DRAFT

Current and Projected Habitat Trends of Elk, Mule Deer, and White-tailed Deer Under Alternatives for the ICBEMP Supplemental Draft EIS (SDEIS)

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INTRODUCTION

Goals

The Elk and Deer Assessment Group of the Interior Columbia Basin Ecosystem Management Project was directed to answer four questions about elk, mule deer and white-tailed deer in the Basin:

1. What are the key variables and contribution of these variables (e.g., composition and structure of vegetation, road-associated factors such as road density and use) controlled or influenced by BLM/FS as these variables affect population size and structure?

2. What are the appropriate geographic areas in which to evaluate habitat and population trends?

3. What are the key geographic areas of most interest and use to tribal nations?

4. What are dominant population trends from historical to current periods at specified appropriate spatial scales?

5. How would the supplemental EIS alternatives affect habitat and population trends in the future, both in the short and long term (e.g., 10-year versus 100-year trends)?

Answers to Questions 1 through 3 were integral to resolving Question 5; so, those four questions are answered in this report. We were not able to answer Question 4 on population trends within the time frame of the SDEIS analysis because that information was not available from state collaborators in time for the SDEIS deadline.

Objectives

To meet the goals in a way meaningful to the FS/BLM and our state and tribal partners, we set several process-oriented objectives:

1. Enlist collaborators. Enlist representatives of state wildlife agencies, tribes, and federal agencies (FS and BLM) in the Basin to assist in the task.

This was accomplished with the addition to the group of Scott McCorquodale (Yakama Nation), Don Gentry and Craig Bienz (Klamath Tribes), Lou Bender (WA Dept. Fish and Wildlife), Scott Findholt and Mark Kirsch (OR Dept. Fish and Wildlife), Harvey Nyberg (MT Fish, Wildlife and Parks), Greg Servheen (ID Fish and Game), and Mike Hillis (Forest Service).

2. Assemble population data and describe analysis model. In the first stage of the process, we convened state agency representatives with access to population data (Bender, Findholt, Nyberg) to: (a) establish a process for assembling data on historical and current population and harvest levels or trends from state agency data; (b) identify the geographic units for analysis; and (c) review a draft Bayesian Belief Network (BBN) habitat model based on a subset of variables from Christensen and others (1995). The BBN model was used to analyze the effects of the SDEIS alternatives. This objective was met during a meeting in La Grande on April 8, 1999.

3. Develop analysis model, including peer review. The entire group was assembled May 24-25, 1999 in Walla Walla to review and revise the second version of the BBN model, and finalize the process for analysis of the SDEIS alternatives, which included specifying the analysis units (Question 2) and tribal areas of interest (Question 3). At that meeting it was determined that information on population trends likely would not be available to include in the report by mid-June.

4. Use model to analyze SDEIS alternatives. A generic BBN model for elk, mule deer, and white-tailed deer was developed as a result of work under Objectives 2 and 3. We used the Netica modeling software adopted for the SDEIS analysis by the ICBEMP Scientific Advisory Group for viability analysis of other species. That model is described in this report. The model, input data files, and output data and maps are available on the SDEIS analysis web page.

5. Complete report and integrate with concurrent viability assessment of SDEIS. This report presents the result of our analysis of the SDEIS alternatives, and has been submitted to the primary Terrestrial Science Advisory Group (TSAG) to integrate with their viability analysis of plant and animal species of conservation (viability) concern. The BBN models used for both our analysis and the viability analysis were similar in modeling habitat correlates using proxy variables supplied by the Spatial Team; however, our model estimated habitat capability only, not population viability based on habitat or population levels. Christensen and others (1995) and the terrestrial species DEIS evaluation of alternatives (Lehmkuhl and others 1997, PNW-GTR-406, v.2) concluded that elk and deer are not species of viability concern.

CONCEPTS AND GENERAL STRUCTURE OF BBN MODELS

[Much of the following text describing BBN models was adapted from TSAG documents written by B. G. Marcot]

BBN modeling has a rich literature and a growing use and following in ecological modeling. BBN models can be used to depict logical and causal influences of key environmental correlates on species habitat or population levels. They incorporate uncertainty in relationships (e.g., habitat relationships) by using probability structures to estimate effects and outcomes. A BBN model will represent suitability by the expected value (similar to the mean) and the distribution of judgements will reflect the certainty or uncertainty among experts.

Data are entered and processed as probabilities (e.g., the likely effect of cattle grazing in a watershed), but also can be deterministic (e.g., we actually know for sure the density of roads). Unconditional probabilities are input in “parentless” nodes; in our case these would be data on the effects of the alternatives, e.g., the likely density of roads in a watershed. Conditional probabilities are estimated in “child” nodes based on a “conditional probability table” (CPT) defined by the model builders. An example of a CPT definition would be: given that road density is high and nearby human population density is high, then what are the likely probabilities that human disturbance would be low (0%?), medium (10%?), or high (90%) in a watershed? Such judgements are made for each combination of value for input variables.

THE ELK AND DEER BBN MODEL

Overview

The Generic Elk and Deer BBN model (ver. 1.0) (fig. ED-1) was developed to be consistent with the habitat correlates described in Christensen et al. (1995) (appendix E/D-1), and with the proxy data to describe those correlates that were available from the ICBEMP Spatial Team. As such, the model was a balance between what is known or hypothesized about the habitat relationships of the species, what data are available to model those relationships, our ability to model habitat relationships at the broad regional scale of the SDEIS analysis, and the time available for the assignment. The group felt that a generic model for all three species would adequately balance those constraints. Although the model structure (nodes and CPTs) is generic to all three species, model results varied for each species because forage and cover habitat were defined differently for each species.

Each “node,” or variable, in the model usually was defined by three levels – usually high, moderate, and low. The bars inside the node box show the probability of each outcome, and the expected value (average) and standard deviation of that outcome. The outcomes are rated Low=1, Moderate=2, and High=3; hence the expected value would range between 1 and 3.

The model first predicted the “Inherent Habitat Capability” of each 6th Hydrologic Unit Code (HUC6) watershed, which average about 20,000 acres, within the range of the species in the Basin. Inherent Habitat Capability was based on the area of forage and cover habitat, and the qualitative effects of livestock grazing, wildfire (include prescribed natural fire), and prescribed fire. Then, the Inherent Habitat Capability was adjusted by the level of “Security” from human disturbance in the watershed, as determined by the amount of cover, road density, and topographic complexity. The final outcome was an “Adjusted Habitat Capability,” which is the primary outcome reported in this document. The Netica model code is available in the BBN model section of the ICBEMP SDEIS web site, or from John Lehmkuhl (jlehmkuhl/r6pnw_wenatchee@fs.fed.us).

Model outcomes were calculated for each HUC6 watershed, and summarized by the SDEIS Regional Advisory Committee (RAC)/Provincial Advisory Committee (PAC) units. Both the state ungulate specialists and tribal representatives in the Group, along with the tribal liaison with the EIS team (Cliff

Walker) felt that these units were adequate and appropriate for analysis and for summarizing the results. Results were reported in three forms for each species.

(1) Tables show the average Inherent Habitat Capability and Adjusted Habitat Capability in HUC6 watersheds, weighted by the area of the watershed, for each RAC/PAC. The Security effect was calculated as the difference between Inherent and Adjusted Habitat Capability. Change from the current value in Adjusted Habitat Capability under each of the three alternatives (designated as X1, X2, and X3) for 10 years and 100 years also is given.

(2) Maps of current Adjusted Habitat Capability, and change from current in Adjusted Habitat Capability under each alternative and period are given for each species. The HUC6 watersheds are the map unit. Current Adjusted Habitat Capability was categorized as Low (1.00 – 1.65), Moderate (1.66 – 2.30), or High (2.31 – 3.0) by examining the frequency distribution of current values and noting natural breaks in the distribution. The distributions of values for all three species generally were similar, with fairly well-defined cut points for the categories (e.g., fig. ED-2 for elk).

(3) The percentages of HUC6 watersheds with declining, increasing, and unchanging Adjusted Habitat Capability from the current value within a RAC/PAC are given in a second table. We determined a significant change in Adjusted Habitat Capability to be $\pm$0.5 units, which approximated the average standard deviation (SD nearly equal to 0.60) in Adjusted Habitat Capability of all 7,467 HUC6 watersheds for all periods and alternatives. Only those HUC6 watersheds within the range of the species in a RAC/PAC were included.

Model Node Descriptions

Uncharacteristic Livestock Grazing (A13) – A proxy variable defined from Variable 14 of the SDEIS evaluation data set. Uncharacteristic livestock grazing effects have a probability of causing change of more than 20% dissimilarity compared with native (historical) vegetation composition and structure, and effects soil cover and surface characteristics. These effects reduce native species habitat quality, vegetation/litter cover, root binding capability, and riparian condition. Categories are a percentage of the watershed affected as determined by the Landscape Team: None = 0%; Low = <5%; Moderate = 5% - 54%; High = >55% (combined high and very high categories in original data set).

Wildfire (A11) – Categorized area coefficients for amount of wildfire and prescribed natural fire within the total subwatershed area from the SDEIS Variable 9 evaluation data set. Current wildfire levels are based on an administrative-unit 10 year average (1988-1997). Typically wildfires burn in the summer and early fall. Wildfires typically have high resistance to control once they become larger than 40 hectares (100 acres).

Prescribed natural fires are summer/fall lightning ignitions that are not suppressed because they meet a prescription for fire behavior that is specified in a fire management plan. Even though they burn under a prescription for fire behavior they may be burning in unnaturally high fuel levels, altered conditions (such as cheatgrass or other exotics), or dry conditions that can cause uncharacteristic fire effects. Burn periods can last up to 60 days for a prescribed natural fire. Current levels are based on administrative unit 3-year average (1995-1997).

Categories were determined by combining the class marks for wildfire and prescribed natural fire as given by the Landscape Team: None = 0%; Low = <0.17%; Moderate = 0.18% - 0.92%; High = >0.92%.

Prescribed Fire (A12) – Categories of an area coefficient for amount of prescribed fire within the total subwatershed area from the SDEIS Variable 9 evaluation data set. Current levels based on an administrative-unit 3 year average (1995-1997). These are spring, summer or fall management ignitions designed to meet a prescription for both fire behavior and effects that are specified in a prescribed fire burn plan. Even though they may burn in unnaturally high fuel levels or altered conditions (such as cheatgrass or other exotics), the burn plan attempts to minimize uncharacteristic fire effects. Burn periods typically only last 1-2 days as compared to up to 60 days for a prescribed natural fire.

Categories as determined by the Landscape Team: None = 0%; Low = <0.007%; Moderate = 0.007% - 0.09%; High = >0.1%.

Forage Habitat Area (C20) – Forage area calculated as a percentage of each 6th HUC watershed based on the SDEIS evaluation Variable 18 data set. Forage habitat was described using of Terrestrial Community types, as defined by the Landscape Team, which grouped cover type and structural stage combinations. Forage habitat definitions vary for elk, mule deer, and white-tailed deer. Categories were defined as: Low = <25%; Moderate = 26 - 50%; High = >50%.

Forage Capability (A30) – Forage habitat capability as a function of forage area (quantity), the qualitative effects of fire, and the extent of uncharacteristic livestock grazing effects. Uncharacteristic livestock grazing has a negative effect on forage availability. Fire is assumed to have a positive effect on forage quality and quality, although only the high level of fire will affect >1% of the landscape. Hence, lower levels of fire (defined by the Landscape team) will an insignificant area of the watershed and have a tiny effect. The CPT is in appendix E/D-2.

Cover Habitat (B30) – Cover area calculated as a percentage of each 6th HUC watershed based on the SDEIS evaluation Variable 18 data set. Cover habitat was estimated by summing the percentage of Terrestrial Community types used as cover in each HUC6 watershed. Terrestrial Community types were defined by the Landscape Team by grouping vegetation cover type and structural stage combinations. Cover habitat definitions vary for elk, mule deer, and white-tailed deer.

Categories were defined as: Low = <25%; Moderate = 26 - 50%; High = 51 - 75%; Very High = >75%.

The amount of cover influences both Inherent Habitat Capability and Security (from human disturbance) nodes in the model. See descriptions of those nodes for an explanation.

Inherent Habitat Capability (D) – Inherent Habitat Capability for the analysis unit (HUC6 watershed) is a function of Forage capability and Cover area. Forage capability was generally weighted much greater than Cover area. Cover was considered in terms of its thermal and security from predation value; security from human disturbance is modeled in the "Security" branch of the model.

In general, at low forage levels increasing cover had little influence. At moderate forage levels increasing cover increased habitat capability about 10% with each increment in cover. With high forage capability, cover had relatively little influence on habitat capability; habitat capability increased only with high to very high cover levels. The CPT is in appendix E/D-2.

Road Density (B11) – Road density is summarized from the road density index, provided by the Landscape Team for the SDEIS analysis as follows:

None_Very_Low = <0.1 mi/sq mi

Low = 0.1-0.7 mi/sq mi

Moderate = 0.7-1.7 mi/sq mi

High = >1.7 mi/sq mi

Terrain or Topographic Relief (B13) – This variable is from the Landscape Pattern Profile data set developed by the Landscape Team to describe topographic complexity. The categorized index combines attributes of watershed size, elevational range (max-min/mean elevation), slope, and drainage pattern complexity.

Security from Human Disturbance (B20) – Cover area, open road density, and terrain complexity interact to determine the relative security of ungulates in a watershed from human disturbance, primarily vulnerability to and harassment from hunters. Increasing open road density was considered negative. Increasing cover and terrain complexity negated the effects of roads by increasing security in the presence of roads.The CPT is in appendix E/D-2.

Adjusted Habitat Capability (D1) – Habitat capability of the HUC6 watershed as a function of inherent habitat capability and the relative security of elk from human disturbance within the watershed. The CPT is in appendix E/D-2.

Model Sensitivity Analysis

Netica procedures were used in sensitivity analysis to determine the relative importance of variables in determining Adjusted Habitat Capability, hence, the underlying structure of the network relationships and the processes captured by the conditional probabilities. The Netica procedure determined the sensitivity of outcomes at a particular node as the percentage “entropy reduction” in outcome that can be attributed to input variables, in a manner similar to reduction in variance described by the R-squared statistic. Unexpected low or high sensitivity of an outcome to a particular variable would indicate that the conditional probabilities need to be changed to give a particular variable more or less influence on the outcome.

The analysis was done in stages. Working from the “top” of the model with the input proxy variables, nodes determined by conditional probabilities were examined in turn until the final Adjusted Habitat Capability node was analyzed.

* The Fire node was most sensitive to Wildfire inputs (70% entropy reduction) vs. Prescribed Fire (1 % entropy reduction).

* Forage Capability was primarily a function of forage habitat area in a watershed (43% entropy reduction), with much weaker sensitivity to Uncharacteristic Livestock Grazing (2% entropy reduction), Wildfire, (1% entropy reduction) and Prescribed Fire (0.02% entropy reduction).

* Inherent Habitat Capability was mostly a function of Forage Capability (67% entropy reduction), whereas Cover had relatively little influence (2% entropy reduction).

* Security from human disturbance was mostly sensitive to changes in Road Density (29% entropy reduction), with lesser influence by Cover (5% entropy reduction) and Terrain Relief (1% entropy reduction).

* Adjusted Habitat Capability was most sensitive to the level of Inherent Habitat Capability (38% entropy reduction), with Security having a smaller effect (6% entropy reduction).

RESULTS

Elk

RAC/PAC Mean Habitat Capability -- Current Inherent Habitat Capability for elk is moderately high (mean = 2.3) across the Basin (table ED-1). Nine of 15 RAC/PACs scored within the High range of Inherent Habitat Capability. The mean reduction from security was 0.4 units, yielding a mean Adjusted Habitat Capability of 1.8 across the Basin. After adjusting for security, no RAC/PACs scored within the High range of Adjusted Habitat Capability.

Adjusted Habitat Capability in RAC/PACs, averaged within and across RAC/PACs, changed little from the current situation over both the short- and long-term under alternatives. The average change from current across the Basin was consistently about 0.1 unit among alternatives. The security adjustment actually increased slightly from 0.4 to 0.5 units, so change seemed primarily to be in increasing habitat quality, primarily forage habitat.

HUC6s within RAC/PACs -- A different, and perhaps better, outcome is perceived by looking at the percentage of HUC6 watersheds within RAC/PACs with changed Adjusted Habitat Capability under alternatives (table ED-2, Maps ED-1 to ED-7).

In the short term (10 years), about 9% of the watersheds will increase in Adjusted Habitat Capability under all alternatives, while 90% remain unchanged and 1% decline. Although Alternative 1 seems slightly better in that respect, the small difference is probably not important. After 100 years, Adjusted Habitat Capability is projected to have increased in about 20% of the watersheds, while 6% show a decline in capability.

Projected increases in Adjusted Habitat Capability were well distributed across the mountainous elk range in the Basin. Most increases occurred in western Montana, eastern and northeastern Washington, northern and central Idaho, and northeastern Oregon (maps ED-1 to ED-7). The largest declines in capability over the next 100 years were projected to occur in the eastern Washington Cascades and northern Idaho.

Mule Deer

RAC/PAC Mean Habitat Capability– Current Inherent Habitat Capability for mule deer is high (mean = 2.5) across the Basin (table ED-3). Eight of 15 RAC/PACs scored within the High range of Inherent Habitat Capability. As with elk, the mean reduction from security was 0.4 units, yielding an Adjusted Habitat Capability of 2.0 across the Basin. After adjusting for security, only two RAC/PACs scored within the High range of Adjusted Habitat Capability, five scored moderately-high (2.0 – 2.3), and the rest were moderate to moderately-low (≥1.6).

Adjusted Habitat Capability in RAC/PACs, averaged within and across RAC/PACs, changed little from the current situation over both the short- and long-term under alternatives. The average change from current across the Basin was consistently about 0.1 unit among alternatives.

HUC6s within RAC/PACs-- As with elk, a different, and perhaps better, outcome is perceived by looking at the percentage of HUC6 watersheds within RAC/PACs with changed Adjusted Habitat Capability under alternatives (table ED-4, maps ED-8 to ED-14). The results were very similar to elk. In the short term (10 years), about 9% of the watersheds will increase in Adjusted Habitat Capability under all alternatives, while 90% remain unchanged and 1% decline. Although Alternative 1 seems slightly better in that respect after 10 years, the small 2% difference probably is not important. After 100 years, Adjusted Habitat Capability is projected to have increased in about 18% of the watersheds, while 6% show a decline in capability.

Projected increases in Adjusted Habitat Capability were well distributed across the mountainous mule deer range in the Basin, primarily where habitat capability is currently rated Low. Most increases occurred in western Montana, throughout eastern Washington, in northern and central Idaho, and northeastern Oregon (maps ED-8 to ED-14). The largest declines in capability over the next 100 years were projected to occur in the eastern Washington Cascades and northern Idaho.

White-tailed Deer

RAC/PAC Mean Habitat Capability– Current Inherent Habitat Capability for white-tailed deer is moderately-high (mean = 2.2) across the Basin (table ED-5). Five of 11 RAC/PACs withing the range of white-tailed deer scored within the High range of Inherent Habitat Capability. The mean reduction from security was 0.3 units, yielding an Adjusted Habitat Capability of 2.0 across the Basin. After adjusting for security, only two RAC/PACs scored within the High range of Adjusted Habitat Capability, five scored moderately-high (2.0 – 2.3), and the rest were moderate to moderately-low ($\geq$1.6).

Adjusted Habitat Capability in RAC/PACs, averaged within and across RAC/PACs, did not change from the current situation over both the short- and long-term under alternatives. The average change from current across the Basin was consistently zero among alternatives.

HUC6s within RAC/PACs– As with the other two species, a different, and perhaps better, outcome is perceived by looking at the percentage of HUC6 watersheds within RAC/PACs with changed Adjusted Habitat Capability under alternatives (table ED-6, maps ED-15 to ED-21). In the short term (10 years), about 9-10% of the watersheds will increase in Adjusted Habitat Capability under all alternatives, while 85-88% remain unchanged and 3-4% decline. Although Alternative 1 seems slightly better in that respect after 10 years, the small 3% difference probably is not important. After 100 years, Adjusted Habitat Capability is projected to have increased in about 18% of the watersheds, while 6% show a decline in capability.

Projected increases in Adjusted Habitat Capability were well distributed across white-tailed deer range in the northern Rockies and northeastern Washington, primarily where habitat capability is currently rated Low. Most increases occurred in western Montana, northeastern Washington, in northern Idaho in the Bitterroot country, and in central Idaho (maps ED-15 to ED-21). The largest declines in capability over the next 100 years were projected to occur in the eastern Washington Cascades, northern Idaho, and in the Bitterroot range in Idaho.

LITERATURE CITED

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Lehmkuhl, J. F.; Raphael, M. G.; Holthausen, R. S.; Hickenbottom, J. R.; Naney, R. H.; Shelly, J. S.. 1997. Historical and current status of terrestrial species and the effects of the proposed alternatives. pp. 537-730 in: T. M. Quigley, K. M. Lee, and S. J. Arbelbide (tech. eds.). Evaluation of EIS alternatives by the Science Integration Team. USDA Forest Service General Technical Report PNW-GTR-406. USDA Forest Service Pacific Northwest Research Station, Portland, OR. 1094 pp.

Table ED-1. Inherent and Adjusted Habitat Capability predictions of the ICBEMP BBN Model for elk during the current period and projected for alternativ over 10 years and 100 years. Means are calculated using the value for watersheds weighted by the area of the watershed, and uses only those watersheds within the range of the species, not all watersheds in the RAC/PAC

	Current		
RAC/PAC Name	Inherent Habitat Capability	Security Adjust-ment	Adjusted Habitat Capability
Sierra Front-Northwestern Great Basin RAC	2.7	-0.7	2.0
Wyoming RAC	2.5	-0.2	2.3
Lewiston RAC	1.9	-0.1	1.8
Butte RAC	1.8	-0.2	1.6
Klamath PAC	2.5	-0.7	1.8
Deschutes PAC	2.5	-0.7	1.8
John Day-Snake RAC	2.1	-0.5	1.6
Southeastern Oregon RAC	2.6	-0.8	1.9
Lower Snake River RAC	2.5	-0.6	1.9
Upper Snake River RAC	2.5	-0.6	1.9
Upper Columbia-Salmon-Clearwater RAC - R4	2.5	-0.3	2.2
Upper Columbia-Salmon-Clearwater RAC - R1	1.9	-0.3	1.6
Eastern Washington RAC	1.6	-0.2	1.4
Yakima PAC	2.0	-0.4	1.6
Eastern Washington Cascades PAC	2.6	-0.5	2.1

	X1 10 years				X1 100 years			
RAC/PAC Name	Inherent Habitat Capability	Security Adjust-ment	Adjusted Habitat Capability	Change from Current	Inherent Habitat Capability	Security Adjust-ment	Adjusted Habitat Capability	Change from Current
Sierra Front-Northwestern Great Basin RAC	2.7	-0.7	2.0	0.0	2.7	-0.6	2.0	0.0
Wyoming RAC	2.5	-0.1	2.4	0.0	2.4	-0.1	2.4	0.0
Lewiston RAC	2.1	-0.2	1.9	0.1	1.9	-0.1	1.9	0.0
Butte RAC	2.1	-0.3	1.7	0.1	2.2	-0.3	1.8	0.2
Klamath PAC	2.6	-0.7	1.9	0.1	2.5	-0.6	1.8	0.0
Deschutes PAC	2.6	-0.8	1.8	0.0	2.5	-0.7	1.8	0.0
John Day-Snake RAC	2.3	-0.5	1.7	0.1	2.4	-0.6	1.8	0.2
Southeastern Oregon RAC	2.6	-0.8	1.9	0.0	2.7	-0.8	1.9	0.0
Lower Snake River RAC	2.6	-0.7	1.9	0.0	2.5	-0.6	1.9	0.0
Upper Snake River RAC	2.6	-0.6	2.0	0.0	2.5	-0.6	2.0	0.0
Upper Columbia-Salmon-Clearwater RAC - R4	2.7	-0.3	2.3	0.1	2.7	-0.3	2.4	0.2
Upper Columbia-Salmon-Clearwater RAC - R1	2.0	-0.3	1.7	0.1	2.0	-0.3	1.7	0.1
Eastern Washington RAC	1.9	-0.3	1.5	0.1	2.2	-0.5	1.7	0.3
Yakima PAC	2.2	-0.5	1.7	0.1	2.2	-0.5	1.8	0.1
Eastern Washington Cascades PAC	2.7	-0.4	2.3	0.1	2.2	-0.2	2.0	-0.2

	X2 10 years				X2 100 years			
RAC/PAC Name	Inherent Habitat Capability	Security Adjust-ment	Adjusted Habitat Capability	Change from Current	Inherent Habitat Capability	Security Adjust-ment	Adjusted Habitat Capability	Change from Current
Sierra Front-Northwestern Great Basin RAC	2.7	-0.7	2.0	0.0	2.7	-0.6	2.0	0.0
Wyoming RAC	2.5	-0.1	2.4	0.0	2.4	-0.1	2.4	0.0
Lewiston RAC	2.0	-0.1	1.9	0.1	2.0	-0.1	1.9	0.1
Butte RAC	2.0	-0.3	1.7	0.1	2.2	-0.3	1.8	0.2
Klamath PAC	2.6	-0.7	1.9	0.1	2.5	-0.6	1.8	0.1
Deschutes PAC	2.6	-0.7	1.8	0.0	2.5	-0.7	1.8	0.0
John Day-Snake RAC	2.2	-0.5	1.7	0.1	2.3	-0.5	1.8	0.1

Southeastern Oregon RAC	2.7	-0.8	1.9	0.0	2.7	-0.8	1.9	0.0
Lower Snake River RAC	2.6	-0.7	1.9	0.0	2.6	-0.6	1.9	0.0
Upper Snake River RAC	2.5	-0.6	2.0	0.0	2.6	-0.6	2.0	0.1
Upper Columbia-Salmon-Clearwater RAC - R4	2.6	-0.3	2.3	0.1	2.7	-0.3	2.4	0.2
Upper Columbia-Salmon-Clearwater RAC - R1	2.0	-0.3	1.7	0.0	2.0	-0.3	1.7	0.1
Eastern Washington RAC	1.9	-0.3	1.5	0.1	2.2	-0.5	1.7	0.3
Yakima PAC	2.2	-0.5	1.7	0.1	2.2	-0.5	1.8	0.1
Eastern Washington Cascades PAC	2.6	-0.4	2.3	0.1	2.2	-0.2	2.0	-0.2

	X3 10 years				X3 100 years			
RAC/PAC Name	Inherent Habitat Capability	Security Adjust-ment	Adjusted Habitat Capability	Change from Current	Inherent Habitat Capability	Security Adjust-ment	Adjusted Habitat Capability	Change from Current
Sierra Front-Northwestern Great Basin RAC	2.7	-0.7	2.0	0.0	2.7	-0.6	2.0	0.0
Wyoming RAC	2.5	-0.1	2.4	0.0	2.4	-0.1	2.4	0.0
Lewiston RAC	2.0	-0.1	1.9	0.0	1.8	0.0	1.8	0.0
Butte RAC	2.0	-0.3	1.7	0.1	2.2	-0.3	1.8	0.2
Klamath PAC	2.6	-0.7	1.9	0.1	2.5	-0.6	1.8	0.1
Deschutes PAC	2.6	-0.8	1.8	0.0	2.5	-0.7	1.8	0.0
John Day-Snake RAC	2.2	-0.5	1.7	0.1	2.3	-0.5	1.8	0.1
Southeastern Oregon RAC	2.6	-0.8	1.9	0.0	2.7	-0.8	1.9	0.0
Lower Snake River RAC	2.6	-0.7	1.9	0.0	2.6	-0.6	1.9	0.0
Upper Snake River RAC	2.5	-0.6	2.0	0.0	2.6	-0.6	2.0	0.1
Upper Columbia-Salmon-Clearwater RAC - R4	2.6	-0.3	2.3	0.1	2.7	-0.3	2.4	0.2
Upper Columbia-Salmon-Clearwater RAC - R1	2.0	-0.3	1.7	0.0	2.0	-0.3	1.7	0.1
Eastern Washington RAC	1.9	-0.3	1.5	0.1	2.2	-0.5	1.7	0.3
Yakima PAC	2.2	-0.5	1.7	0.1	2.2	-0.5	1.8	0.1
Eastern Washington Cascades PAC	2.7	-0.4	2.3	0.1	2.2	-0.2	2.0	-0.2

Table ED-2. Percentage of HUC6s in each RAC/PAC with significant changes in Adjusted Habitat Capability from the Current period for elk under each SDEIS Alternative at 10 years and 100 years. Significant change was a >0.5 point shift in Adjusted Habitat Capability

	X1 10 years			X1 100 years		
RAC/PAC	-	+	0	-	+	0
Sierra Front-Northwestern Great Basin RAC	0	0	100	0	0	100
Wyoming RAC	4	4	92	13	13	74
Lewiston RAC	3	14	83	17	17	66
Butte RAC	2	18	79	8	38	54
Klamath PAC	0	9	91	1	7	91
Deschutes PAC	1	5	94	5	9	87
John Day-Snake RAC	0	9	91	2	17	81
Southeastern Oregon RAC	0	2	98	0	5	95
Lower Snake River RAC	0	3	96	5	5	90
Upper Snake River RAC	1	5	94	3	9	89
Upper Columbia-Salmon-Clearwater RAC - R4	1	10	89	7	22	71
Upper Columbia-Salmon-Clearwater RAC - R1	4	13	83	14	26	60
Eastern Washington RAC	2	19	79	4	38	58
Yakima PAC	1	12	87	6	18	76
Eastern Washington Cascades PAC	6	10	83	33	25	42
Total	1	10	89	6	19	75

	X2 10 years			X2 100 years		
RAC/PAC	-	+	0	-	+	0
Sierra Front-Northwestern Great Basin RAC	0	0	100	0	0	100
Wyoming RAC	3	4	93	13	13	74
Lewiston RAC	3	10	86	17	17	66
Butte RAC	2	13	85	8	38	54
Klamath PAC	0	8	92	1	7	91
Deschutes PAC	1	5	94	5	9	87
John Day-Snake RAC	0	6	93	2	17	81
Southeastern Oregon RAC	0	1	99	0	5	95
Lower Snake River RAC	0	3	97	3	5	91
Upper Snake River RAC	1	4	95	3	9	89
Upper Columbia-Salmon-Clearwater RAC - R4	1	9	91	7	21	72
Upper Columbia-Salmon-Clearwater RAC - R1	3	8	89	13	25	62
Eastern Washington RAC	2	17	81	4	36	59
Yakima PAC	1	13	86	6	18	76
Eastern Washington Cascades PAC	6	8	85	33	25	42
Total	1	7	91	6	19	76

	X3 10 years			X3 100 years		
RAC/PAC	-	+	0	-	+	0
Sierra Front-Northwestern Great Basin RAC	0	0	100	0	0	100
Wyoming RAC	3	4	93	13	13	74
Lewiston RAC	3	10	86	17	7	76
Butte RAC	2	13	85	8	37	55
Klamath PAC	0	8	92	1	7	91
Deschutes PAC	1	5	94	5	8	87
John Day-Snake RAC	0	7	93	2	17	82
Southeastern Oregon RAC	0	2	98	0	4	95
Lower Snake River RAC	0	3	96	3	6	91
Upper Snake River RAC	1	4	95	2	9	89
Upper Columbia-Salmon-Clearwater RAC - R4	1	9	90	7	22	71
Upper Columbia-Salmon-Clearwater RAC - R1	3	9	88	12	23	65
Eastern Washington RAC	2	16	81	4	37	59
Yakima PAC	1	13	86	6	18	76
Eastern Washington Cascades PAC	6	10	83	33	25	42
Total	1	8	91	6	18	76

Table ED-3. Inherent and Adjusted Habitat Capability predictions of the ICBEMP BBN Model for mule deer during the current period and projected for alternatives over 10 years and 100 years. Means are calculated using the value for watersheds weighted by the area of the watershed, and uses only those watersheds within the range of the species, not all watersheds in the RAC/PAC

	Current		
RAC/PAC Name	Inherent Habitat Capability	Security Adjust-ment	Adjusted Habitat Capability
Sierra Front-Northwestern Great Basin RAC	2.9	-0.2	2.7
Wyoming RAC	2.6	-0.2	2.4
Lewiston RAC	1.9	-0.1	1.8
Butte RAC	1.8	-0.2	1.6
Klamath PAC	2.5	-0.7	1.8
Deschutes PAC	2.6	-0.7	1.9
John Day-Snake RAC	2.1	-0.4	1.7
Southeastern Oregon RAC	2.8	-0.5	2.3
Lower Snake River RAC	2.6	-0.4	2.2
Upper Snake River RAC	2.4	-0.4	2.0
Upper Columbia-Salmon-Clearwater RAC - R4	2.6	-0.2	2.3
Upper Columbia-Salmon-Clearwater RAC - R1	1.9	-0.3	1.6
Eastern Washington RAC	1.8	-0.2	1.6
Yakima PAC	2.1	-0.3	1.8
Eastern Washington Cascades PAC	2.6	-0.4	2.2

	X1 10 years				X1 100 years			
RAC/PAC Name	Inherent Habitat Capability	Security Adjust-ment	Adjusted Habitat Capability	Change from Current	Inherent Habitat Capability	Security Adjust-ment	Adjusted Habitat Capability	Change from Current
Sierra Front-Northwestern Great Basin RAC	2.9	-0.2	2.7	0.0	2.9	-0.2	2.7	0.0
Wyoming RAC	2.6	-0.1	2.4	0.0	2.5	-0.1	2.4	0.1
Lewiston RAC	2.1	-0.2	1.9	0.1	1.9	0.0	1.8	0.0
Butte RAC	2.1	-0.3	1.7	0.1	2.2	-0.4	1.8	0.2
Klamath PAC	2.6	-0.7	1.9	0.1	2.5	-0.6	1.9	0.1
Deschutes PAC	2.7	-0.7	2.0	0.1	2.6	-0.7	1.9	0.0

John Day-Snake RAC	2.3	-0.5	1.8	0.1	2.3	-0.5	1.8	0.1
Southeastern Oregon RAC	2.8	-0.6	2.3	0.0	2.8	-0.6	2.2	-0.1
Lower Snake River RAC	2.7	-0.4	2.3	0.0	2.6	-0.4	2.2	0.0
Upper Snake River RAC	2.5	-0.4	2.1	0.1	2.5	-0.4	2.1	0.1
Upper Columbia-Salmon-Clearwater RAC - R4	2.7	-0.2	2.5	0.2	2.7	-0.2	2.5	0.2
Upper Columbia-Salmon-Clearwater RAC - R1	2.0	-0.3	1.7	0.1	2.0	-0.3	1.7	0.1
Eastern Washington RAC	1.9	-0.3	1.6	0.1	2.1	-0.4	1.7	0.1
Yakima PAC	2.3	-0.4	1.9	0.1	2.3	-0.4	1.9	0.0
Eastern Washington Cascades PAC	2.7	-0.4	2.3	0.1	2.4	-0.3	2.1	-0.1

	X2 10 years				X2 100 years			
RAC/PAC Name	Inherent Habitat Capability	Security Adjust-ment	Adjusted Habitat Capability	Change from Current	Inherent Habitat Capability	Security Adjust-ment	Adjusted Habitat Capability	Change from Current
Sierra Front-Northwestern Great Basin RAC	2.9	-0.2	2.7	0.0	2.9	-0.2	2.7	0.0
Wyoming RAC	2.6	-0.1	2.4	0.0	2.5	-0.1	2.5	0.1
Lewiston RAC	2.0	-0.1	1.9	0.1	2.0	-0.1	1.9	0.1
Butte RAC	2.0	-0.3	1.7	0.1	2.2	-0.3	1.8	0.2
Klamath PAC	2.6	-0.7	1.9	0.1	2.5	-0.6	1.9	0.1
Deschutes PAC	2.7	-0.7	2.0	0.0	2.6	-0.7	1.9	0.0
John Day-Snake RAC	2.2	-0.5	1.8	0.1	2.3	-0.5	1.8	0.1
Southeastern Oregon RAC	2.8	-0.6	2.3	0.0	2.8	-0.6	2.2	-0.1
Lower Snake River RAC	2.7	-0.4	2.3	0.0	2.7	-0.4	2.2	0.0
Upper Snake River RAC	2.5	-0.4	2.1	0.1	2.5	-0.4	2.1	0.1
Upper Columbia-Salmon-Clearwater RAC - R4	2.7	-0.2	2.5	0.2	2.7	-0.2	2.5	0.2
Upper Columbia-Salmon-Clearwater RAC - R1	2.0	-0.3	1.6	0.0	2.0	-0.3	1.7	0.1
Eastern Washington RAC	1.9	-0.3	1.6	0.1	2.1	-0.4	1.7	0.1
Yakima PAC	2.3	-0.4	1.9	0.1	2.3	-0.4	1.9	0.0
Eastern Washington Cascades PAC	2.7	-0.4	2.3	0.1	2.4	-0.3	2.1	-0.1

	X3 10 years				X3 100 years			
RAC/PAC Name	Inherent Habitat Capability	Security Adjust-ment	Adjusted Habitat Capability	Change from Current	Inherent Habitat Capability	Security Adjust-ment	Adjusted Habitat Capability	Change from Current
Sierra Front-Northwestern Great Basin RAC	2.9	-0.2	2.7	0.0	2.9	-0.2	2.7	0.0
Wyoming RAC	2.6	-0.1	2.4	0.0	2.5	-0.1	2.5	0.1
Lewiston RAC	2.0	-0.2	1.9	0.0	1.8	0.0	1.8	0.0
Butte RAC	2.0	-0.3	1.7	0.1	2.2	-0.3	1.8	0.2
Klamath PAC	2.6	-0.7	1.9	0.1	2.5	-0.6	1.9	0.1
Deschutes PAC	2.7	-0.7	2.0	0.0	2.6	-0.7	1.9	0.0
John Day-Snake RAC	2.3	-0.5	1.8	0.1	2.3	-0.5	1.8	0.1
Southeastern Oregon RAC	2.8	-0.6	2.3	0.0	2.8	-0.6	2.2	-0.1
Lower Snake River RAC	2.7	-0.4	2.3	0.0	2.7	-0.4	2.2	0.0
Upper Snake River RAC	2.5	-0.4	2.1	0.1	2.5	-0.4	2.1	0.1
Upper Columbia-Salmon-Clearwater RAC - R4	2.7	-0.2	2.5	0.2	2.7	-0.2	2.5	0.2
Upper Columbia-Salmon-Clearwater RAC - R1	2.0	-0.3	1.7	0.0	2.0	-0.3	1.7	0.1
Eastern Washington RAC	1.9	-0.3	1.6	0.1	2.1	-0.4	1.7	0.1
Yakima PAC	2.3	-0.4	1.9	0.1	2.3	-0.4	1.9	0.0
Eastern Washington Cascades PAC	2.7	-0.4	2.3	0.1	2.4	-0.3	2.1	-0.1

Table ED-4. Percentage of HUC6's in each RAC/PAC with significant changes in Adjusted Habitat Capability from the Current period for mule deer under each SDEIS Alternative at 10 years and 100 years. Significant change was a >0.5 point shift in Adjusted Habitat Capability

RAC/PAC	X1 10 years -	X1 10 years +	X1 10 years 0	X1 100 years -	X1 100 years +	X1 100 years 0
Sierra Front-Northwestern Great Basin RAC	0	2	98	1	7	92
Wyoming RAC	4	3	93	9	13	78
Lewiston RAC	3	14	83	17	14	69
Butte RAC	2	19	79	8	40	52
Klamath PAC	0	9	91	3	7	90
Deschutes PAC	1	5	94	4	10	85
John Day-Snake RAC	1	11	88	5	18	77
Southeastern Oregon RAC	0	2	98	3	4	93
Lower Snake River RAC	0	4	96	6	6	89
Upper Snake River RAC	1	9	91	1	11	87
Upper Columbia-Salmon-Clearwater RAC - R4	0	16	83	6	25	69
Upper Columbia-Salmon-Clearwater RAC - R1	4	13	83	12	22	66
Eastern Washington RAC	1	10	89	5	22	73
Yakima PAC	2	14	84	10	18	72
Eastern Washington Cascades PAC	3	8	89	29	20	51
Total	1	10	89	6	18	76

RAC/PAC	X2 10 years -	X2 10 years +	X2 10 years 0	X2 100 years -	X2 100 years +	X2 100 years 0
Sierra Front-Northwestern Great Basin RAC	0	2	98	1	7	93
Wyoming RAC	3	3	94	9	14	78
Lewiston RAC	3	10	86	17	21	62
Butte RAC	2	13	85	8	38	54
Klamath PAC	0	8	92	1	7	91
Deschutes PAC	1	6	94	5	10	85
John Day-Snake RAC	1	7	93	6	17	77
Southeastern Oregon RAC	0	2	98	3	5	92
Lower Snake River RAC	0	4	96	4	7	90
Upper Snake River RAC	0	8	92	1	13	86
Upper Columbia-Salmon-Clearwater RAC - R4	1	14	85	6	25	69
Upper Columbia-Salmon-Clearwater RAC - R1	3	7	89	13	25	62
Eastern Washington RAC	1	8	91	5	21	74
Yakima PAC	2	14	84	10	18	72
Eastern Washington Cascades PAC	3	9	88	28	20	52
Total	1	8	91	6	18	76

	X3 10 years			X3 100 years		
RAC/PAC	-	+	0	-	+	0
Sierra Front-Northwestern Great Basin RAC	0	2	98	1	7	93
Wyoming RAC	3	3	94	9	14	78
Lewiston RAC	3	10	86	17	10	72
Butte RAC	2	13	84	8	37	55
Klamath PAC	0	8	92	1	7	91
Deschutes PAC	1	5	94	5	10	86
John Day-Snake RAC	1	8	91	5	17	78
Southeastern Oregon RAC	0	2	98	3	4	92
Lower Snake River RAC	0	4	96	4	6	90
Upper Snake River RAC	1	7	92	1	13	86
Upper Columbia-Salmon-Clearwater RAC - R4	1	14	85	6	25	69
Upper Columbia-Salmon-Clearwater RAC - R1	3	9	88	12	23	65
Eastern Washington RAC	1	8	91	5	21	74
Yakima PAC	2	14	84	10	18	72
Eastern Washington Cascades PAC	3	9	88	28	20	52
Total	1	8	91	6	18	76

Table ED-5. Inherent and Adjusted Habitat Capability predictions of the ICBEMP BBN Model for white-tailed deer during the current period and projected for alternatives over 10 years and 100 years. Means are calculated using the value for watersheds weighted by the area of the watershed, and use only those watersheds within the range of the species, not all watersheds in the RAC/PAC

	Current		
RAC/PAC Name	Inherent Habitat Capability	Security Adjust-ment	Adjusted Habitat Capability
Wyoming RAC	2.7	-0.2	2.5
Lewiston RAC	1.9	-0.1	1.8
Butte RAC	1.8	-0.2	1.6
John Day-Snake RAC	1.9	-0.4	1.6
Southeastern Oregon RAC	2.9	-0.1	2.8
Lower Snake River RAC	2.2	-0.4	1.7
Upper Snake River RAC	2.4	-0.4	2.0
Upper Columbia-Salmon-Clearwater RAC - R4	2.6	-0.2	2.3
Upper Columbia-Salmon-Clearwater RAC - R1	1.9	-0.3	1.6
Eastern Washington RAC	1.6	-0.2	1.4
Eastern Washington Cascades PAC	2.5	-0.4	2.1

	X1 10 years				X1 100 years			
RAC/PAC Name	Inherent Habitat Capability	Security Adjust-ment	Adjusted Habitat Capability	Change from Current	Inherent Habitat Capability	Security Adjust-ment	Adjusted Habitat Capability	Change from Current
Wyoming RAC	2.7	-0.1	2.5	0.0	2.5	-0.1	2.4	-0.1
Lewiston RAC	2.1	-0.2	1.9	0.1	1.8	0.0	1.8	0.0
Butte RAC	2.0	-0.3	1.7	0.1	2.1	-0.3	1.8	0.2
John Day-Snake RAC	2.0	-0.4	1.6	0.0	2.0	-0.4	1.6	0.0
Southeastern Oregon RAC	2.8	-0.3	2.5	-0.3	2.8	-0.3	2.5	-0.3
Lower Snake River RAC	2.2	-0.5	1.7	0.0	2.2	-0.5	1.8	0.0
Upper Snake River RAC	2.5	-0.4	2.1	0.0	2.4	-0.4	2.0	0.0
Upper Columbia-Salmon-Clearwater RAC - R4	2.6	-0.2	2.4	0.1	2.6	-0.2	2.4	0.1
Upper Columbia-Salmon-Clearwater RAC - R1	2.0	-0.3	1.7	0.0	2.0	-0.3	1.7	0.0
Eastern Washington RAC	1.7	-0.3	1.5	0.1	1.9	-0.4	1.6	0.2
Eastern Washington Cascades PAC	2.4	-0.3	2.1	0.0	2.1	-0.1	1.9	-0.1

	X2 10 years				X2 100 years			
RAC/PAC Name	Inherent Habitat Capability	Security Adjust-ment	Adjusted Habitat Capability	Change from Current	Inherent Habitat Capability	Security Adjust-ment	Adjusted Habitat Capability	Change from Current
Wyoming RAC	2.7	-0.1	2.5	0.0	2.5	-0.1	2.5	-0.1
Lewiston RAC	2.0	-0.1	1.9	0.1	1.9	-0.1	1.9	0.0
Butte RAC	1.9	-0.3	1.7	0.1	2.1	-0.3	1.8	0.2
John Day-Snake RAC	1.9	-0.4	1.6	0.0	1.9	-0.4	1.6	0.0
Southeastern Oregon RAC	2.8	-0.3	2.5	-0.3	2.8	-0.3	2.5	-0.3
Lower Snake River RAC	2.3	-0.5	1.8	0.1	2.2	-0.5	1.8	0.0
Upper Snake River RAC	2.5	-0.4	2.1	0.0	2.5	-0.4	2.1	0.0
Upper Columbia-Salmon-Clearwater RAC - R4	2.6	-0.2	2.4	0.1	2.6	-0.2	2.4	0.1
Upper Columbia-Salmon-Clearwater RAC - R1	1.9	-0.3	1.6	0.0	2.0	-0.3	1.7	0.1
Eastern Washington RAC	1.7	-0.3	1.5	0.0	1.9	-0.4	1.6	0.2
Eastern Washington Cascades PAC	2.4	-0.3	2.1	0.1	2.2	-0.2	2.0	-0.1

	X3 10 years				X3 100 years			
RAC/PAC Name	Inherent Habitat Capability	Security Adjust-ment	Adjusted Habitat Capability	Change from Current	Inherent Habitat Capability	Security Adjust-ment	Adjusted Habitat Capability	Change from Current
Wyoming RAC	2.7	-0.1	2.5	0.0	2.5	-0.1	2.5	-0.1
Lewiston RAC	2.0	-0.1	1.9	0.0	1.8	0.0	1.8	0.0
Butte RAC	1.9	-0.3	1.7	0.1	2.1	-0.3	1.8	0.2
John Day-Snake RAC	1.9	-0.4	1.6	0.0	1.9	-0.4	1.6	0.0
Southeastern Oregon RAC	2.8	-0.3	2.5	-0.3	2.8	-0.3	2.5	-0.3
Lower Snake River RAC	2.3	-0.5	1.8	0.0	2.2	-0.5	1.8	0.0
Upper Snake River RAC	2.5	-0.4	2.1	0.0	2.5	-0.4	2.1	0.0
Upper Columbia-Salmon-Clearwater RAC - R4	2.6	-0.2	2.4	0.0	2.6	-0.2	2.4	0.1
Upper Columbia-Salmon-Clearwater RAC - R1	1.9	-0.3	1.6	0.0	2.0	-0.3	1.7	0.1
Eastern Washington RAC	1.7	-0.3	1.5	0.0	1.9	-0.4	1.6	0.2
Eastern Washington Cascades PAC	2.4	-0.3	2.1	0.0	2.1	-0.2	2.0	-0.1

Table ED-6. Percentage of HUC6's in each RAC/PAC with significant changes in Adjusted Habitat Capability from the Current period for white-tailed deer under each SDEIS Alternative at 10 years and 100 years. Significant change was a >0.5 point shift in Adjusted Habitat Capability

RAC/PAC	X1 10 years -	X1 10 years +	X1 10 years 0	X1 100 years -	X1 100 years +	X1 100 years 0
Wyoming RAC	10	5	85	10	0	90
Lewiston RAC	3	14	83	21	14	66
Butte RAC	3	17	80	10	38	53
John Day-Snake RAC	4	6	90	10	13	77
Southeastern Oregon RAC	0	0	100	0	0	100
Lower Snake River RAC	1	7	92	7	10	83
Upper Snake River RAC	4	6	90	8	9	83
Upper Columbia-Salmon-Clearwater RAC - R4	4	11	86	11	20	69
Upper Columbia-Salmon-Clearwater RAC - R1	5	13	82	14	21	65
Eastern Washington RAC	2	11	87	5	23	72
Eastern Washington Cascades PAC	7	8	85	38	23	39
Total	4	11	85	10	22	68

RAC/PAC	X2 10 years -	X2 10 years +	X2 10 years 0	X2 100 years -	X2 100 years +	X2 100 years 0
Wyoming RAC	7	5	88	10	2	88
Lewiston RAC	3	10	86	17	21	62
Butte RAC	3	12	85	10	37	54
John Day-Snake RAC	4	4	93	12	12	77
Southeastern Oregon RAC	0	0	100	0	0	100
Lower Snake River RAC	0	6	94	7	11	82
Upper Snake River RAC	3	5	91	8	10	82
Upper Columbia-Salmon-Clearwater RAC - R4	4	9	87	12	20	68
Upper Columbia-Salmon-Clearwater RAC - R1	4	8	88	14	24	61
Eastern Washington RAC	2	9	89	5	23	72
Eastern Washington Cascades PAC	7	11	82	35	24	41
Total	3	8	88	11	22	67

RAC/PAC	X3 10 years -	X3 10 years +	X3 10 years 0	X3 100 years -	X3 100 years +	X3 100 years 0
Wyoming RAC	7	5	88	10	2	88
Lewiston RAC	3	10	86	17	10	72
Butte RAC	3	12	85	10	36	55
John Day-Snake RAC	4	5	91	11	12	76
Southeastern Oregon RAC	0	0	100	0	0	100
Lower Snake River RAC	1	6	93	7	11	82
Upper Snake River RAC	3	5	92	8	10	82
Upper Columbia-Salmon-Clearwater RAC - R4	5	9	86	12	21	67
Upper Columbia-Salmon-Clearwater RAC - R1	4	9	87	13	23	64
Eastern Washington RAC	2	9	89	5	23	72
Eastern Washington Cascades PAC	8	11	81	35	24	41
Total	4	9	88	10	22	68

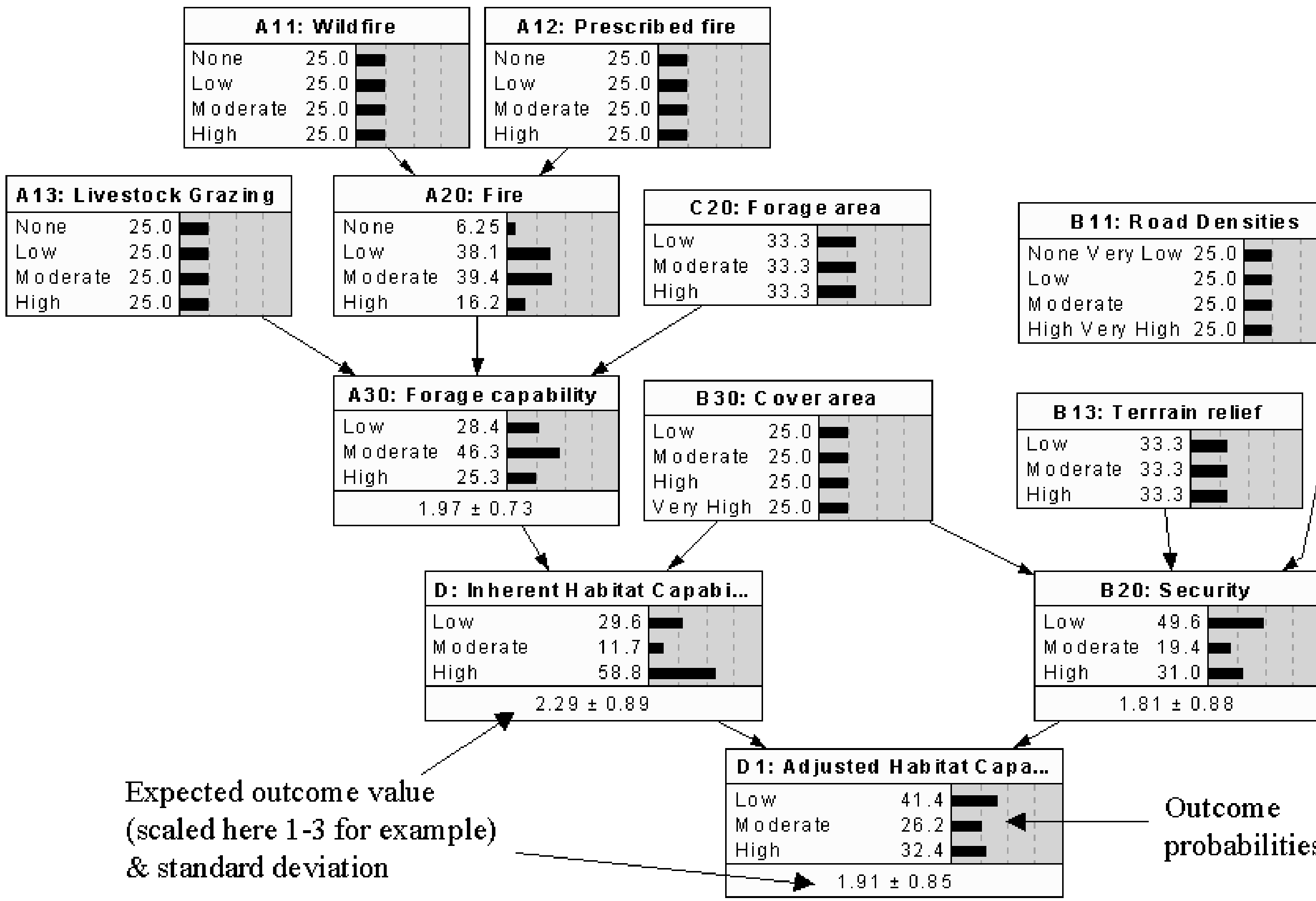


Figure ED-1. Generic elk &deer Bayesian Belief Network Model (v 1.0) for analysis of ICBEMP Supplemental Draft EIS Alternatives.

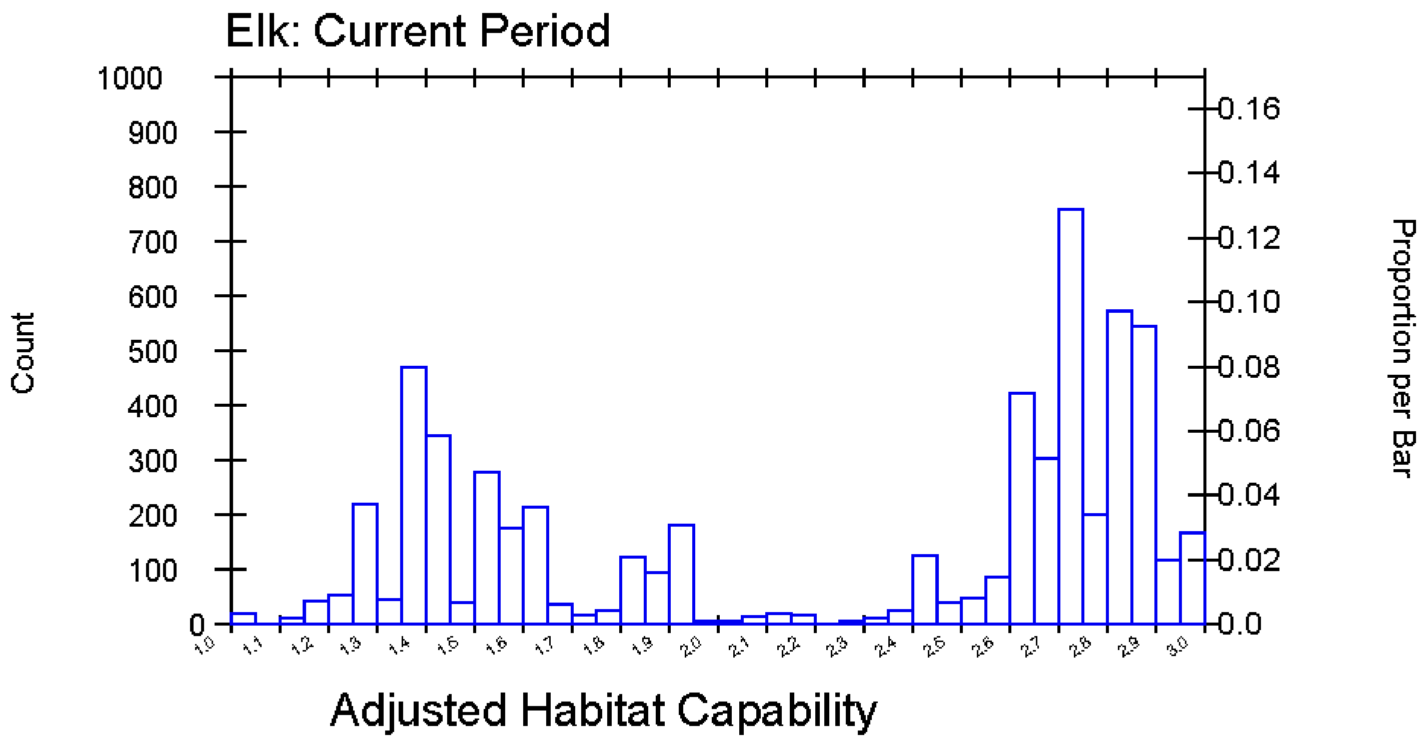


Figure ED-2. Frequency distribution of Adjusted Habitat Capability for elk in HUC6 watersheds in the ICBEMP SDEIS planning area during the current period. Break points to categorize the distribution were: Low ≤1.65, Moderate 1.66-2.3, and High > 2.3

LIST OF MAPS

RAC/PAC KEY FOR MAPS

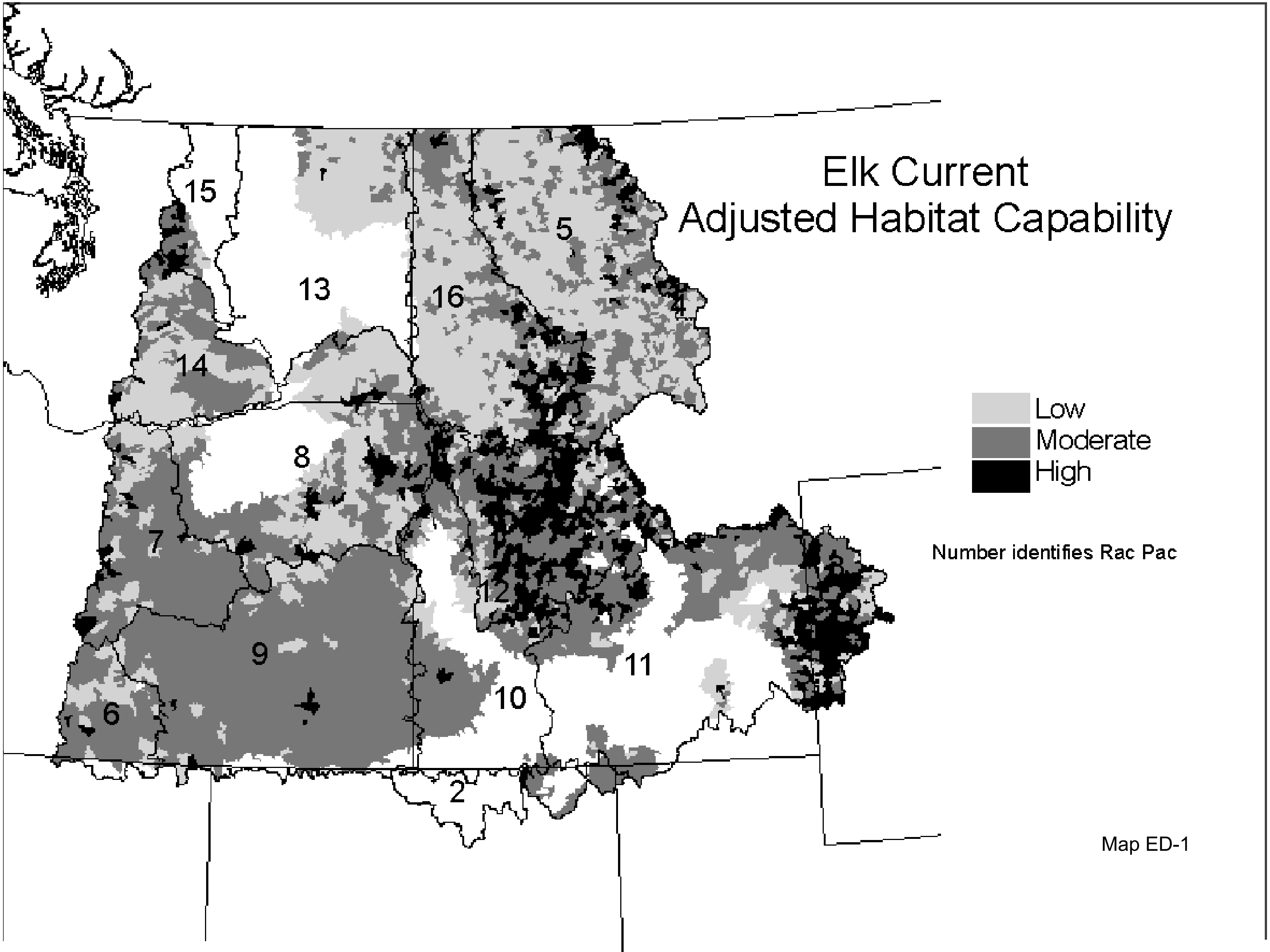
Nevada & Wyoming
2 Sierra Front-Northwestern Great Basin RAC
3 Wyoming RAC

Montana
4 Lewiston RAC
5 Butte RAC

Oregon
6 Klamath PAC
7 Deschutes PAC
8 John Day-Snake RAC (also includes the Blue Mts. in
9 Southeastern Oregon RAC

Idaho
10 Lower Snake River RAC
11 Upper Snake River RAC
12 Upper Columbia-Salmon-Clearwater RAC - R4
16 Upper Columbia-Salmon-Clearwater RAC - R1

Washington
13 Eastern Washington RAC
14 Yakima PAC
15 Eastern Washington Cascades PAC
Also see #8 which includes Blue Mts. of Washington


Elk Current
Adjusted Habitat Capability
Low
Moderate
High
Number identifies Rac Pac
15
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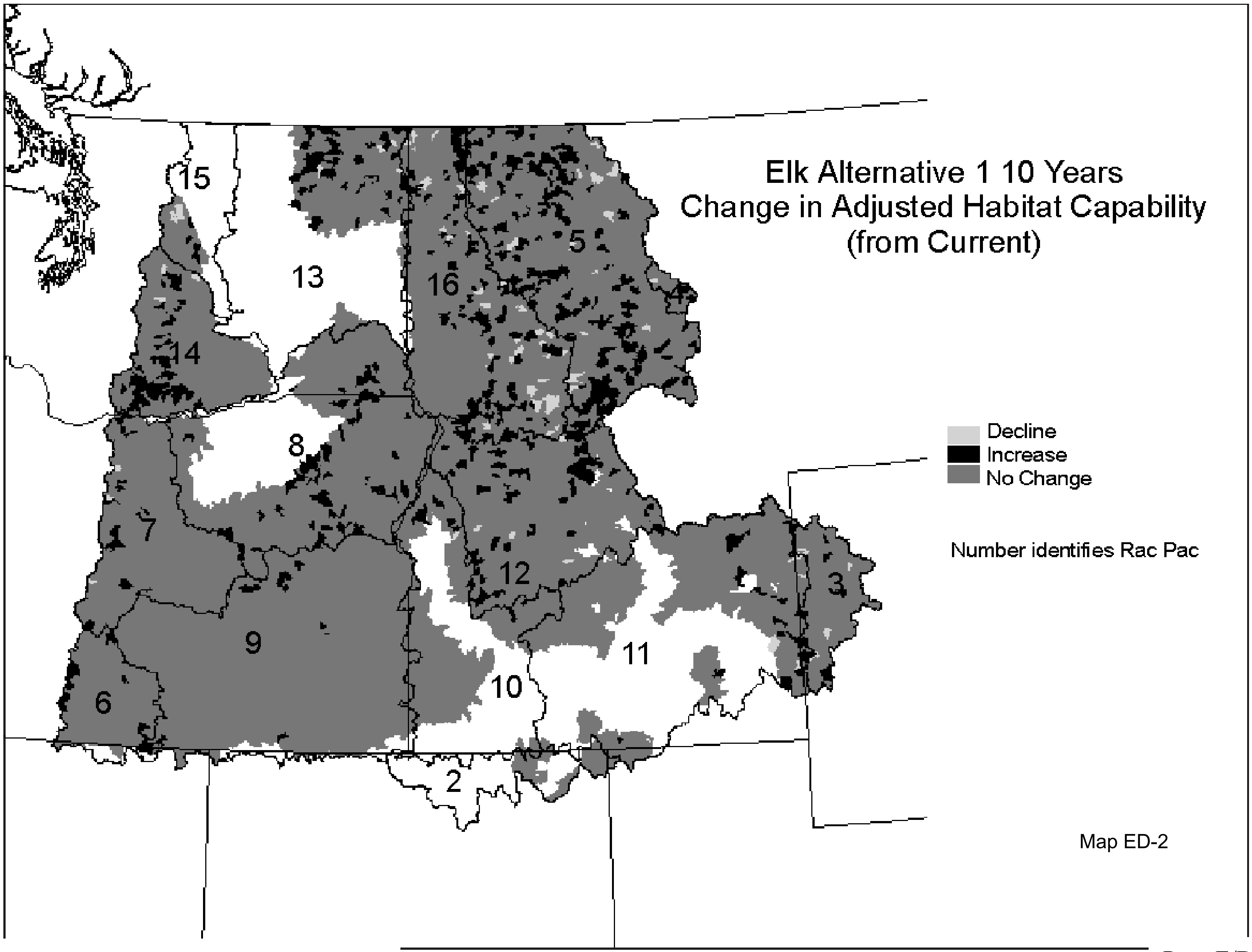
Map ED-1


Elk Alternative 1 10 Years
Change in Adjusted Habitat Capability
(from Current)
Decline
Increase
No Change
Number identifies Rac Pac
15
13
16
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8
7
12
3
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11
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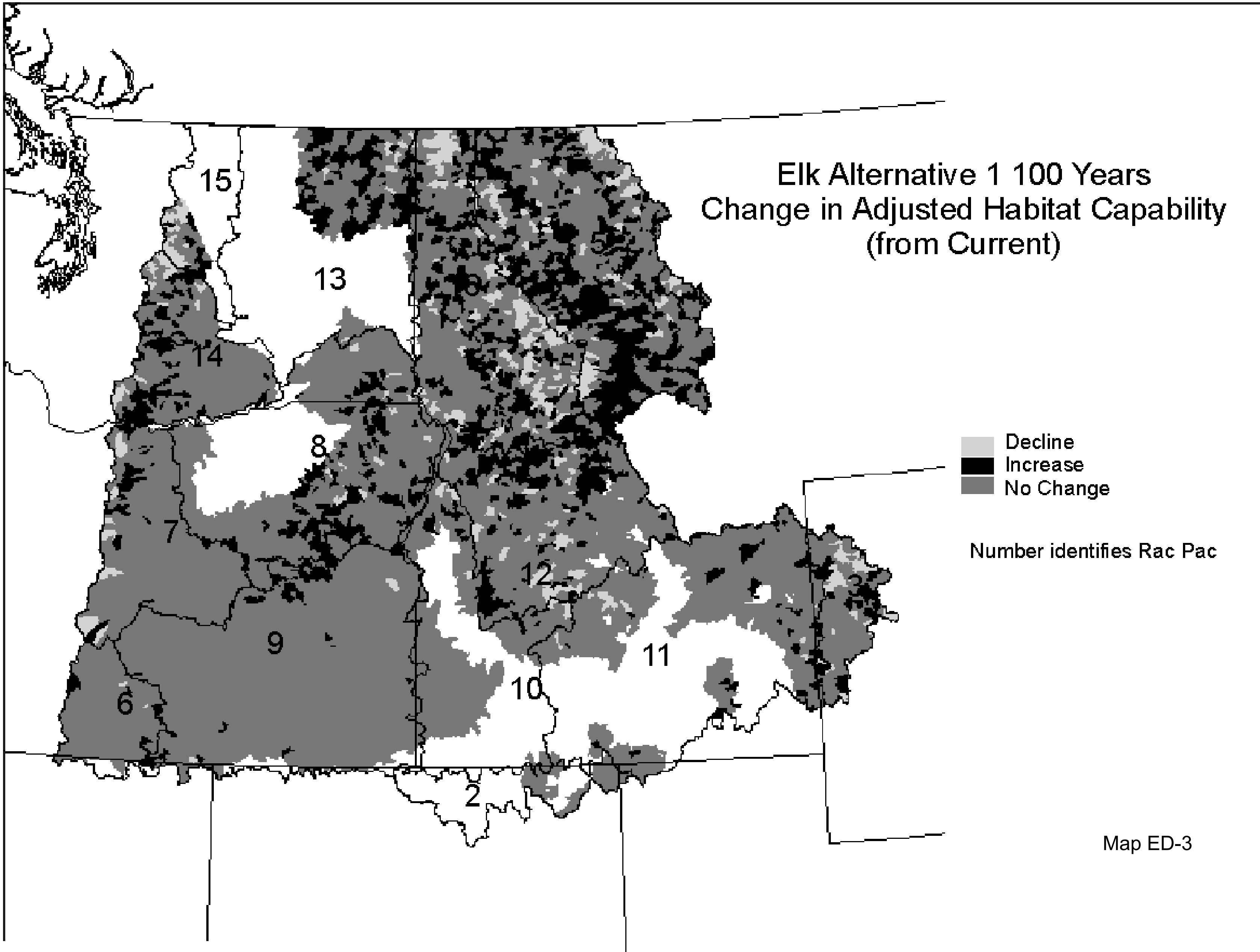
Map ED-2


Elk Alternative 1 100 Years
Change in Adjusted Habitat Capability
(from Current)
Decline
Increase
No Change
Number identifies Rac Pac
Map ED-3
15
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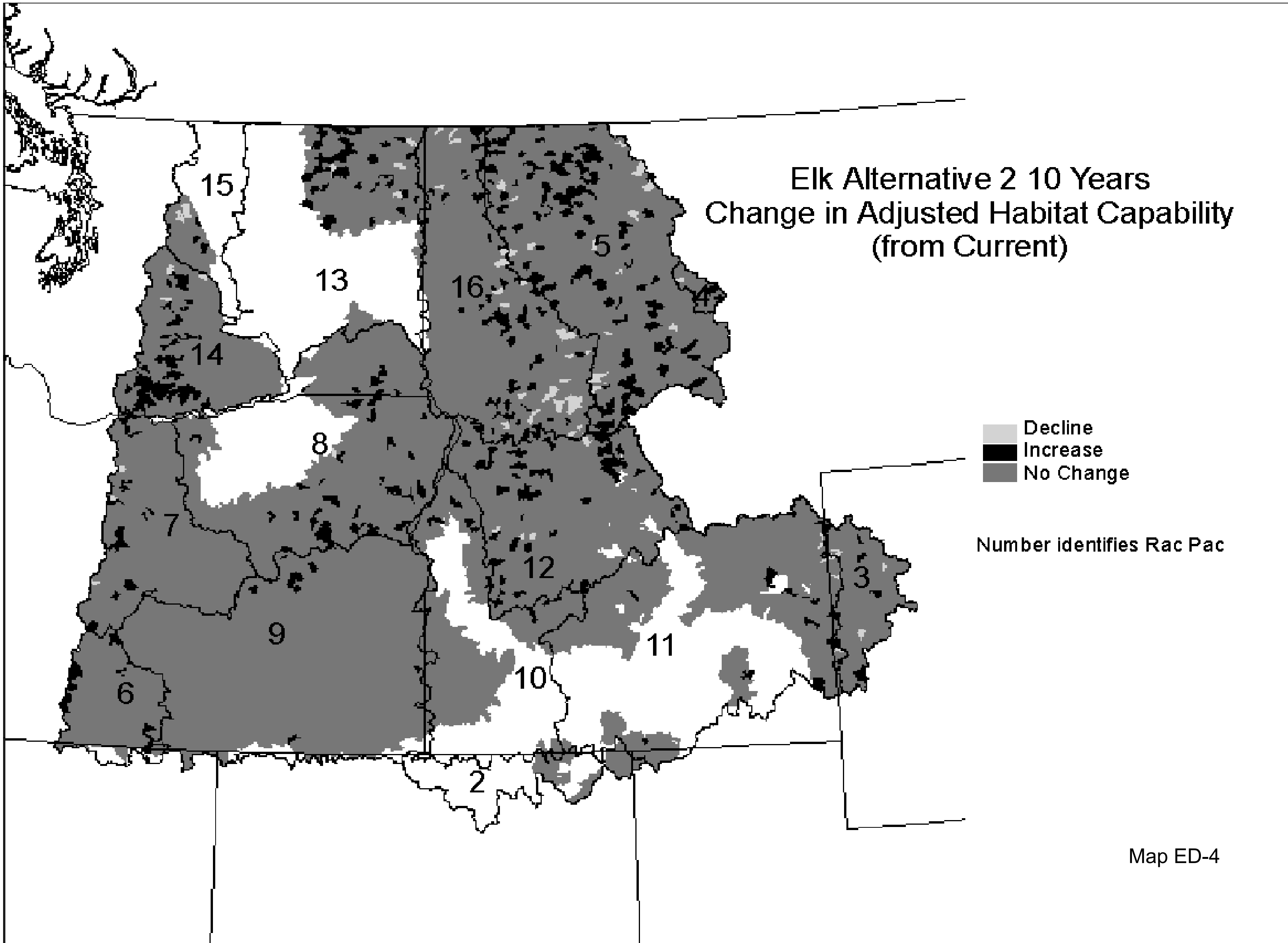
Elk Alternative 2 10 Years
Change in Adjusted Habitat Capability
(from Current)
Decline
Increase
No Change
Number identifies Rac Pac
15
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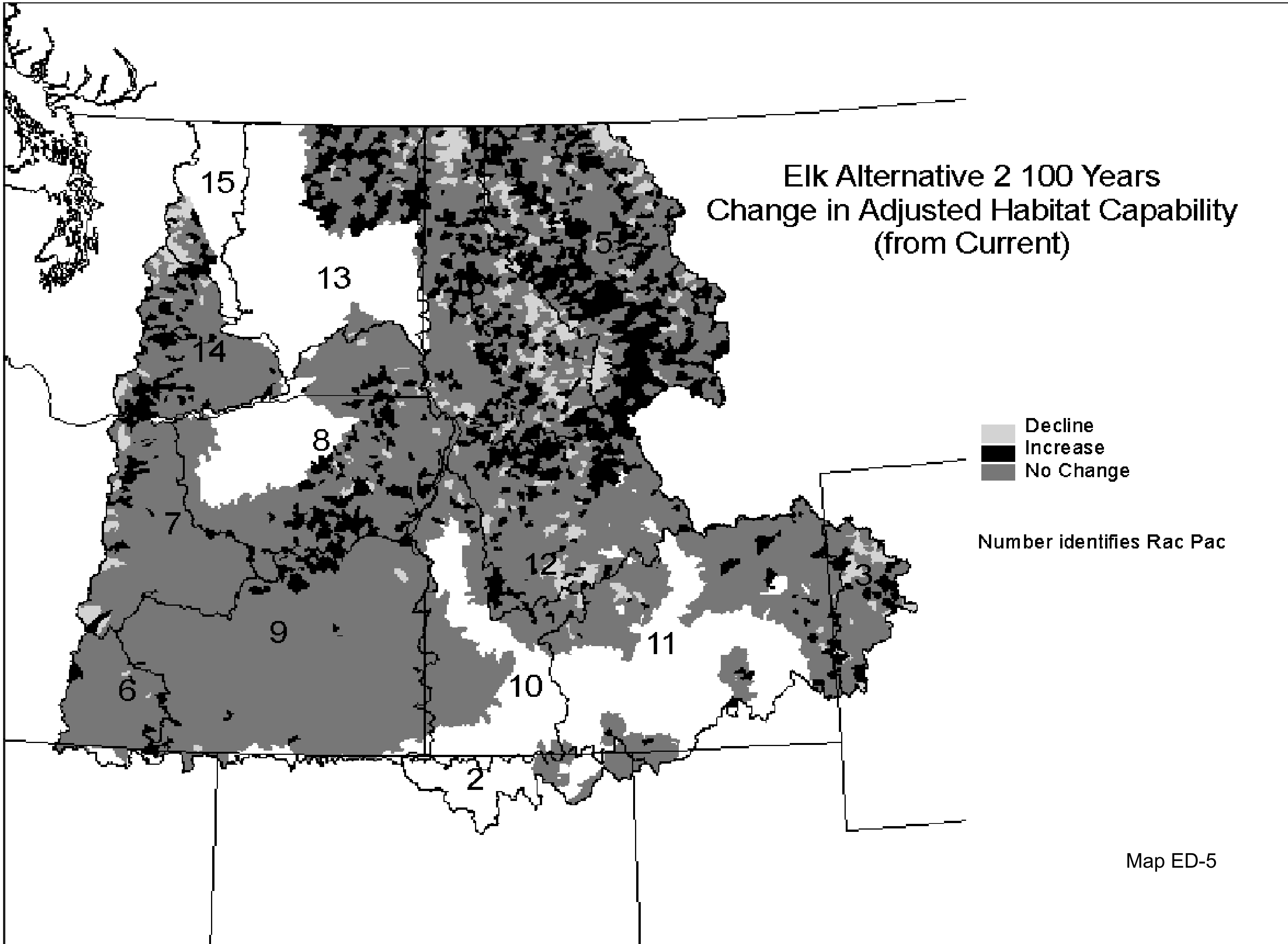
Map ED-4


Elk Alternative 2 100 Years
Change in Adjusted Habitat Capability
(from Current)
Decline
Increase
No Change
Number identifies Rac Pac
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2
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11
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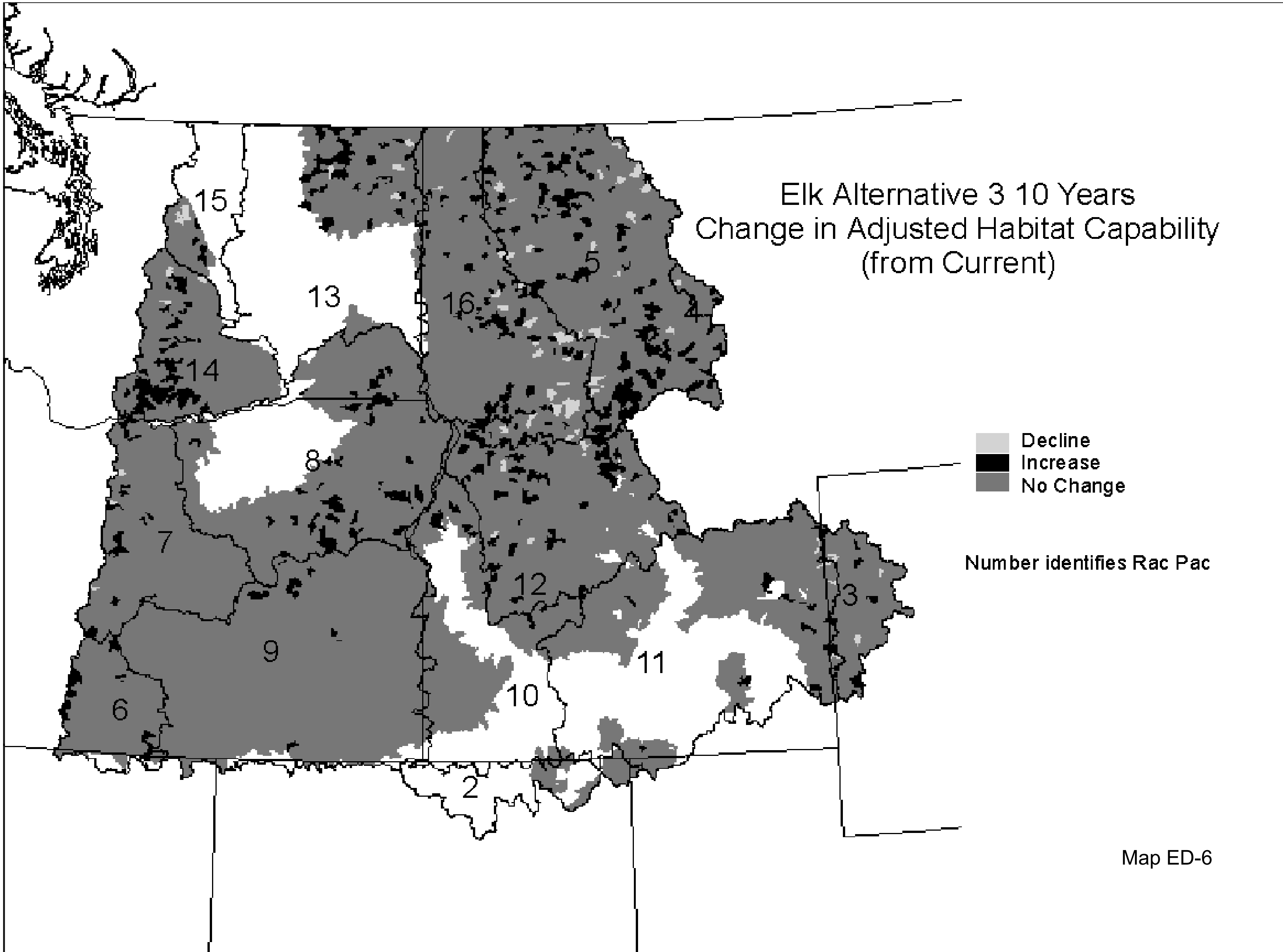
Map ED-5


Elk Alternative 3 10 Years
Change in Adjusted Habitat Capability
(from Current)
Decline
Increase
No Change
Number identifies Rac Pac
Map ED-6
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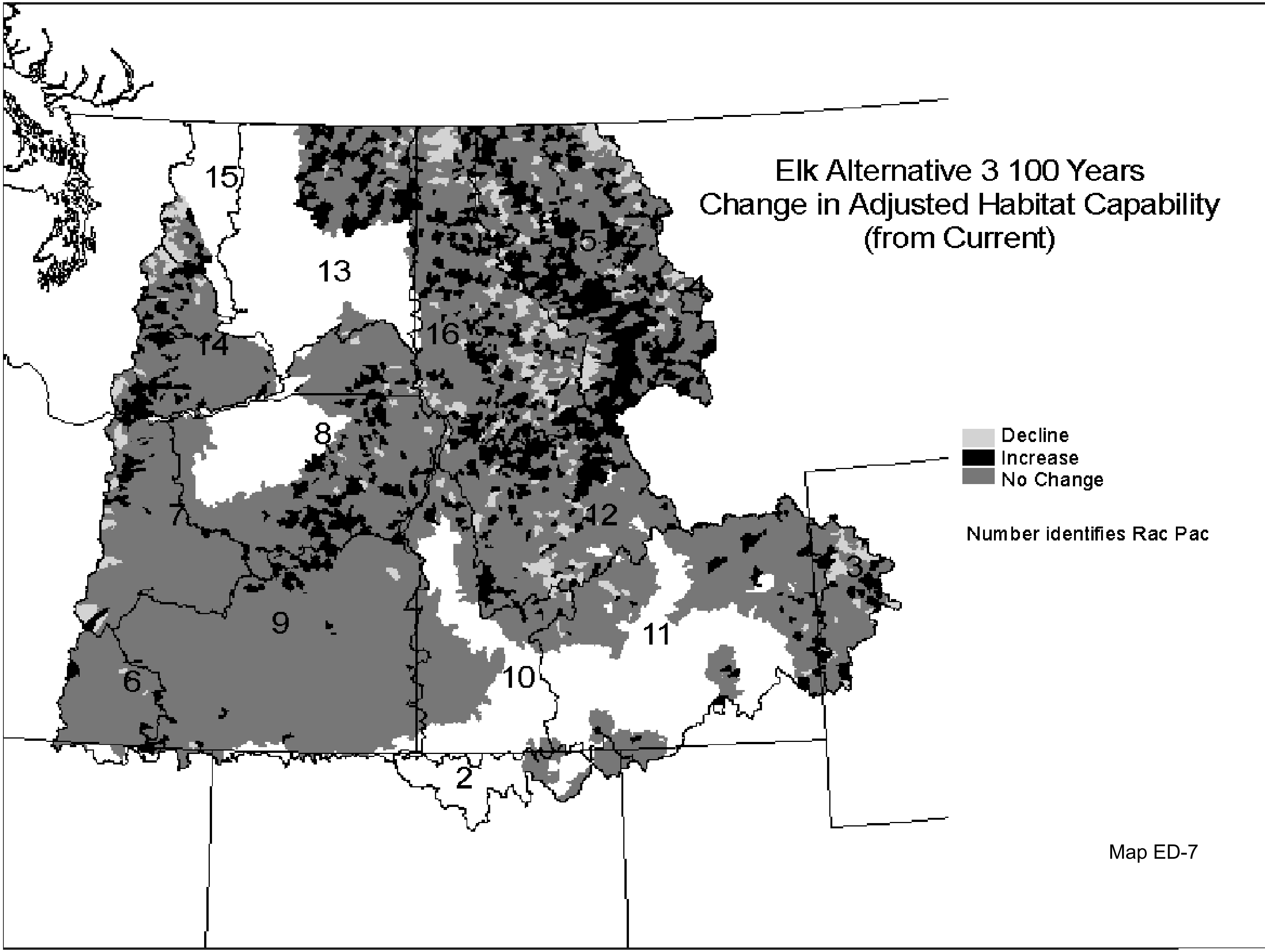
Elk Alternative 3 100 Years
Change in Adjusted Habitat Capability
(from Current)
Decline
Increase
No Change
Number identifies Rac Pac
15
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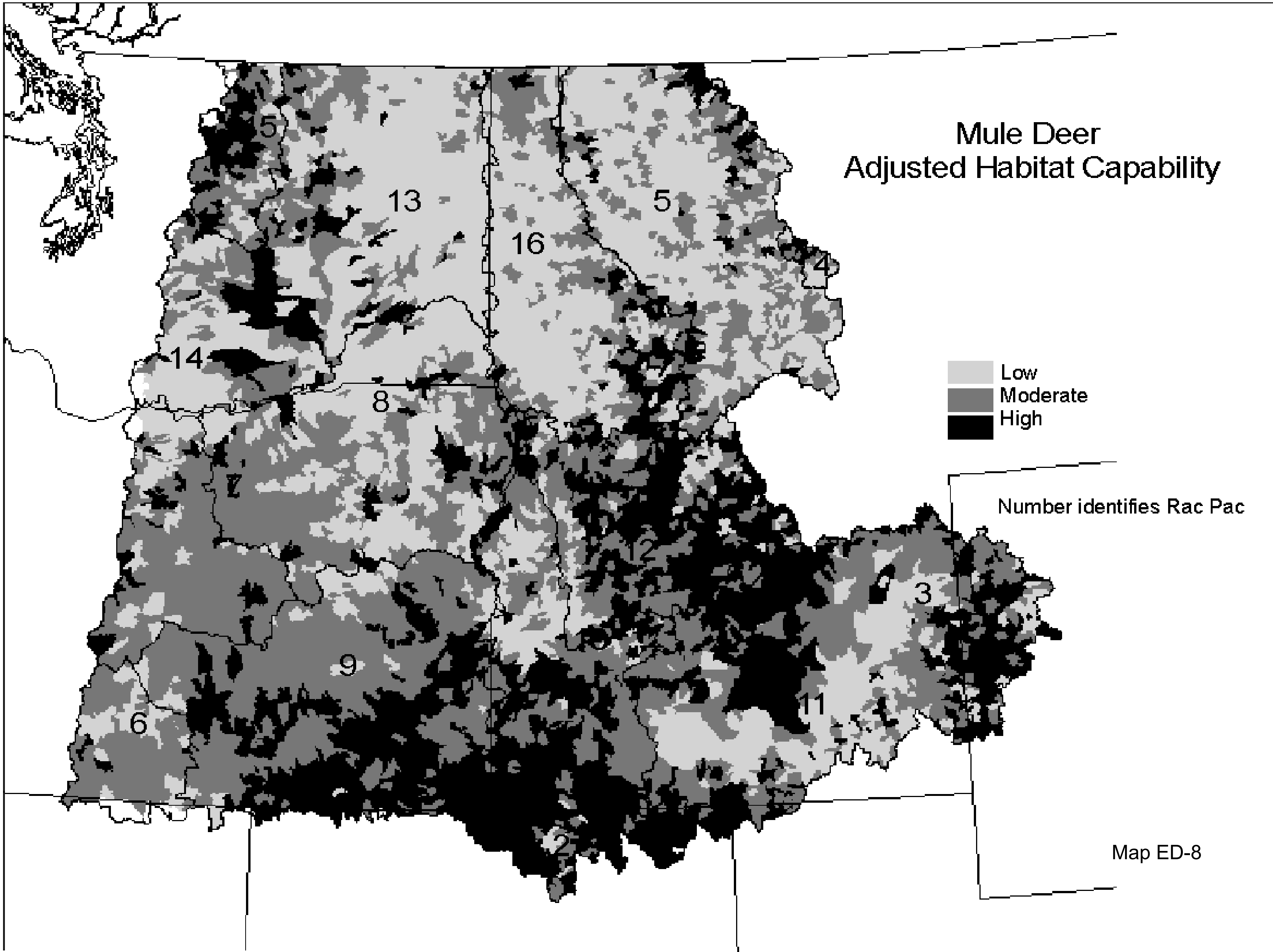
Map ED-7


Mule Deer
Adjusted Habitat Capability
Low
Moderate
High
Number identifies Rac Pac
Map ED-8
15
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12
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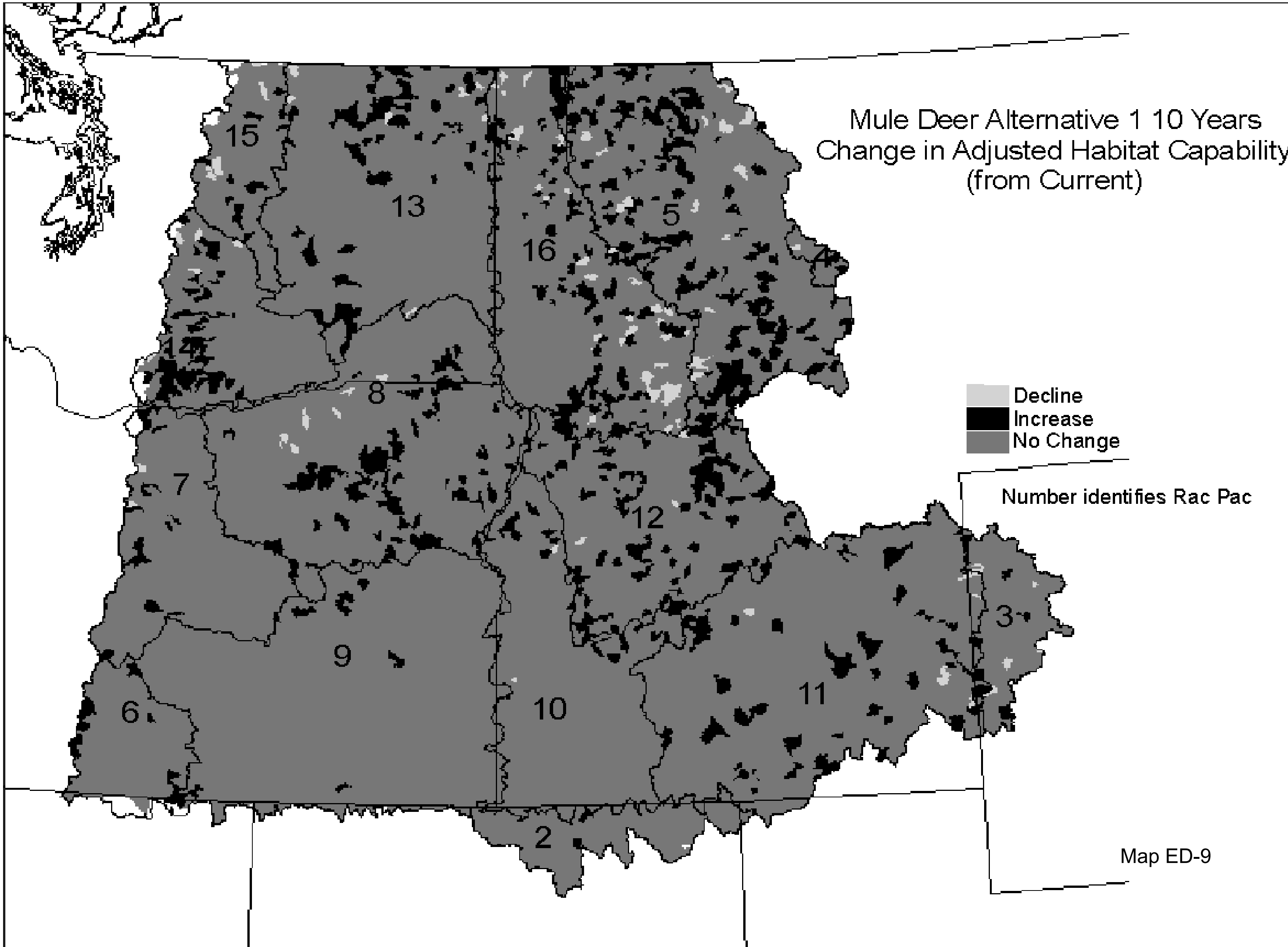
Mule Deer Alternative 1 10 Years
Change in Adjusted Habitat Capability
(from Current)
Decline
Increase
No Change
Number identifies Rac Pac
15
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11
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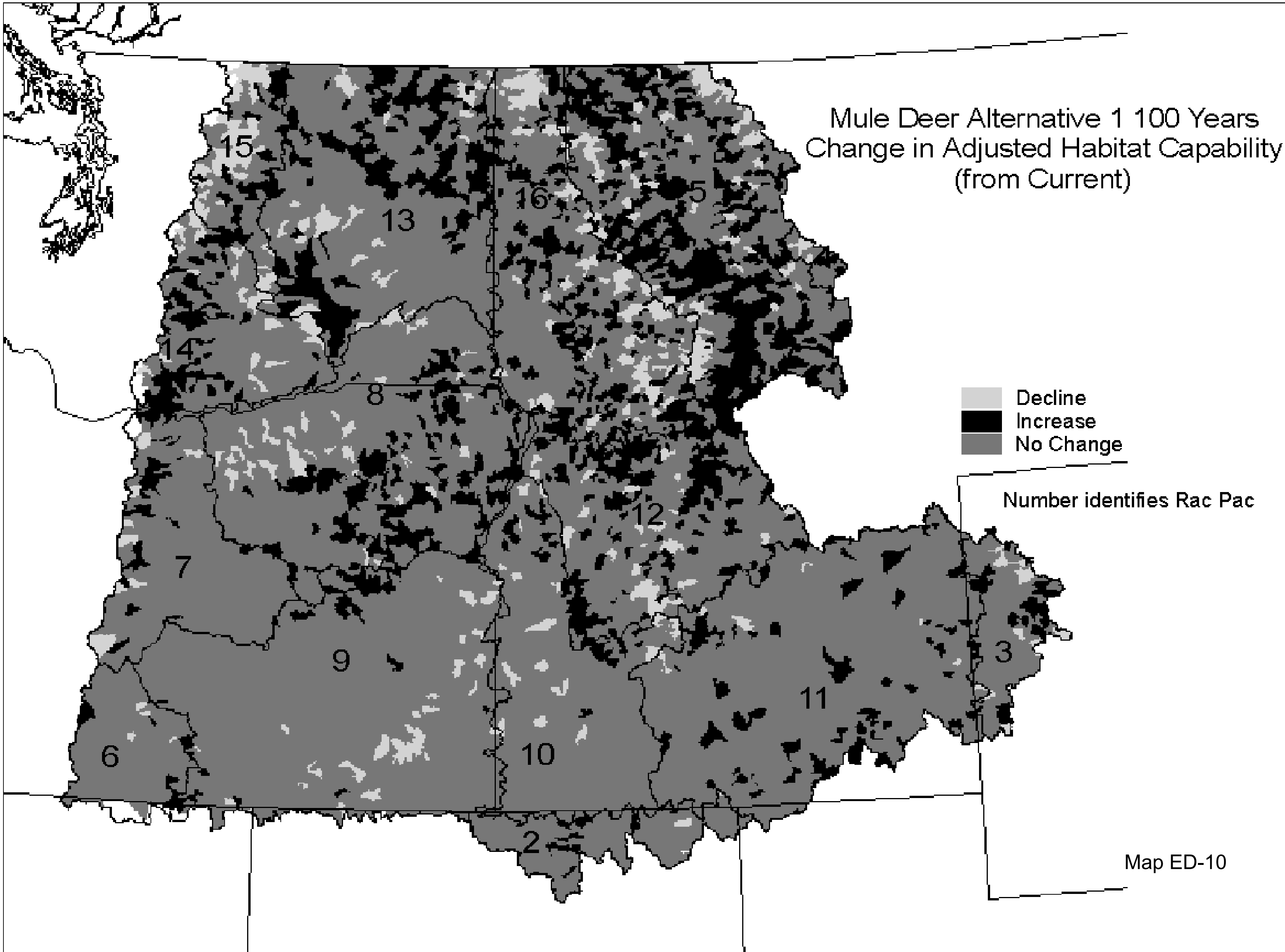
Map ED-9


Mule Deer Alternative 1 100 Years
Change in Adjusted Habitat Capability
(from Current)
Decline
Increase
No Change
Number identifies Rac Pac
Map ED-10
15
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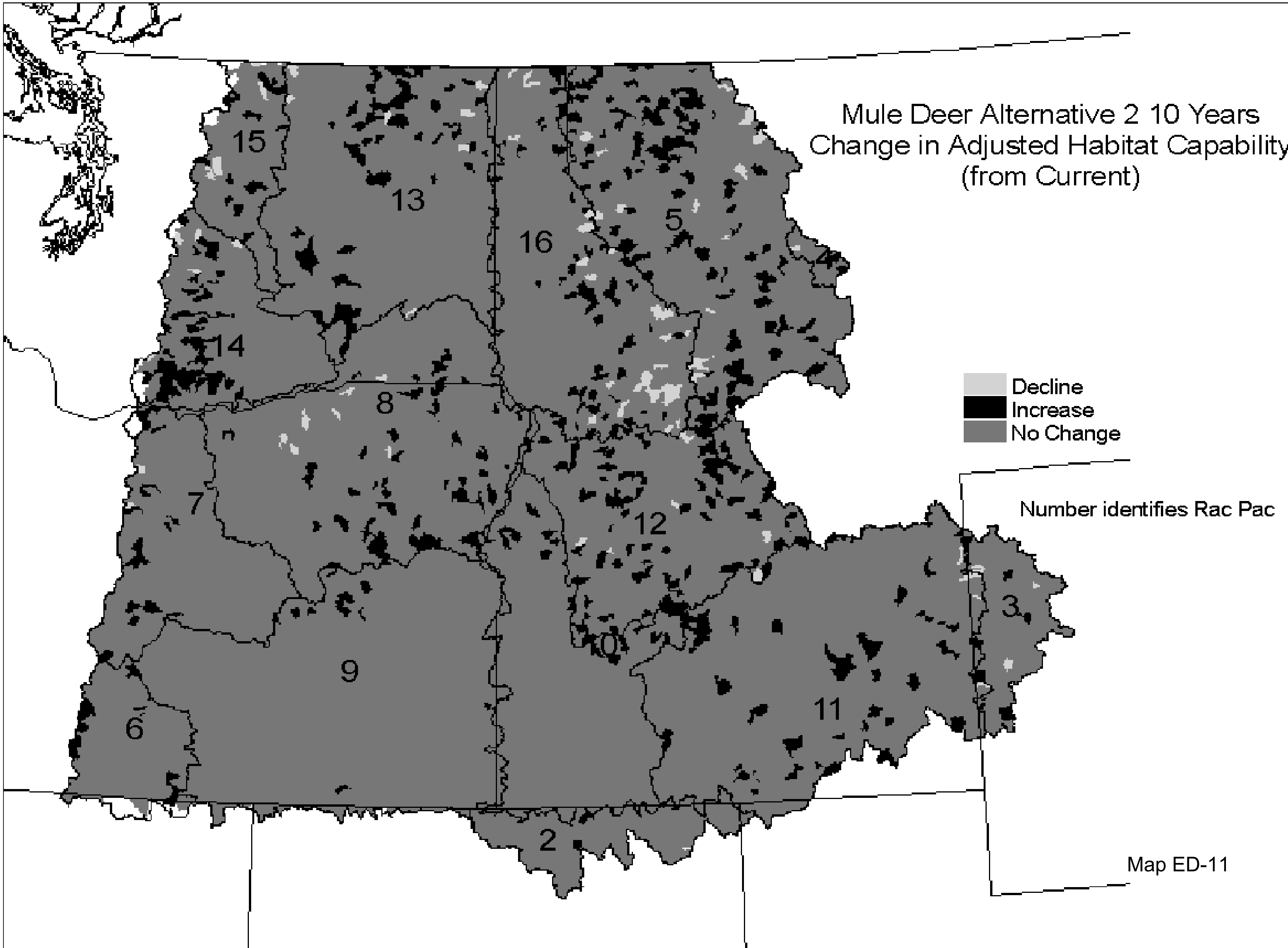
Mule Deer Alternative 2 10 Years
Change in Adjusted Habitat Capability
(from Current)
Decline
Increase
No Change
Number identifies Rac Pac
Map ED-11
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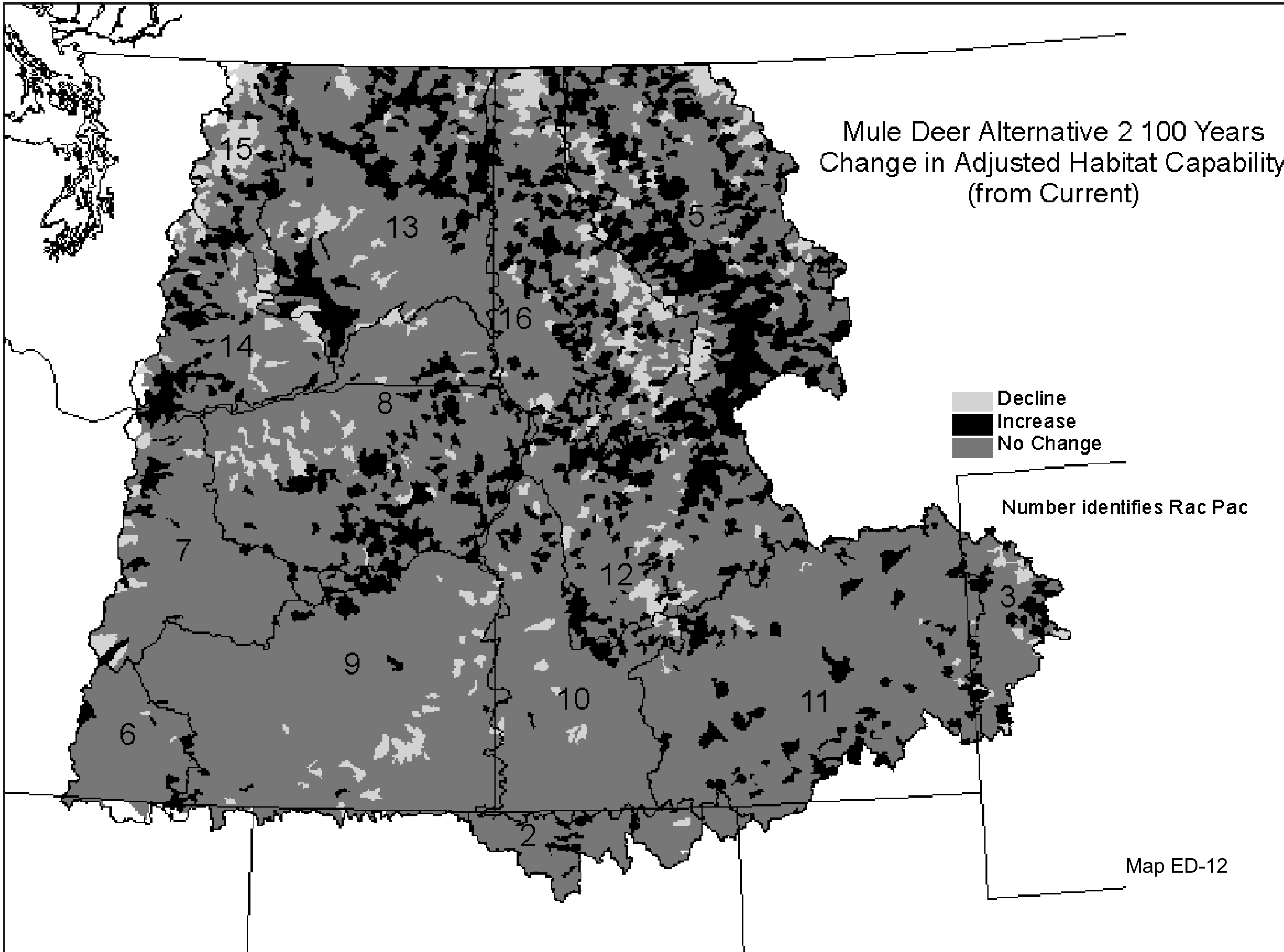
Mule Deer Alternative 2 100 Years
Change in Adjusted Habitat Capability
(from Current)
Decline
Increase
No Change
Number identifies Rac Pac
15
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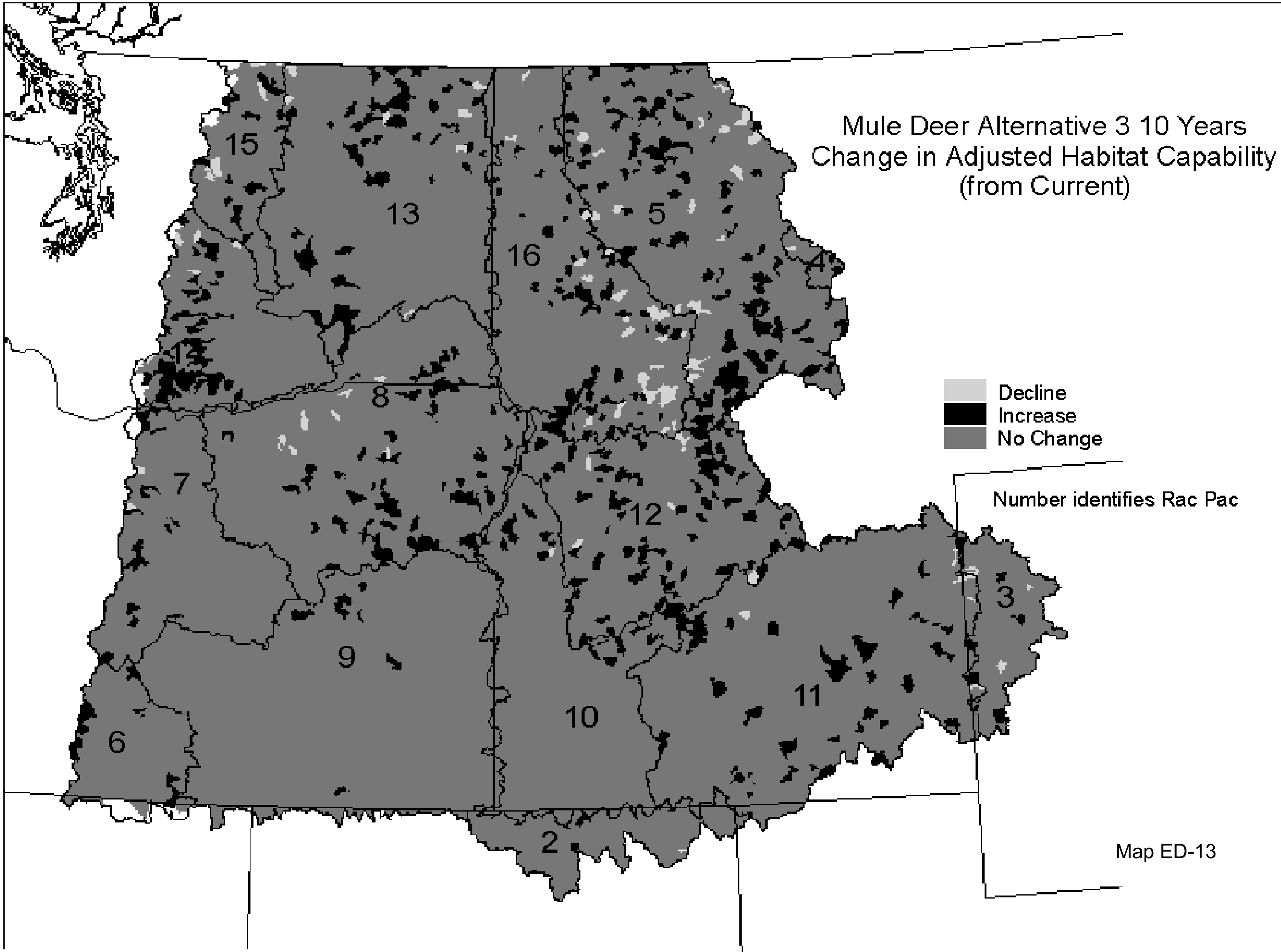
Map ED-12


Mule Deer Alternative 3 10 Years
Change in Adjusted Habitat Capability
(from Current)
Decline
Increase
No Change
Number identifies Rac Pac
Map ED-13
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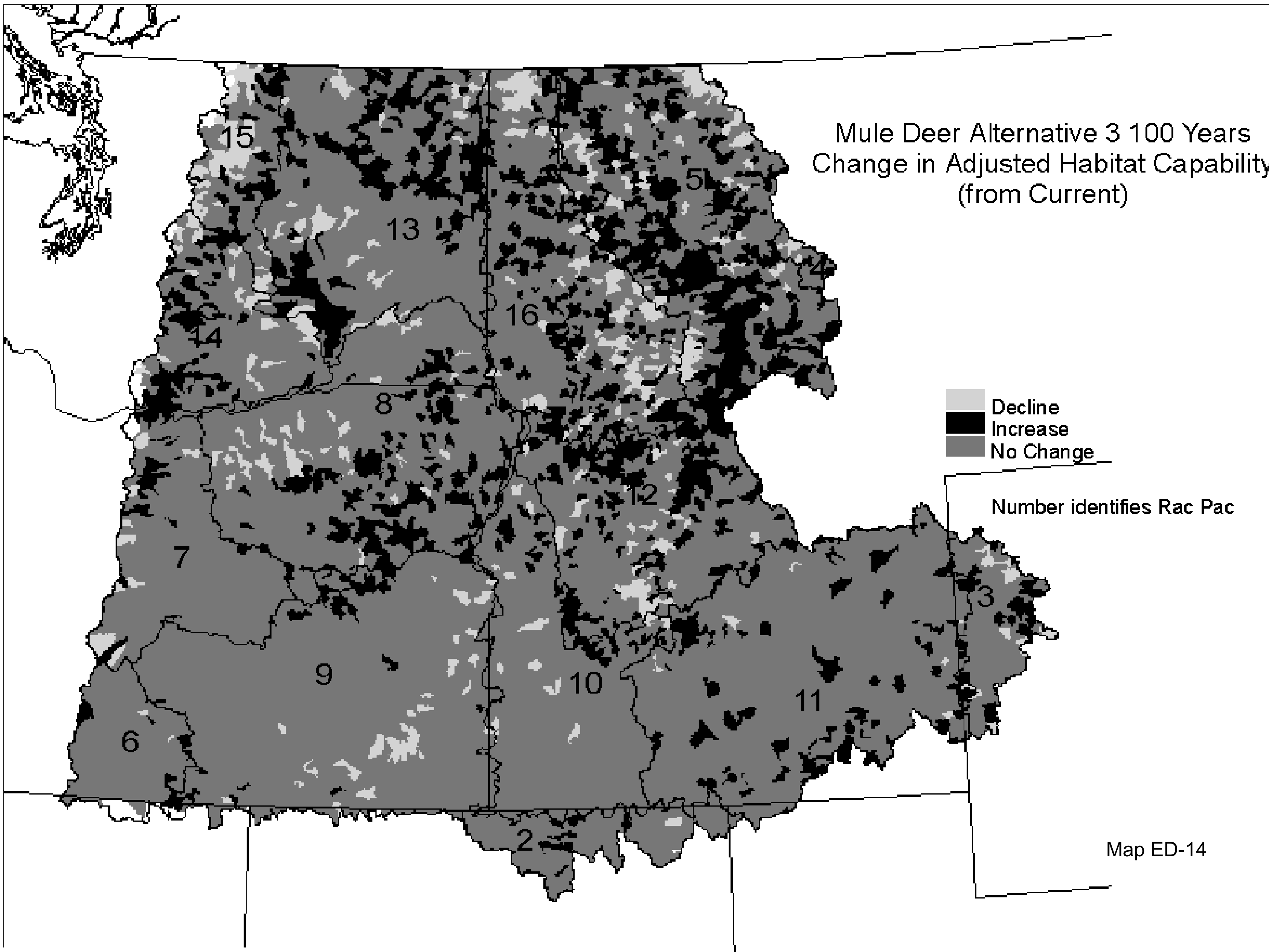
Mule Deer Alternative 3 100 Years
Change in Adjusted Habitat Capability
(from Current)
Decline
Increase
No Change
Number identifies Rac Pac
Map ED-14
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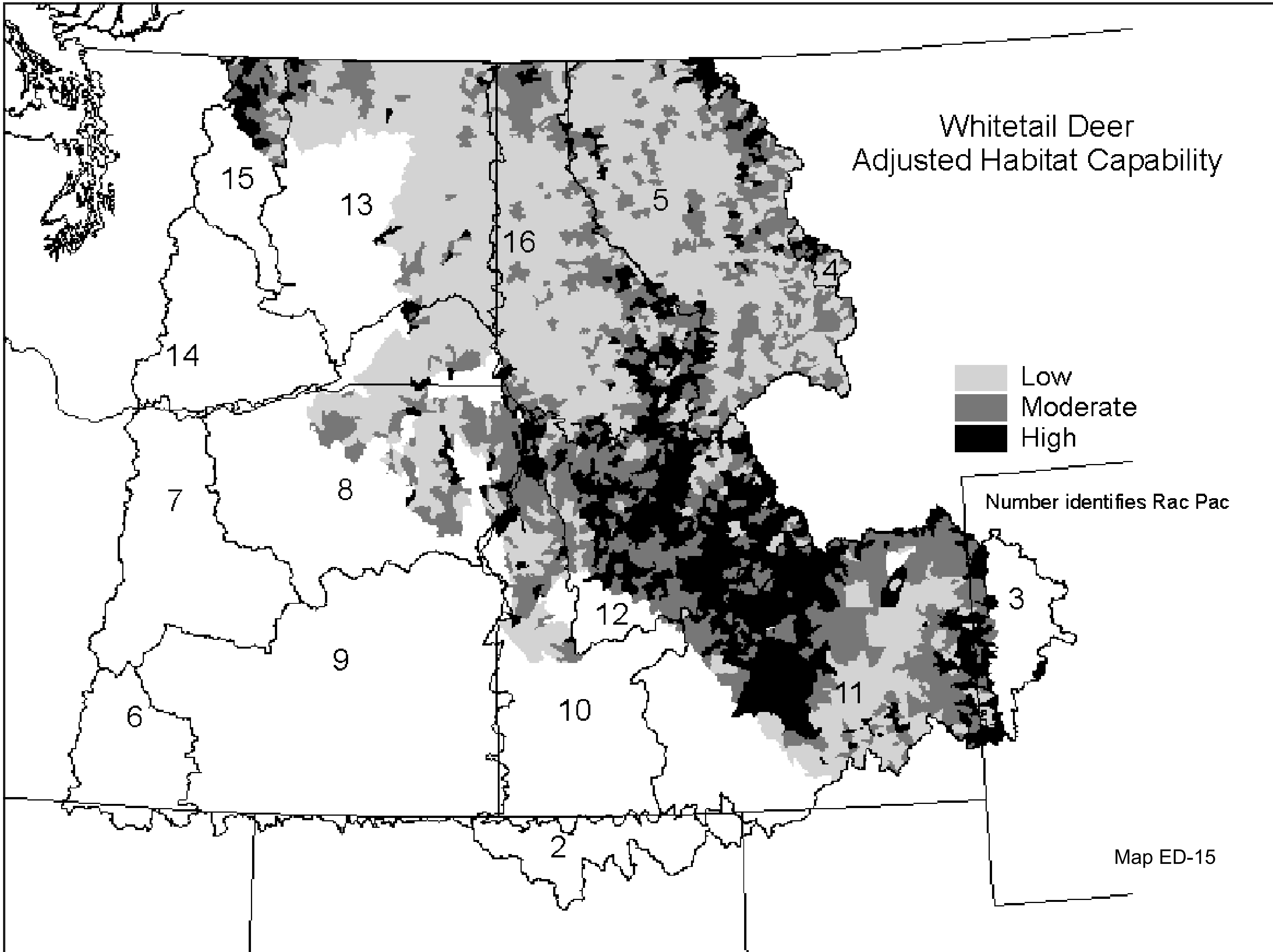
Whitetail Deer
Adjusted Habitat Capability
Low
Moderate
High
Number identifies Rac Pac
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11
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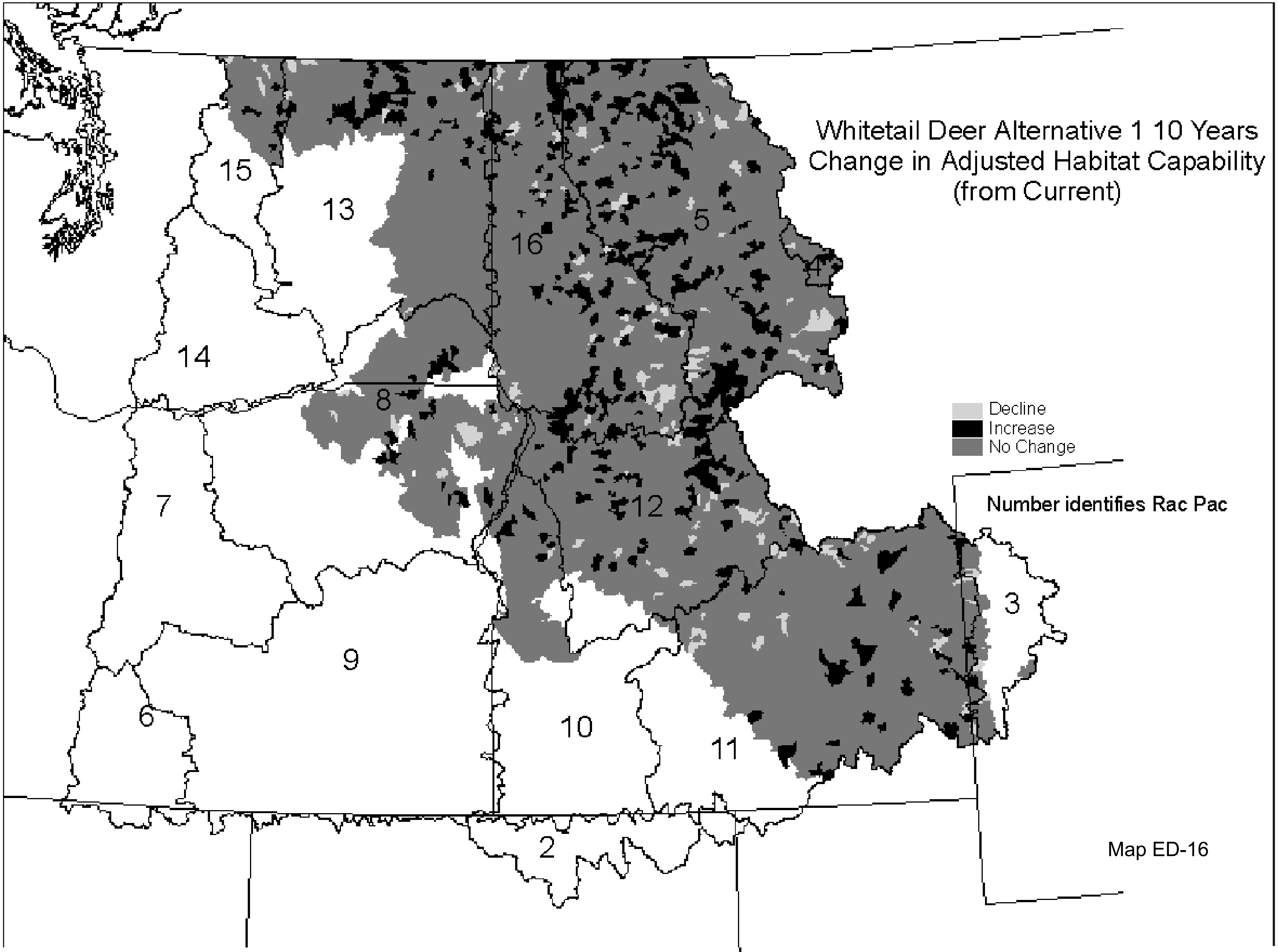
Map ED-15


Whitetail Deer Alternative 1 10 Years
Change in Adjusted Habitat Capability
(from Current)
Decline
Increase
No Change
Number identifies Rac Pac
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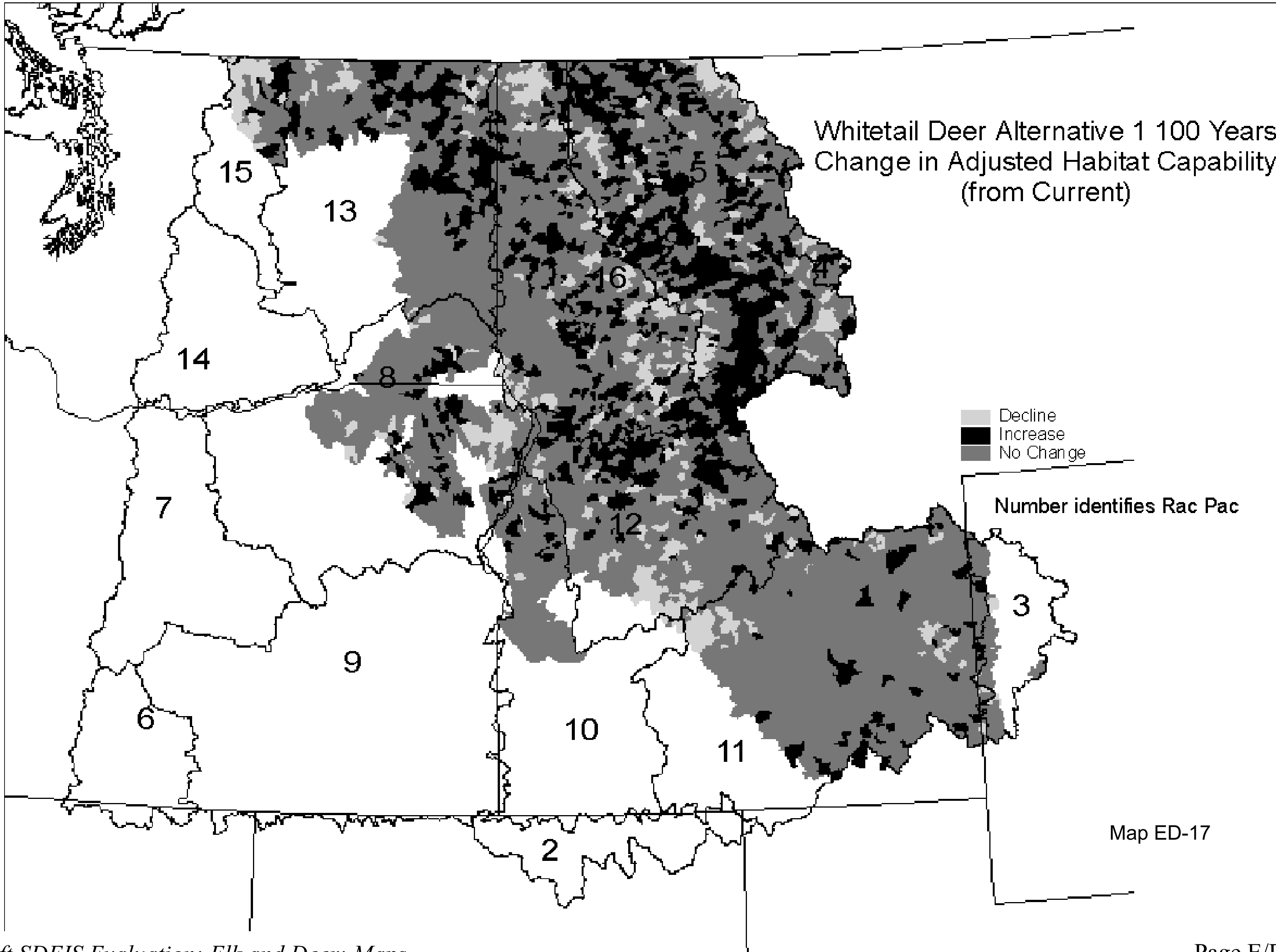
Map ED-16


Whitetail Deer Alternative 1 100 Years
Change in Adjusted Habitat Capability
(from Current)
Decline
Increase
No Change
Number identifies Rac Pac
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12
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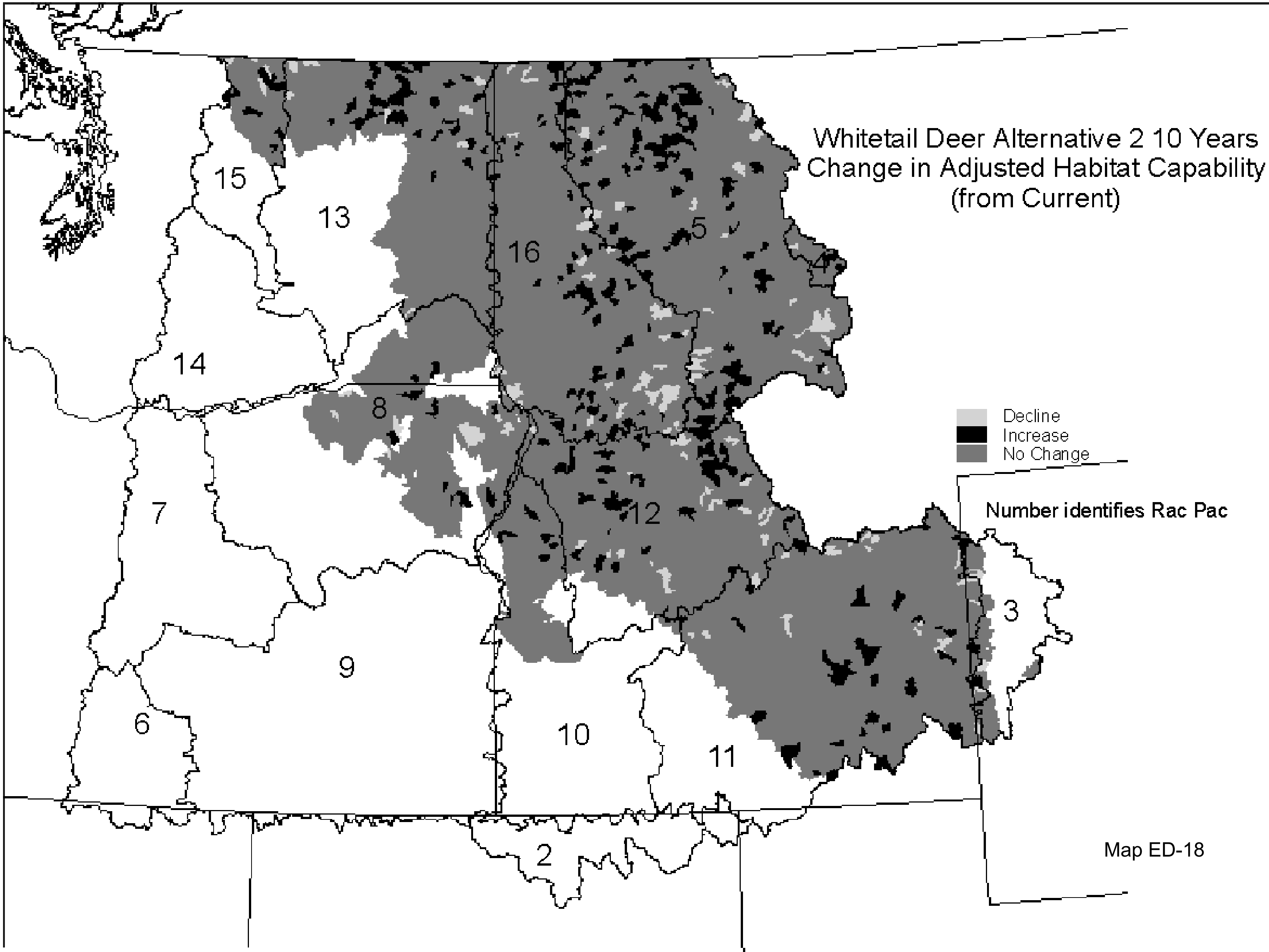
Map ED-17


Whitetail Deer Alternative 2 10 Years
Change in Adjusted Habitat Capability
(from Current)
Decline
Increase
No Change
Number identifies Rac Pac
Map ED-18
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16
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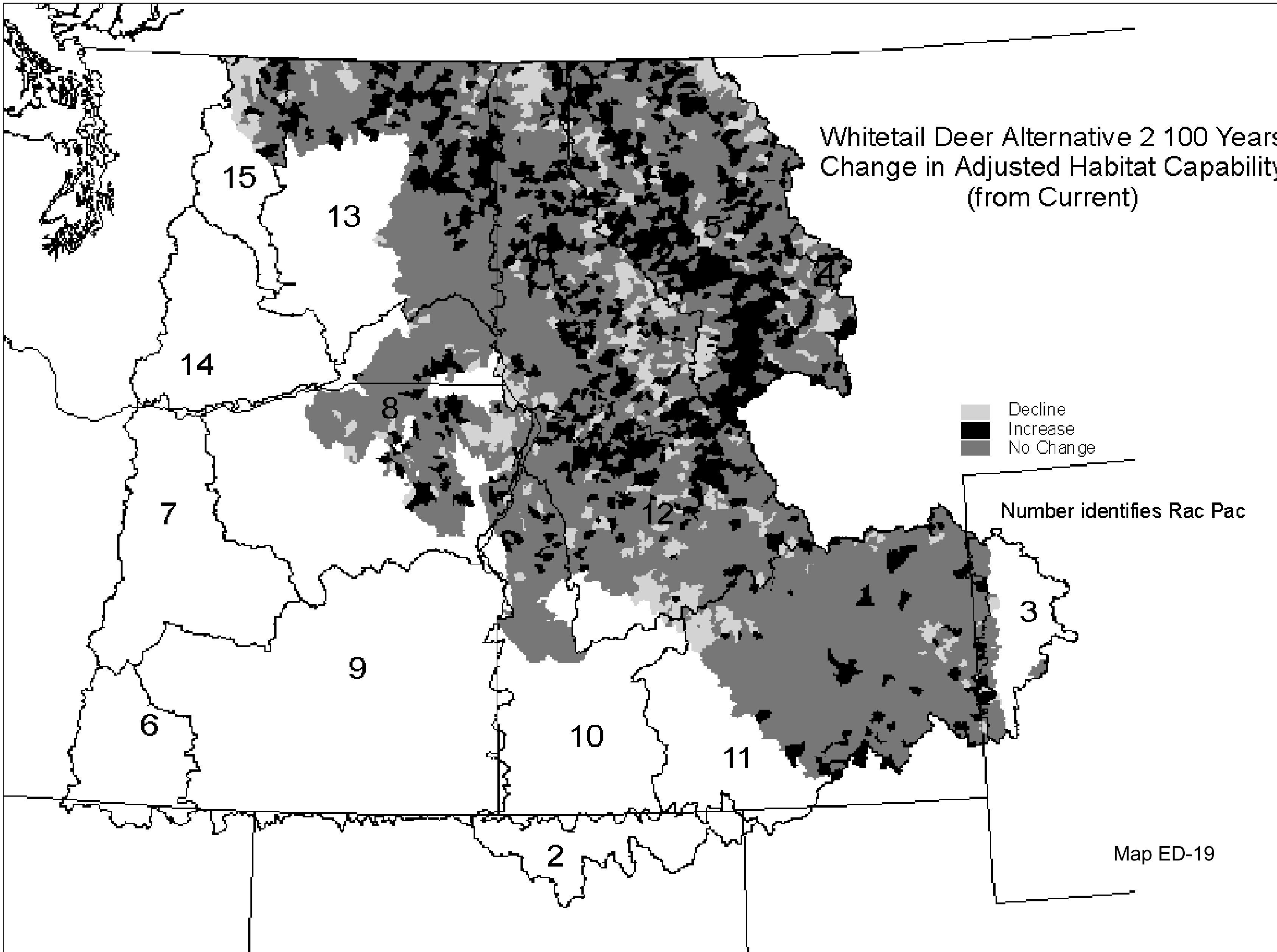
Whitetail Deer Alternative 2 100 Years
Change in Adjusted Habitat Capability
(from Current)
Decline
Increase
No Change
Number identifies Rac Pac
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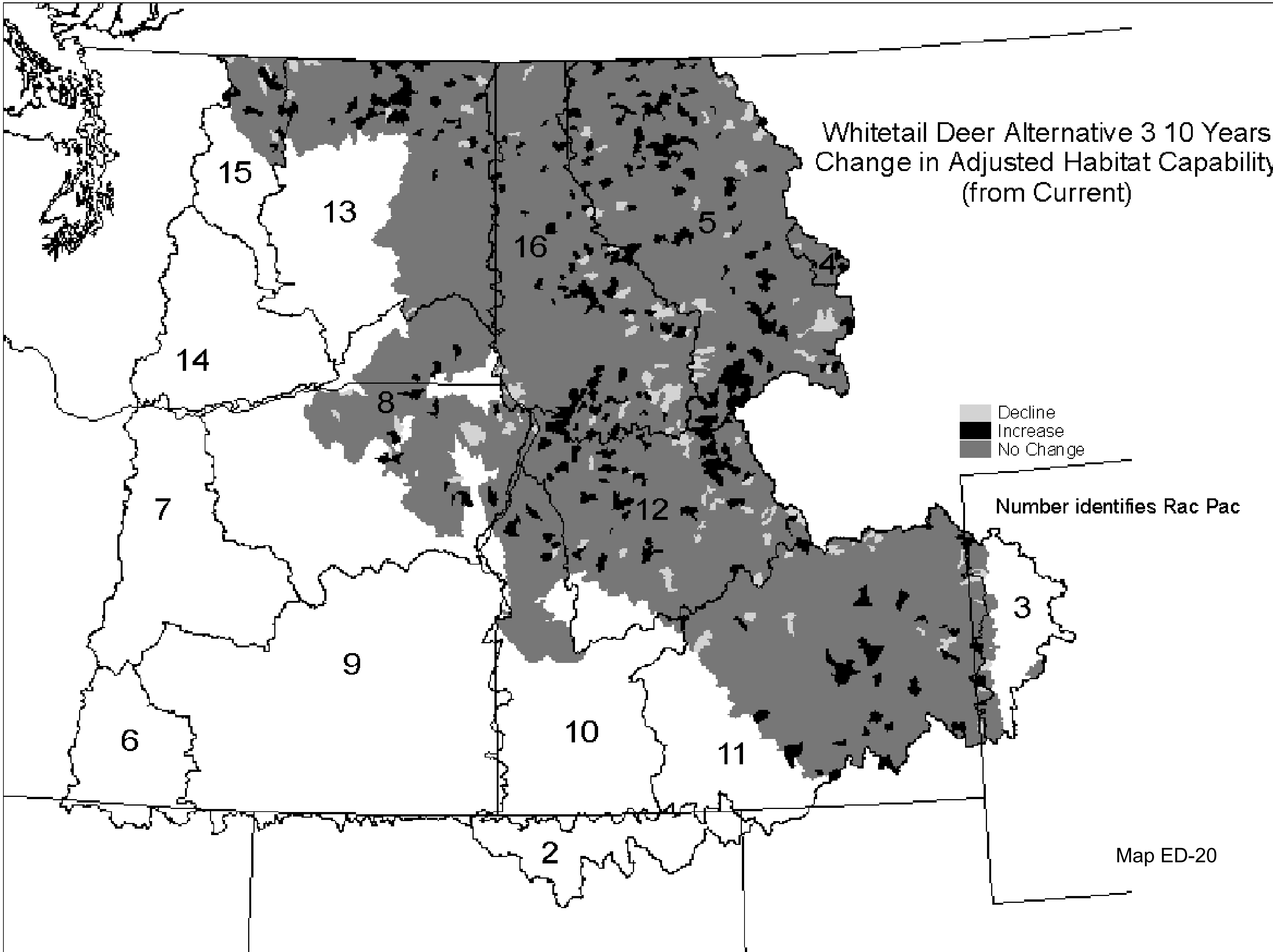
Map ED-19


Whitetail Deer Alternative 3 10 Years
Change in Adjusted Habitat Capability
(from Current)
Decline
Increase
No Change
Number identifies Rac Pac
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14
8
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12
3
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6
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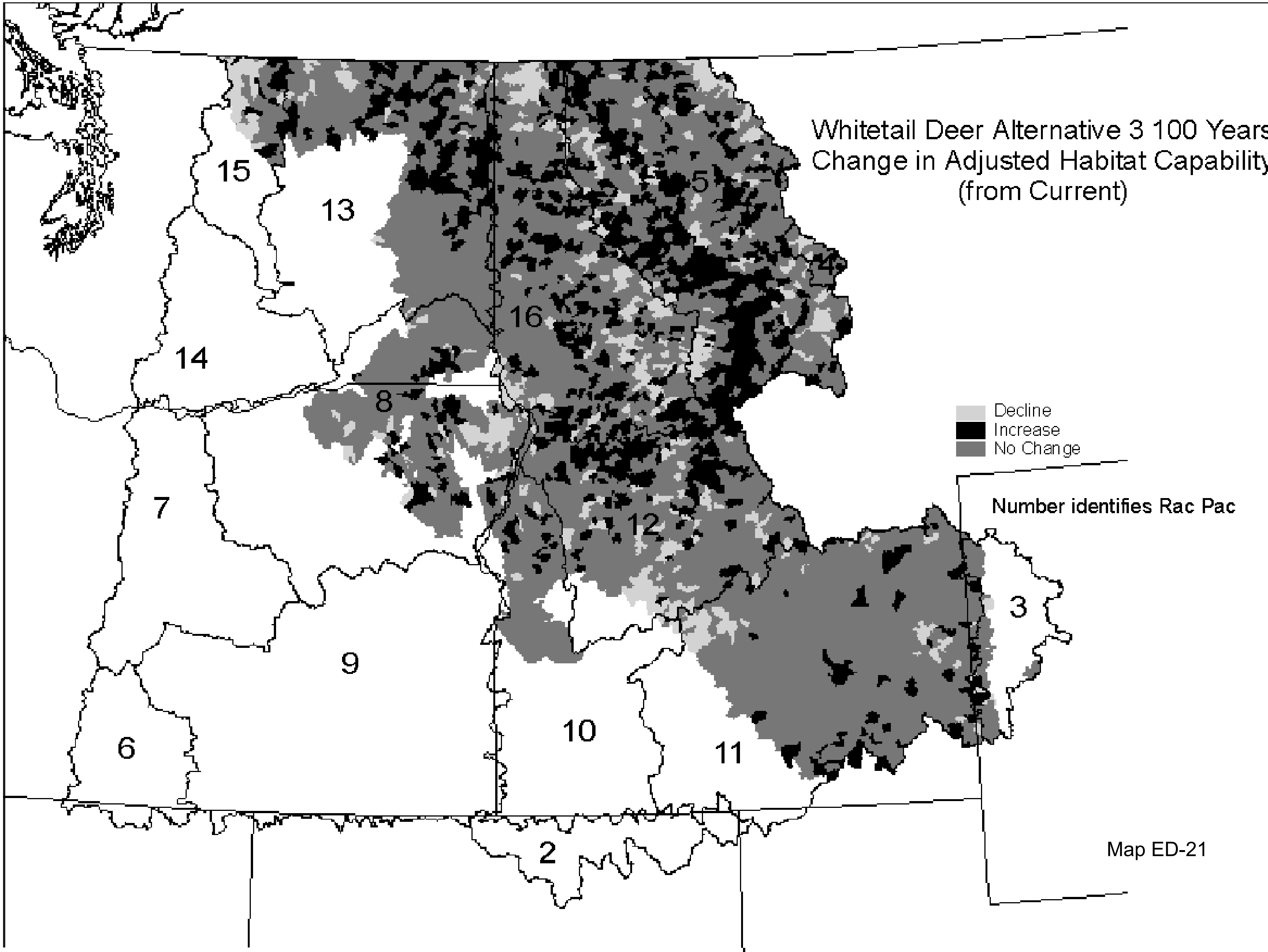
Map ED-20


Whitetail Deer Alternative 3 100 Years
Change in Adjusted Habitat Capability
(from Current)
Decline
Increase
No Change
Number identifies Rac Pac
Map ED-21
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APPENDIX E/D-1. Summary of habitat correlates for elk, mule deer, and white-tail deer described in Christensen, A., and J. Lyon W. Bodie, R. Johnson, and B. O'Gara. 1995. Ungulate Assessment in the Columbia River Basin. Contract report for the Interior Columbia Basin Ecosystem Management Project, Walla Walla, WA. Mimeo, 121 p.

ELK (A. Christensen and J. Lyon were the primary authors of this section).

ISSUES	1° or 2°	CORRELATES
Roads/Access	1	Road density/occurrence
		Open road density by season
		Elk summer-fall range
		Roadless areas
Vegetation manipulation	1	Forested acres
		Non-forested area (wi/ elk habitat)
		Elk summer, fall range
		Area logged annually
		Area burned annually
		Area grazed (active cattle allotments)
Grazing	1	Elk summer, fall range
		Active cattle allotments
		Primary range
Security/refugia	1	Roadless area
		Conifer forest area, patch size
		Terrain slope, relief
		Road densities
		Proximity human development
Winter range	1	Winter range
		Elevation
		Snow depth
		Ownership patterns
Fire management	1	Summer fall range
		Winter range
		Wilderness fire plans
		Fuel, fire models
		Terrain features
Vulnerability	1	Summer fall range
		Road density
		State management guidelines
		Forest acres
Game farms	1	Locations
Models/guidelines	1	Existing habitat models
		Cover/vegetation parameters
		Road density, access
		Summer-fall range
		Existing state guidelines
		Bull:cow ratios
		Hunter numbers, seasons
Motorized vehicles	1	Road density/access
		Terrain features
		Forest area, connectivity
		Summer fall range
		Winter range

Recreation	2	Road density Trails, campsites Developed recreation sites Season human use Summer-fall range Winter range Human density sites & corridors
Tribal relationships	2	Tribal ownership patterns Treaty hunting rights boundaries Proximity to National Forests Summer-fall range Winter range Road density
Land ownership	2	Ownership patterns Private corporate management objectives Summer-fall range Winter range

MULE DEER (R. Pedersen was the primary author of this section.)

ISSUES	1° or 2°	CORRELATES
Forage	1	Area logged annually Area burned annually (prescribed and wild) Road miles on winter range Human pop density on winter range
Snow depth	1	Snow depth $\geq$20 inches
Competition (cattle, sheep)	1	Area cattle allotment Area sheep allotment
Fire management	1	Area prescribed fire Area wild fire
Logging	1	Area logged 3-10 years old ("window of forage productivity")
Urban development	1	Human pop density Road density
Road access	2	(no correlate given)
Poaching	2	Road density Human pop density
Domestic dogs	2	(no correlate given)
Highways	2	(no correlate given)
Vehicle mortality	2	(no correlate given)

Suggested model correlates: summer forested area, logged area; winter range fire, urban interface, snow depth. No source given.

WHITE-TAILED DEER (R. Pedersen was the primary author of this section.)

ISSUES	1° or 2°	CORRELATES	ICBEMP DATASET
Forage	1	Shrub fields	Veg cover & structure
		Riparian zones	ditto
		Abandoned farm fields	ditto?
Snow depth	1	Snow depth ≥20 inches	-- (model elevation, temp, precip?)
Competition (moose, cattle, sheep)	1	Moose range	Moose range map
		Area cattle allotment	Livestock allotments
		Area sheep allotment	ditto
Fire management	1	Area prescribed fire	** (use veg; maybe w/alternatives)
		Area wild fire	** (ditto)
Logging	1	Area logged 3-5 years old wi/ PIPO association	** (ditto)
Urban development	2	Residential density near federal lands	Urban/rural classes, census data
		Number recreational sites per mile of riparian corridor	-- (use above?)
		Season of use at recreation sites	--
		Road density	Road density
Farm practices	2	Area row crops, hay, alfalfa, corn, peas	--
		Ratio developed ag lands to successional habitat	Veg cover
Road access	2	Road density	**
Poaching	2	Road density	**
		Human pop density	**
Domestic dogs	2	(no correlate given)	

Suggested model correlates: riparian zones with conifer cover >70% for winter range; brushy draws, ag lands, low snow depth for summer (?) range. Jageman, H. 1984. White-tailed deer habitat management guidelines. Bull. No. 37. Forest, Wild., and Range Exp. Station, University of Idaho, Moscow. 14 p.

APPENDIX E/D-2. ICBEMP ungulate BBN model conditional probability tables, ver. 1.0

A20		FIRE			
Wildfire (++)	Pres. Fire (+)	NONE	LOW	MODERATE	HIGH
none	none	1.0	0.0	0.0	0.0
none	low	1.0	0.0	0.0	0.0
none	moderate	0.9	0.1	0.0	0.0
none	high	0.7	0.3	0.0	0.0
low	none	0.0	1.0	0.0	0.0
low	low	0.0	1.0	0.0	0.0
low	moderate	0.0	0.9	0.1	0.0
low	high	0.0	0.7	0.3	0.0
moderate	none	0.0	0.2	0.8	0.0
moderate	low	0.0	0.2	0.8	0.0
moderate	moderate	0.0	0.0	1.0	0.0
moderate	high	0.0	0.0	0.8	0.2
high	none	0.0	0	0.3	0.7
high	low	0.0	0.0	0.3	0.7
high	moderate	0.0	0.0	0.2	0.8
high	high	0.0	0.0	0.0	1.0

A30			FORAGE CAPABILITY		
Livestock (-)	Early-seral hab. (0)	Fire (++)	LOW	MODERATE	HIGH
none	low	none	0.8	0.2	0
none	low	low	0.8	0.2	0
none	low	moderate	0.7	0.3	0
none	low	high	0.5	0.5	0
none	moderate	none	0.2	0.8	0.0
none	moderate	low	0.2	0.8	0.0
none	moderate	moderate	0	0.9	0.1
none	moderate	high	0	0.8	0.2
none	high	none	0	0.2	0.8
none	high	low	0	0.2	0.8
none	high	moderate	0	0.1	0.9
none	high	high	0	0	1
low	low	none	0.8	0.2	0
low	low	low	0.8	0.2	0
low	low	moderate	0.7	0.3	0
low	low	high	0.5	0.5	0
low	moderate	none	0.2	0.8	0.0

low	moderate	low	0.2	0.8	0.0
low	moderate	moderate	0	0.9	0.1
low	moderate	high	0	0.8	0.2
low	high	none	0	0.2	0.8
low	high	low	0	0.2	0.8
low	high	moderate	0	0.1	0.9
low	high	high	0	0	1
moderate	low	none	0.9	0.1	0
moderate	low	low	0.9	0.1	0
moderate	low	moderate	0.8	0.2	0
moderate	low	high	0.7	0.3	0
moderate	moderate	none	0.5	0.5	0.0
moderate	moderate	low	0.5	0.5	0.0
moderate	moderate	moderate	0.2	0.8	0.0
moderate	moderate	high	0	1	0.0
moderate	high	none	0	0.5	0.5
moderate	high	low	0	0.5	0.5
moderate	high	moderate	0	0.3	0.7
moderate	high	high	0	0.2	0.8
high	low	none	1	0	0
high	low	low	1	0	0
high	low	moderate	0.9	0.1	0
high	low	high	0.8	0.2	0
high	moderate	none	0.7	0.3	0
high	moderate	low	0.7	0.3	0
high	moderate	moderate	0.6	0.4	0
high	moderate	high	0.4	0.6	0
high	high	none	0	0.7	0.3
high	high	low	0	0.7	0.3
high	high	moderate	0	0.5	0.5
high	high	high	0	0.4	0.6

B30

			SECURITY		
Road density (-)	Terrain complexity (+)	Cover area (+)	LOW	MODERATE	HIGH
none, very low	low	low	0.7	0.2	0.1
none, very low	low	moderate	0.5	0.3	0.2
none, very low	low	high	0.0	0.3	0.7
none, very low	low	very high	0.0	0.2	0.8
none, very low	moderate	low	0.4	0.4	0.2
none, very low	moderate	moderate	0.2	0.3	0.5
none, very low	moderate	high	0.0	0.2	0.8
none, very low	moderate	very high	0.0	0.1	0.9
none, very low	high	low	0.0	0.4	0.6
none, very low	high	moderate	0.0	0.1	0.9
none, very low	high	high	0.0	0.0	1.0
none, very low	high	very high	0.0	0.0	1.0
low	low	low	0.6	0.3	0.1
low	low	moderate	0.2	0.3	0.5
low	low	high	0.0	0.3	0.7
low	low	very high	0.0	0.2	0.8
low	moderate	low	0.6	0.3	0.1
low	moderate	moderate	0.3	0.5	0.2
low	moderate	high	0.1	0.2	0.7
low	moderate	very high	0.0	0.2	0.8
low	high	low	0.3	0.3	0.4
low	high	moderate	0.2	0.2	0.6
low	high		0.0	0.2	0.8
low	high	very high	0.0	0.1	0.9
moderate	low	low	0.9	0.1	0.0
moderate	low	moderate	0.9	0.1	0.0
moderate	low	high	0.8	0.2	0.0
moderate	low	very high	0.7	0.3	0.0
moderate	moderate	low	0.9	0.1	0.0
moderate	moderate	moderate	0.9	0.1	0.0
moderate	moderate	high	0.6	0.3	0.1
moderate	moderate	very high	0.5	0.3	0.2
moderate	high	low	0.9	0.1	0.0
moderate	high	moderate	0.8	0.2	0.0
moderate	high	high	0.5	0.4	0.1
moderate	high	very high	0.4	0.4	0.2
high, very high	low	low	1.0	0.0	0.0
high, very high	low	moderate	1.0	0.0	0.0
high, very high	low	high	0.9	0.1	0.0
high, very high	low	very high	0.8	0.2	0.0
high, very high	moderate	low	1.0	0.0	0.0
high, very high	moderate	moderate	1.0	0.0	0.0
high, very high	moderate	high	0.9	0.1	0.0
high, very high	moderate	very high	0.8	0.2	0.0
high, very high	high	low	1.0	0.0	0.0
high, very high	high	moderate	0.9	0.1	0.0

high, very high	high	high	0.8	0.2	0.0
high, very high	high	very high	0.8	0.2	0.0

D		INHERENT HABITAT CAPABILITY		
Forage	Cover	LOW	MODERATE	HIGH
low	low	1.0	0.0	0.0
low	moderate	1.0	0.0	0.0
low	high	1.0	0.0	0.0
low	very high	1.0	0.0	0.0
moderate	low	0.1	0.3	0.6
moderate	moderate	0.0	0.3	0.7
moderate	high	0.0	0.2	0.8
moderate	very high	0.0	0.1	0.9
high	low	0.0	0.1	0.9
high	moderate	0.0	0.1	0.9
high	high	0.0	0.0	1.0
high	very high	0.0	0.0	1.0

D1		ADJUSTED HABITAT CAPABILITY		
Inherent Hab. Capability	Security	LOW	MODERATE	HIGH
low	low	1.0	0.0	0.0
low	moderate	0.9	0.1	0.0
low	high	0.8	0.2	0.0
moderate	low	0.6	0.4	0.0
moderate	moderate	0.3	0.6	0.1
moderate	high	0.0	0.8	0.2
high	low	0.3	0.5	0.2
high	moderate	0.1	0.3	0.6
high	high	0.0	0.0	1.0