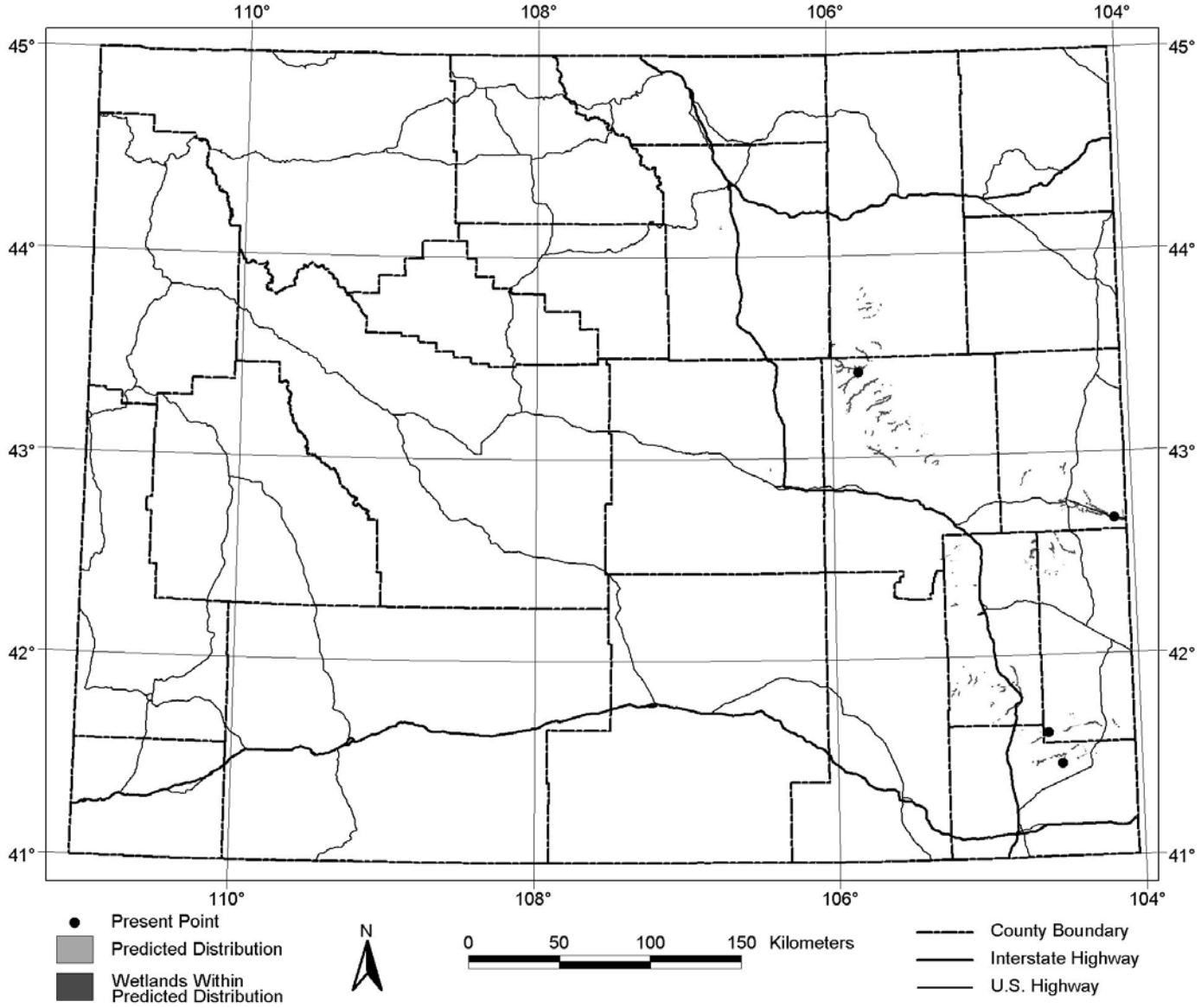
Ranges of Continuous Variables

	MIN	MAX	UNITS
ELEV	1370	1734	m
RELIEF	0	57	m
PT01	0.75	1.24	cm
PT04	3.61	4.58	cm
PT07	2.47	5.78	cm
PT10	2.53	3.49	cm
RT01	6.40	7.83	$MJ/m^2/day$
RT07	22.23	25.41	$MJ/m^2/day$
TA01	-5.96	-1.50	^oC
TA04	4.92	7.81	^oC
TA07	19.64	21.98	^oC
TA10	6.25	9.45	^oC

Values of Categorical Variables

BEDGEOL: Eoe, MiPl, Qal
LANDCOV: FrRip, GrWet, MGras, ShRip
SOIL: WY42, WY44
SURFGEOL: ai

Predicted Distribution in Wyoming



Classification Rates

Model-Building Points

	Predicted		Wetlands	
	Model Present	Model Absent	Model Present	Model Absent
Known Present	4 / 4 100.0%	0 / 4 0.0%	4 / 4 100.0%	0 / 4 0.0%
Known Absent	2 / 962 0.2%	960 / 962 99.8%	2 / 962 0.2%	960 / 962 99.8%
Total Correct	964 / 966 99.8%		964 / 966 99.8%	
Total Incorrect	2 / 966 0.2%		2 / 966 0.2%	

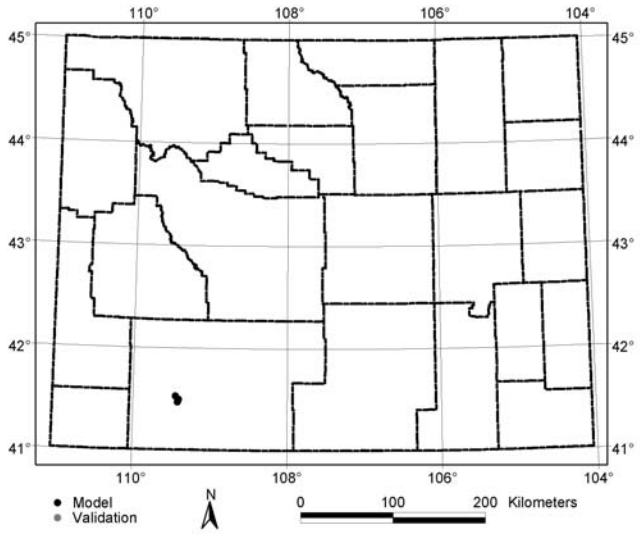
Validation Points

	Predicted		Wetlands	
	Model Present	Model Absent	Model Present	Model Absent
Known Present	0 / 0	0 / 0	0 / 0	0 / 0
Known Absent	2 / 144 1.4%	142 / 144 98.6%	1 / 144 0.7%	143 / 144 99.3%
Total Correct	142 / 144 98.6%		143 / 144 99.3%	
Total Incorrect	2 / 144 1.4%		1 / 144 0.7%	

Area of Predicted Distribution: 291 km^2 (0.11% of WY); **Wetlands:** 71 km^2 (0.03% of WY)

Thelesperma caespitosum Dorn

Known Distribution in Wyoming



Numbers of Points for Modeling

	Model	Validation	Total
Known Present	3	0	3
Known Absent	963	135	1098
Total	966	135	1101

Data Source (Points)

Wyoming Heritage Program (3)

Modeling Notes

Factor used to expand ranges: 0.05
Biomes used for validation: IDGRS

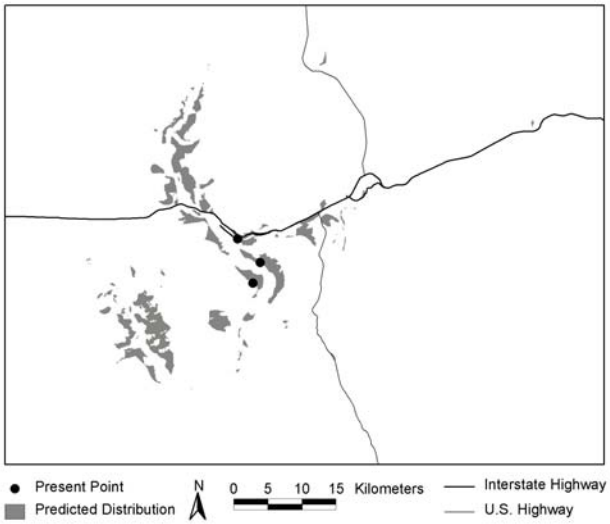
Ranges of Continuous Variables

	MIN	MAX	UNITS
ELEV	1761	2085	m
RELIEF	76	234	m
PT01	1.01	1.27	cm
PT04	1.82	2.14	cm
PT07	1.74	2.01	cm
PT10	2.00	2.53	cm
RT01	7.08	8.38	$MJ/m^2/day$
RT07	24.16	26.95	$MJ/m^2/day$
TA01	-8.13	-6.10	^oC
TA04	4.09	6.56	^oC
TA07	17.81	20.27	^oC
TA10	5.22	7.54	^oC

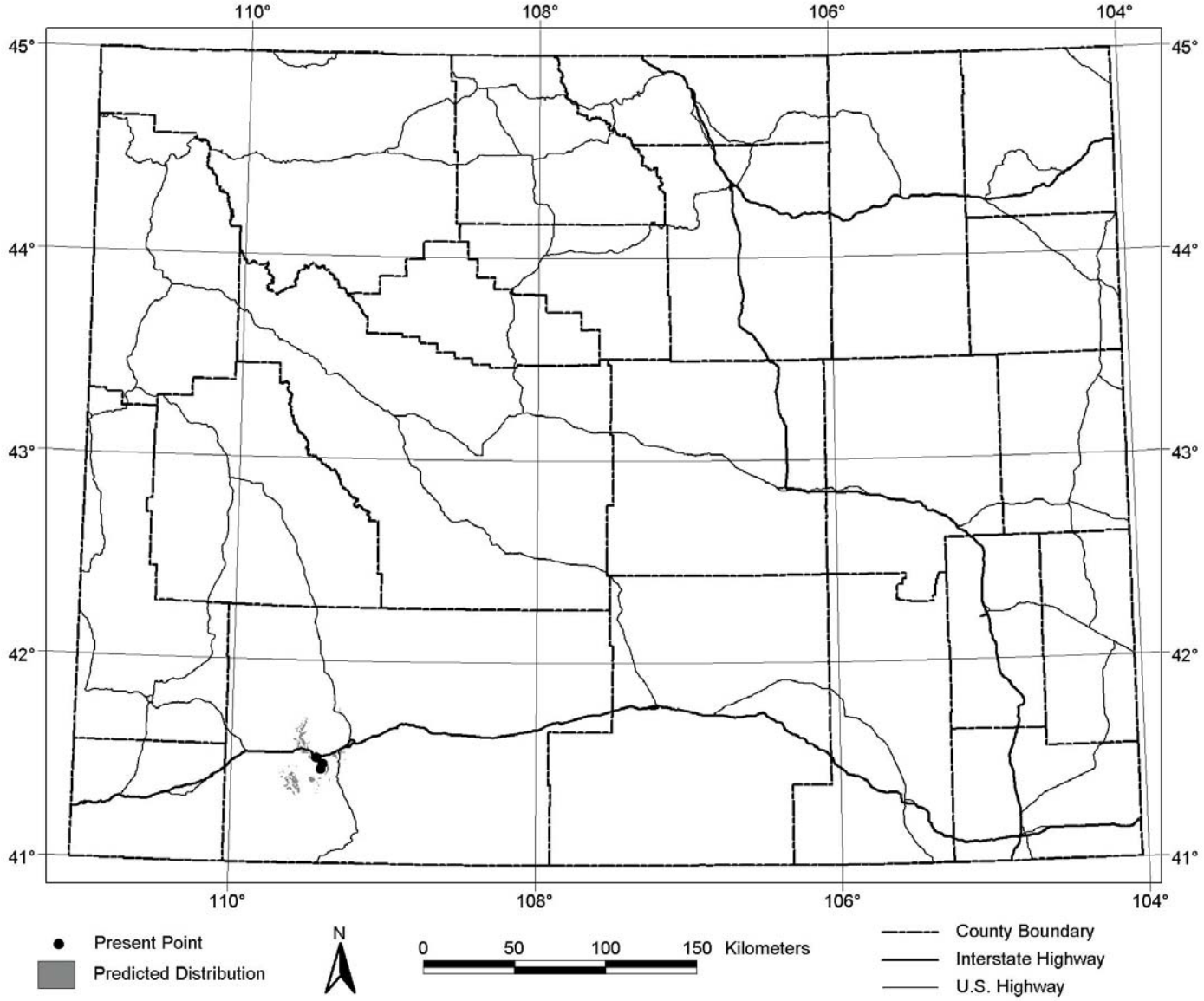
Values of Categorical Variables

BEDGEOL: Eoe, Qal
LANDCOV: BsnRk, ShRip, WySge
SOIL: WY40C, WY44
SURFGEOL: ri, sci

Detailed View of Predicted Distribution



Predicted Distribution in Wyoming



Classification Rates

Model-Building Points

	Model Present	Model Absent		
Known Present	3 / 3 100.0%	0 / 3 0.0%	Total Correct	966 / 966 100.0%
Known Absent	0 / 963 0.0%	963 / 963 100.0%	Total Incorrect	0 / 966 0.0%

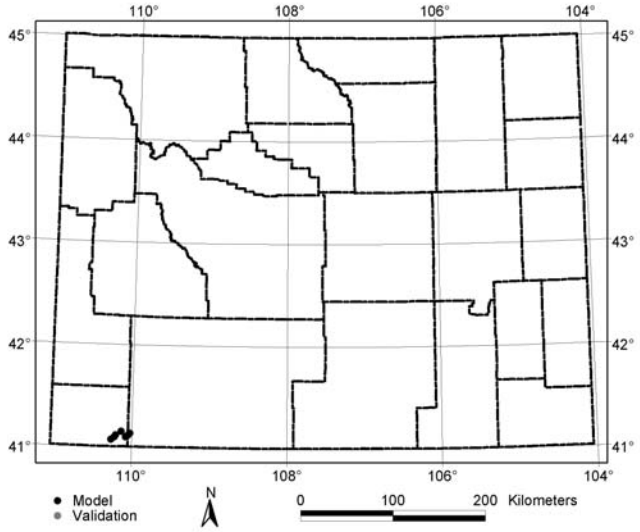
Validation Points

	Model Present	Model Absent		
Known Present	0 / 0	0 / 0	Total Correct	135 / 135 100.0%
Known Absent	0 / 135 0.0%	135 / 135 100.0%	Total Incorrect	0 / 135 0.0%

Area of Predicted Distribution: 132 km^2 (0.05% of WY)

Thelesperma pubescens Dorn

Known Distribution in Wyoming



Numbers of Points for Modeling

	Model	Validation	Total
Known Present	7	0	7
Known Absent	962	167	1129
Total	969	167	1136

Data Source (Points)

Wyoming Heritage Program (7)

Modeling Notes

Factor used to expand ranges: 0.05
Biomes used for validation: FOOT, IDGRS

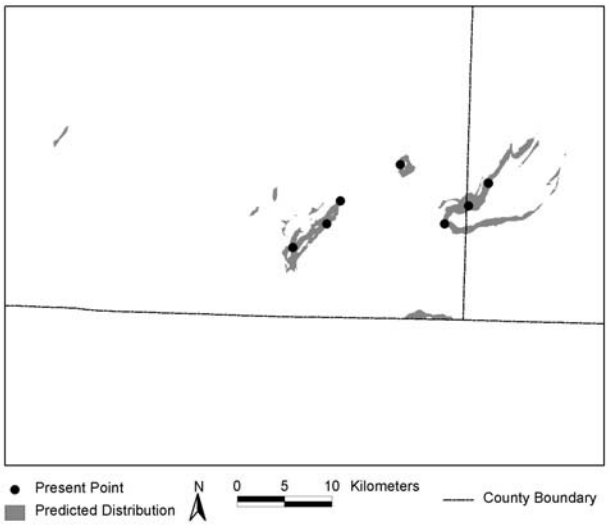
Ranges of Continuous Variables

	MIN	MAX	UNITS
ELEV	2410	2828	m
RELIEF	112	201	m
PT01	1.86	3.14	cm
PT04	3.75	4.95	cm
PT07	2.77	3.61	cm
PT10	3.40	4.46	cm
RT01	7.05	8.52	$MJ/m^2/day$
RT07	23.64	26.39	$MJ/m^2/day$
TA01	-8.18	-5.97	^oC
TA04	0.14	3.08	^oC
TA07	13.46	16.49	^oC
TA10	2.56	5.31	^oC

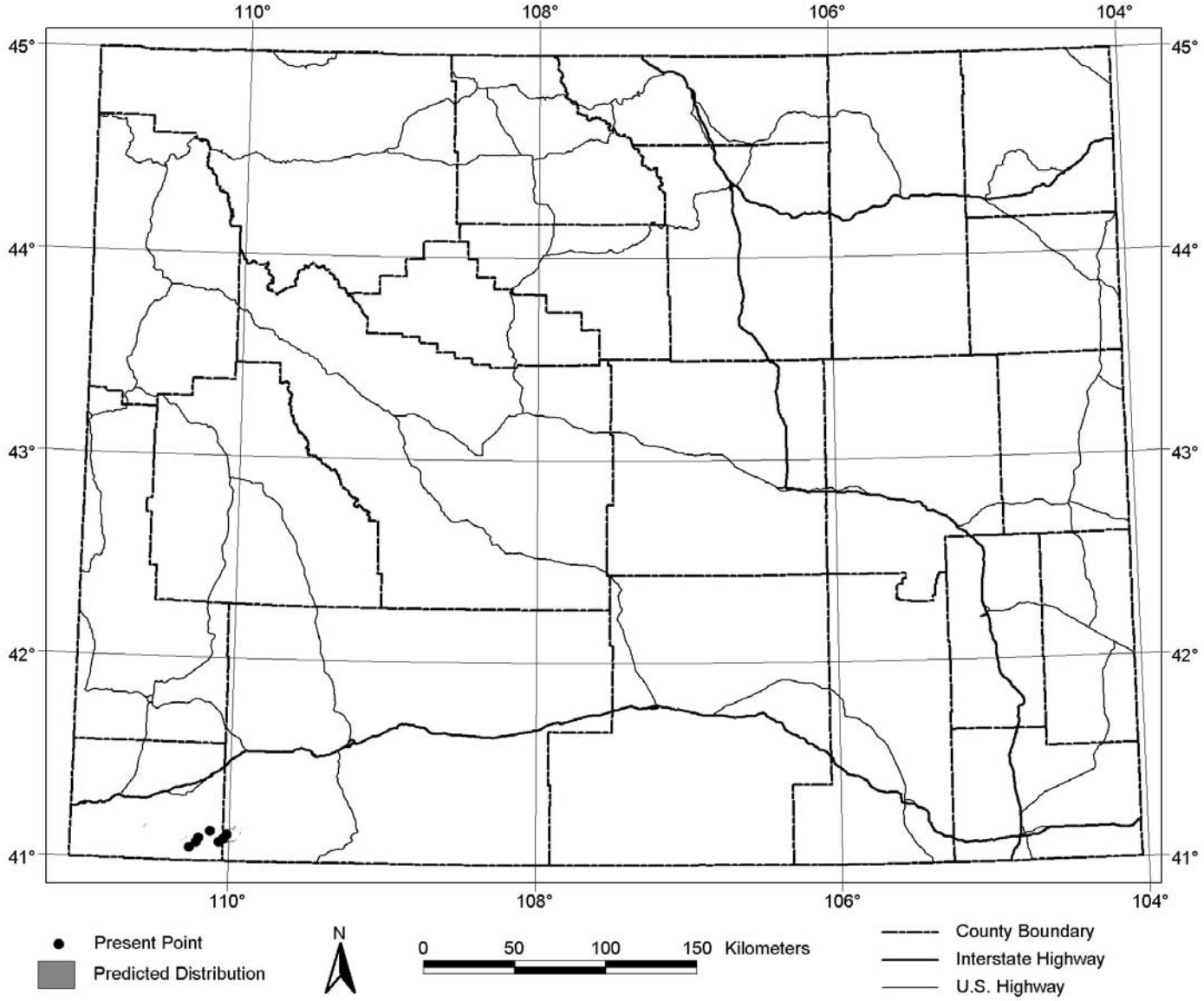
Values of Categorical Variables

BEDGEOL: Qal, Qls, TQc
LANDCOV: Junpr, MtSge, WySge, XerSh
SOIL: WY06C
SURFGEOL: li, mi

Detailed View of Predicted Distribution



Predicted Distribution in Wyoming



Classification Rates

Model-Building Points

	Model Present	Model Absent		
Known Present	7 / 7 100.0%	0 / 7 0.0%	Total Correct	969 / 969 100.0%
Known Absent	0 / 962 0.0%	962 / 962 100.0%	Total Incorrect	0 / 969 0.0%

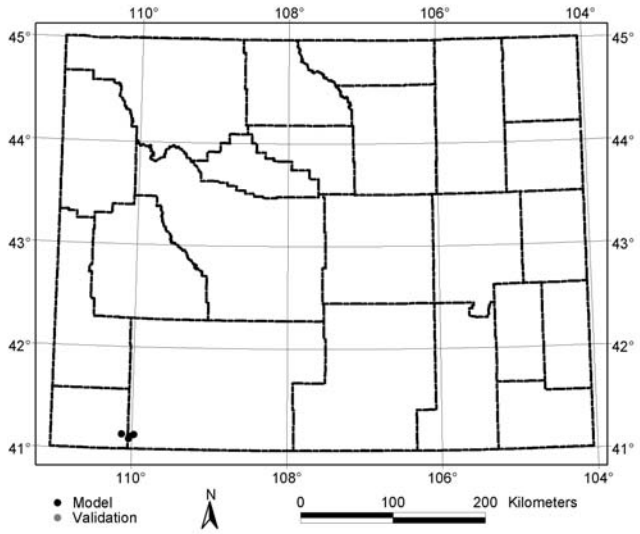
Validation Points

	Model Present	Model Absent		
Known Present	0 / 0	0 / 0	Total Correct	167 / 167 100.0%
Known Absent	0 / 167 0.0%	167 / 167 100.0%	Total Incorrect	0 / 167 0.0%

Area of Predicted Distribution: 39 km^2 (0.02% of WY)

Townsendia microcephala Dorn

Known Distribution in Wyoming



Numbers of Points for Modeling

	Model	Validation	Total
Known Present	4	0	4
Known Absent	963	32	995
Total	967	32	999

Data Source (Points)

Wyoming Heritage Program (4)

Modeling Notes

Factor used to expand ranges: 0.05
Biomes used for validation: FOOT

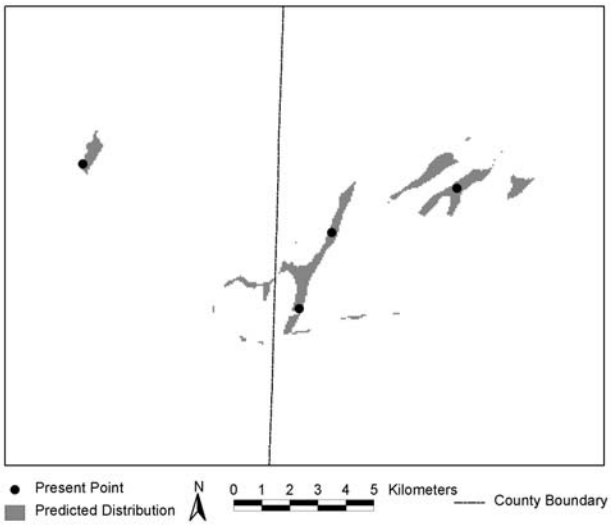
Ranges of Continuous Variables

	MIN	MAX	UNITS
ELEV	2394	2704	m
RELIEF	61	145	m
PT01	1.86	2.46	cm
PT04	3.77	4.58	cm
PT07	2.79	3.20	cm
PT10	3.38	4.44	cm
RT01	7.23	8.47	$MJ/m^2/day$
RT07	23.73	26.44	$MJ/m^2/day$
TA01	-8.14	-6.08	^oC
TA04	0.76	3.05	^oC
TA07	14.22	16.56	^oC
TA10	3.07	5.27	^oC

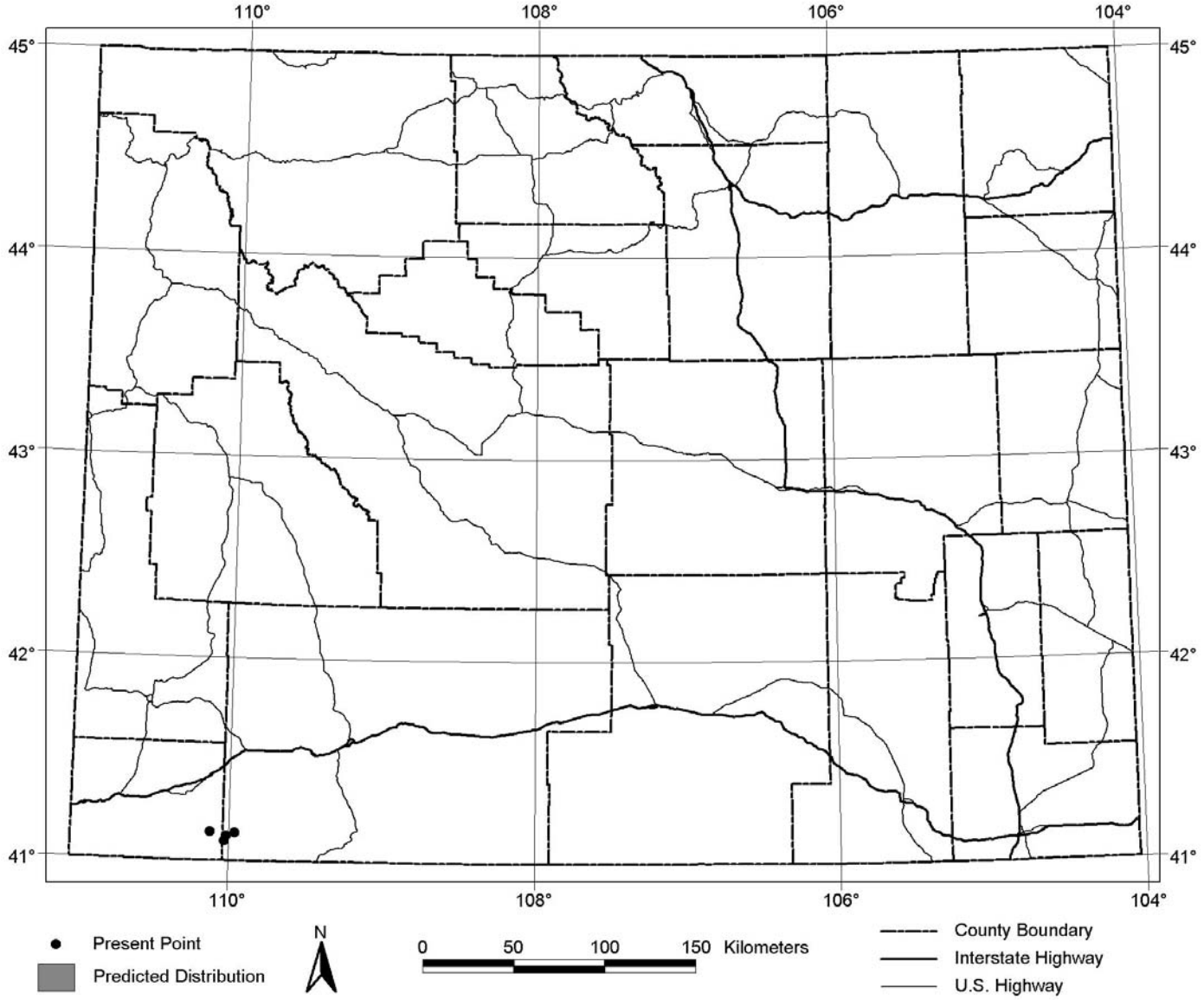
Values of Categorical Variables

BEDGEOL: Eol, Qls, TQc
LANDCOV: ShRip, XerSh
SOIL: WY06C
SURFGEOL: li, mi

Detailed View of Predicted Distribution



Predicted Distribution in Wyoming



Classification Rates

Model-Building Points

	Model Present	Model Absent		
Known Present	4 / 4 100.0%	0 / 4 0.0%	Total Correct	967 / 967 100.0%
Known Absent	0 / 963 0.0%	963 / 963 100.0%	Total Incorrect	0 / 967 0.0%

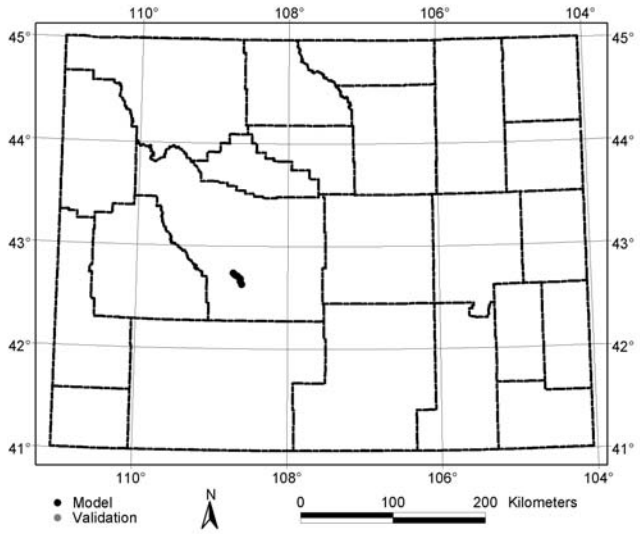
Validation Points

	Model Present	Model Absent		
Known Present	0 / 0	0 / 0	Total Correct	32 / 32 100.0%
Known Absent	0 / 32 0.0%	32 / 32 100.0%	Total Incorrect	0 / 32 0.0%

Area of Predicted Distribution: 5.6 km^2 (0.00% of WY)

Trifolium barnebyi (Isely) Dorn & Lichvar

Known Distribution in Wyoming



Numbers of Points for Modeling

	Model	Validation	Total
Known Present	6	0	6
Known Absent	963	28	991
Total	969	28	997

Data Source (Points)

Wyoming Heritage Program (5)
Other (1)

Modeling Notes

Factor used to expand ranges: 0.05
Biomes used for validation: FOOT

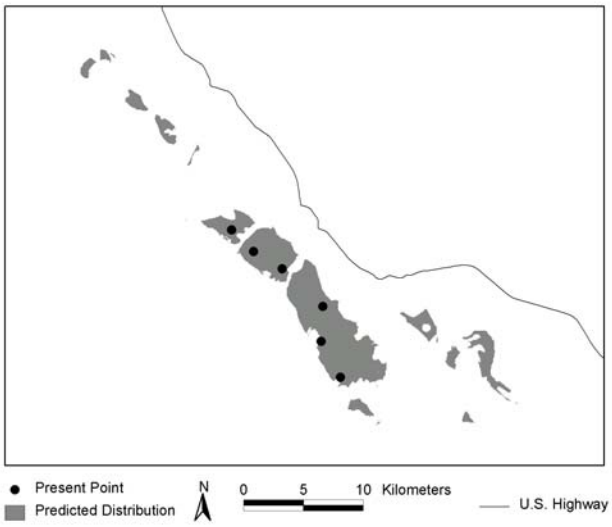
Ranges of Continuous Variables

	MIN	MAX	UNITS
ELEV	1652	2124	m
RELIEF	88	228	m
PT01	1.98	2.67	cm
PT04	3.67	4.92	cm
PT07	1.61	2.24	cm
PT10	2.51	3.21	cm
RT01	6.47	7.46	$MJ/m^2/day$
RT07	23.75	26.37	$MJ/m^2/day$
TA01	-8.39	-5.84	^oC
TA04	3.15	7.24	^oC
TA07	17.01	21.21	^oC
TA10	4.57	8.06	^oC

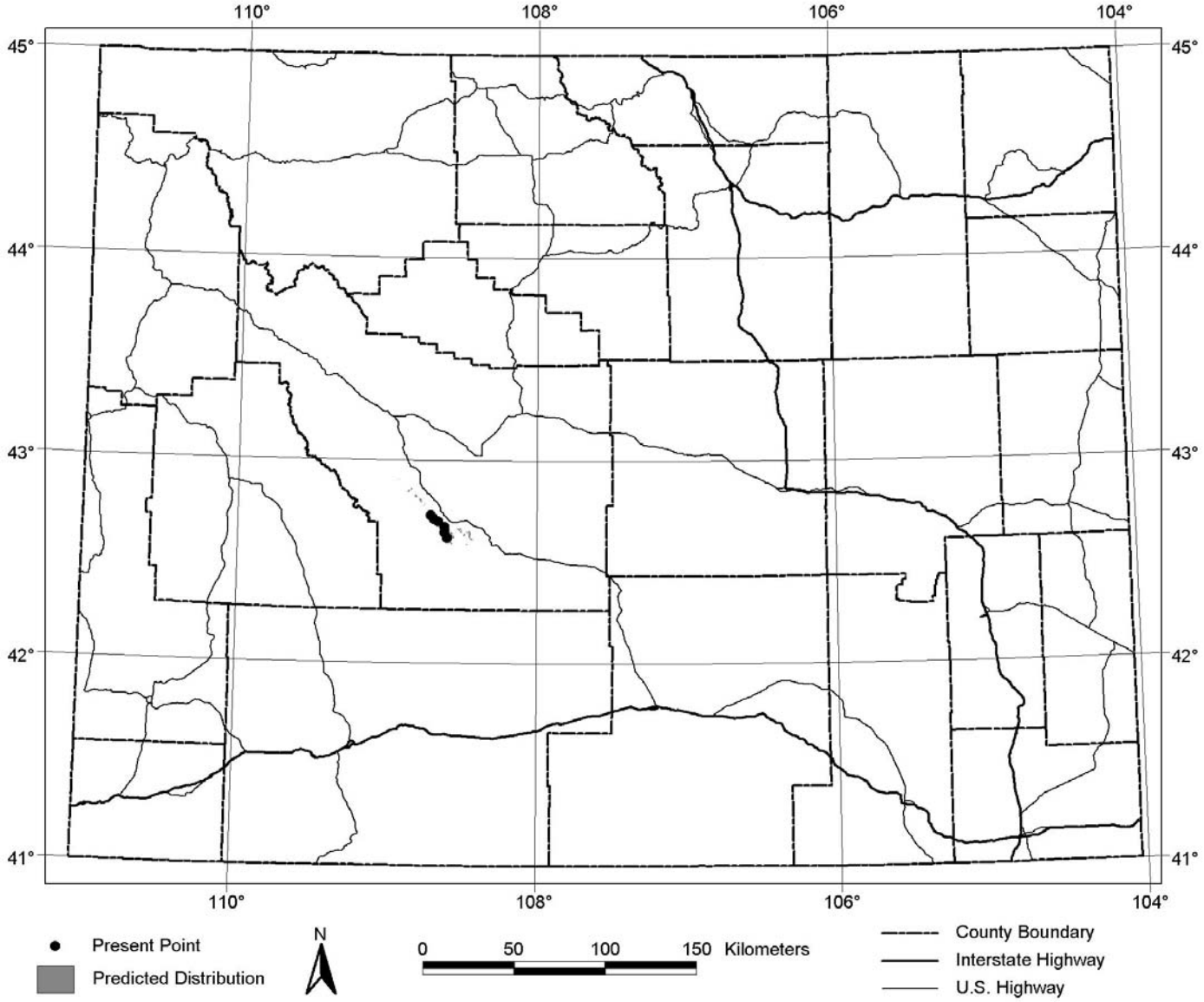
Values of Categorical Variables

BEDGEOL: Ksh, PTJ
LANDCOV: Junpr
SOIL: WY16C, WY35
SURFGEOL: Ri, sci

Detailed View of Predicted Distribution



Predicted Distribution in Wyoming



Classification Rates

Model-Building Points

	Model Present	Model Absent		
Known Present	6 / 6 100.0%	0 / 6 0.0%	Total Correct	969 / 969 100.0%
Known Absent	0 / 963 0.0%	963 / 963 100.0%	Total Incorrect	0 / 969 0.0%

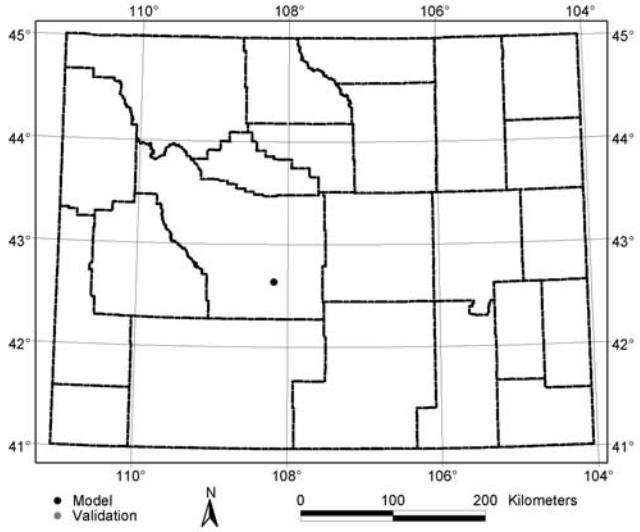
Validation Points

	Model Present	Model Absent		
Known Present	0 / 0	0 / 0	Total Correct	28 / 28 100.0%
Known Absent	0 / 28 0.0%	28 / 28 100.0%	Total Incorrect	0 / 28 0.0%

Area of Predicted Distribution: 75 km^2 (0.03% of WY)

Yermo xanthocephalus Dorn

Known Distribution in Wyoming



Numbers of Points for Modeling

	Model	Validation	Total
Known Present	1	0	1
Known Absent	963	122	1085
Total	964	122	1086

Data Source (Points)

Wyoming Heritage Program (1)

Modeling Notes

Factor used to expand ranges: 0.1
Biomes used for validation: IDGRS

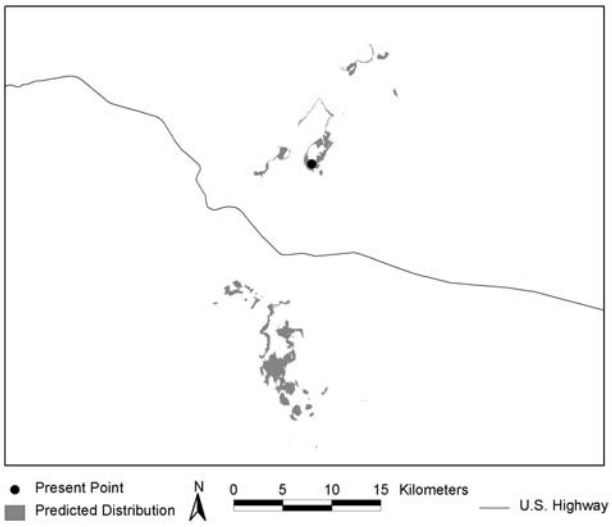
Ranges of Continuous Variables

	MIN	MAX	UNITS
ELEV	1857	2269	m
RELIEF	67	83	m
PT01	1.30	1.60	cm
PT04	3.42	4.18	cm
PT07	2.13	2.61	cm
PT10	2.16	2.64	cm
RT01	6.52	7.98	$MJ/m^2/day$
RT07	22.65	27.69	$MJ/m^2/day$
TA01	-9.06	-5.06	^oC
TA04	2.26	6.26	^oC
TA07	16.27	20.27	^oC
TA10	3.82	7.82	^oC

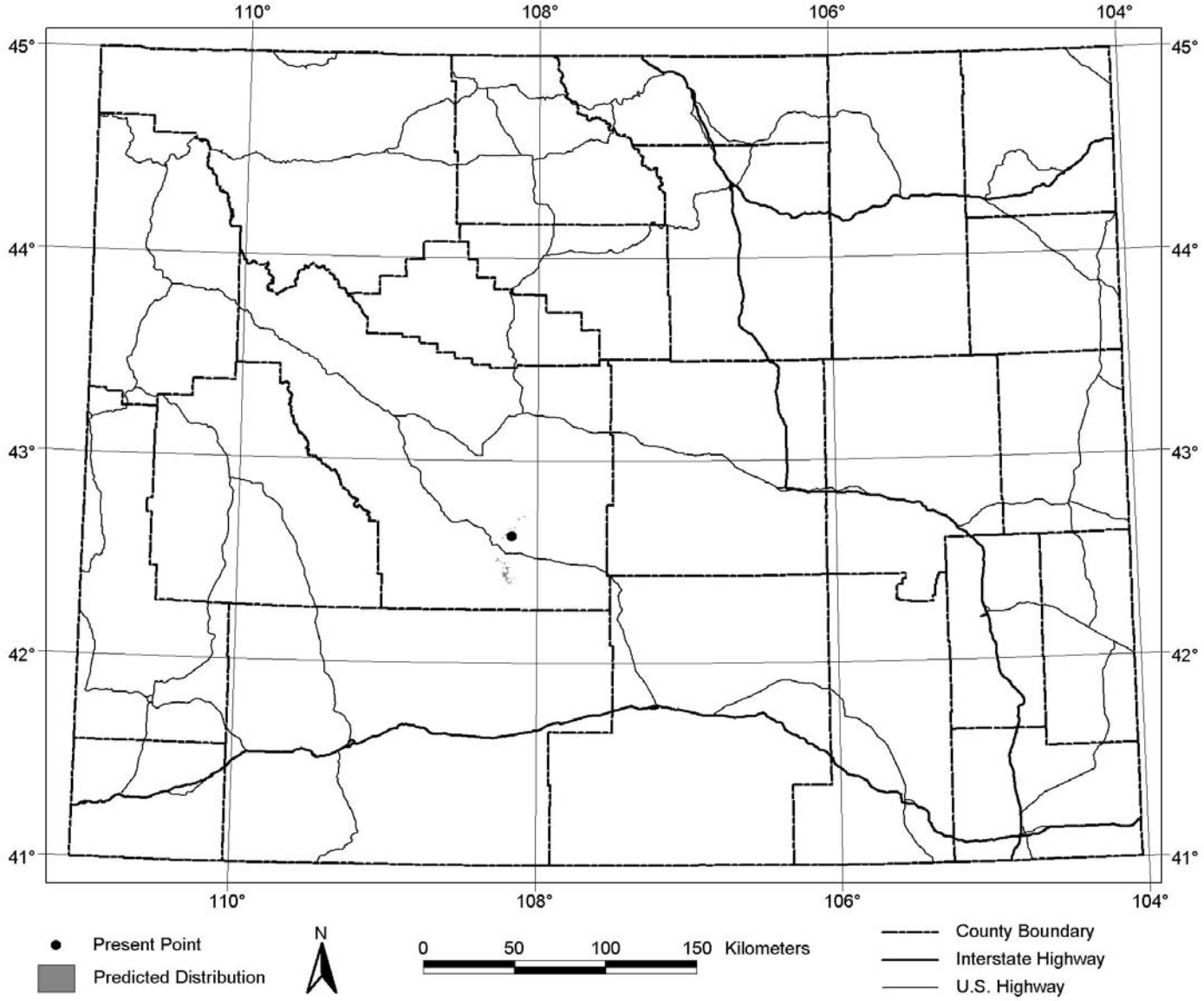
Values of Categorical Variables

BEDGEOL: Olg
LANDCOV: WySge
SOIL: WY34
SURFGEOL: ri, sci

Detailed View of Predicted Distribution



Predicted Distribution in Wyoming



Classification Rates

Model-Building Points

	Model Present	Model Absent		
Known Present	1 / 1 100.0%	0 / 1 0.0%	Total Correct	964 / 964 100.0%
Known Absent	0 / 963 0.0%	963 / 963 100.0%	Total Incorrect	0 / 964 0.0%

Validation Points

	Model Present	Model Absent		
Known Present	0 / 0	0 / 0	Total Correct	122 / 122 100.0%
Known Absent	0 / 122 0.0%	122 / 122 100.0%	Total Incorrect	0 / 122 0.0%

Area of Predicted Distribution: 26.3 km^2 (0.01% of WY)