Appendix B
Adaptive Management

APPENDIX B
ADAPTIVE MANAGEMENT

Adaptive management is a decision process that promotes flexible resource management decision making that can be adjusted in the face of uncertainties as outcomes from management actions and other events become better understood. Careful monitoring of these outcomes both advances scientific understanding and helps with adjusting resource management directions as part of an iterative management process. Adaptive management also recognizes the importance of natural variability in contributing to ecological resilience and productivity. It is not a "trial and error" process, but rather emphasizes learning while doing. Adaptive management does not represent an end in itself, but rather a means to more effective decisions and enhanced benefits. On February 1, 2008, the Department of the Interior published its Adaptive Management Implementation Policy (522 DM 1). The Forest Service adaptive management direction is FSH 1909.12 Chapter 20, FSM 1920, and 36 CFR 219.6. The adaptive management strategy presented within this EIS complies with this policy and direction.

In relation to the Bureau of Land Management (BLM) and US Forest Service (Forest Service) National Greater Sage-Grouse Planning Strategy, adaptive management provides additional certainty for effectiveness of conservation when implemented in concert with the Greater Sage-Grouse (GRSG) conservation measures presented in the plan amendments. This adaptive management strategy is incorporated along with the conservation measures in the plan to ameliorate threats GRSG, thereby increasing the likelihood that the combined conservation measures are effective in reducing threats to that species. The following provides the BLM and Forest Service's adaptive management strategy for the Utah Greater Sage-Grouse Proposed Land Use Plan Amendment (LUPA)/Final Environmental Impact Statement (EIS).

UTAH SUBREGIONAL ADAPTIVE MANAGEMENT STRATEGY

The Utah Subregional adaptive management strategy includes the identification of soft and hard triggers and a management approach for responding to those triggers. In the spring of 2014, a multi-agency Utah group coordinated to developed adaptive management triggers for GRSG populations in Utah. This group includes State of Utah Division of Wildlife Resources (UDWR), Utah Governor's Public Lands Policy Coordination Office, US Fish and Wildlife Service (USFWS), Forest Service, and BLM. A biologist focus group, a subset of the Utah adaptive

management group, was tasked with reviewing GRSG monitoring data and determining what population and habitat triggers are appropriate given the natural cyclic variability observed in all GRSG populations.

BACKGROUND INFORMATION

Greater Sage-Grouse Population Change

As is discussed in the Proposed LUPA/FEIS, **Section 3.3**, GRSG populations across the range fluctuate cyclically. In Utah the cycle seems, generally, to follow a 10-year pattern. The exact reason for the cycle is currently unknown. However, various aspects (i.e., vital rates) of the GRSG's life cycle have been linked by past research to changes in environmental and habitat

Utah's GRSG populations will likely continue to fluctuate over the short-term and on their historic 10-year cycle. The general direction of the cycles, whether populations are trending up or down, is the critical conservation concern for GRSG. Connelly et al. (2004) showed that rangewide the trend was decreasing from the 1960s to the mid-1980s, hitting a low in the mid-1990s, but then stabilizing to the present. Certainly, if habitat loss and degradation occur within a population's habitat base the population would likely decline in succeeding years without habitat restoration and/or other management intervention. However, if the habitat base remains intact it is likely that the population will continue to fluctuate, but remain relatively stable in the long-term. GRSG require large landscapes of contiguous sagebrush habitat to carry out their life-cycle. Securing these large landscapes from further degradation and adding more habitat through restoration is the primary conservation action for GRSG.

Lek Count Data

When considering monitoring data there is always uncertainty, error, and statistical noise. GRSG lek (breeding ground) counts are not comprehensive in nature, but rather represent a sample of and index to the population. This uncertainty carries over into using lek counts to make decisions for implementing management actions. Any metric of population change (e.g., percent annual change, percent above or below 10-year average, etc.) includes the uncertainty that comes from sampling populations. Therefore, creating precise decision triggers based on lek data is inherently problematic, and should include a relatively large range of specific metrics and management options. However, much more certainty exists concerning the effect of habitat loss or degradation, and precise decision triggers would be much more reliable for habitat conservation purposes.

For GRSG, while some production data has been collected in various populations, the only data that has been consistently collected across the range of the species and within Utah for this species has been males attending leks. While male lek attendance has been the primary source of data collected and is used as an index of GRSG populations, it is critical that the strengths and weaknesses of lek counts be understood to appropriately evaluate how confidence in the data may vary. For instance, the number of males counted on leks can vary depending upon how many times the lek was counted in a spring (at least three times is recommended to increase the chances that the peak male lek attendance was observed), time of day (three counts conducted between 30 minutes before sunrise to 1 hour after sunrise), and the weather conditions (calm). Standardized lek counts have become more common practice recently. The lek count protocol

is based on lek attendance research (Jenni and Hartzler 1978; Emmons and Braun 1984; Connelly et al. 2003). In general, lek count protocol has become a priority in the last 15 years and adherence to the protocol increases the confidence in and comparability of the resulting data.

Early in the history of collecting lek count data in Utah, the likelihood that leks were known depended on two things: 1) the proximity of the lek to areas frequented by people during dawn (near roads or corrals); and 2) the size of the lek; the larger the lek, the more likely it was noticed. Therefore, the leks counted earliest in the history of GRSG monitoring in Utah were either large leks and/or easily accessible leks (e.g. near roads). In the last 20 years in Utah and throughout the west, efforts to count and find leks have increased substantially (though there is variation in the number of leks counted, up and down, each year). With these concerted efforts to find new leks, new and generally smaller leks were added to the list of known leks. Consequently, by adding primarily small leks to the overall state "average males per lek", the state average males per lek decreases even though more birds and more leks are being counted. In addition, where graduate students have studied GRSG populations, new leks have been found as a result of the amount of time on the landscape and radio-telemetry information. From these increased efforts, the number of leks counted has increased from 14 leks in 1959, 99 leks in 1980, up to 362 leks in 2012 (2,485 percent increase) (UDWR 2009). Similarly, the total number of birds counted in a spring has increased, based on State of Utah data, from 451 males in 1959 to 3,231 males counted in 2012 (616 percent increase).

ADAPTIVE MANAGEMENT TRIGGERS

This overarching adaptive management strategy includes the identification of a two-tiered system of triggers (soft and hard) for both GRSG populations and habitat. These triggers are not specific to any particular project, but identify population and habitat thresholds which, if exceeded/tripped, would result in a change in how the BLM and Forest Service address management of GRSG in that area. Triggers have been based on the two key metrics that are regularly monitored: population declines and habitat loss.

Soft triggers represent an intermediate threshold indicating that management changes are needed to address habitat or population losses before they become severe. They represent a "caution" signal that changes outside the normal range of variation may be occurring. If a soft-trigger is tripped, monitoring data would be evaluated and management would be implemented to stop further declines.

Hard triggers represent a threshold indicating that immediate action is necessary to stop a severe deviation from GRSG conservation objectives set forth in the BLM and Forest Service plans. The intent of a soft-trigger is to identify changes in management at a point where further losses could be avoided. There should be no expectation of hitting a hard trigger; if unforeseen circumstances occur that trip either a population or habitat hard trigger, more restrictive management will be required.

The changes in management required after a trigger is tripped are included below in the "Management Response" section. The following sections present the adaptive management triggers, organized first by the metric being addressed (population or habitat) and then by the associated soft and hard triggers.

Population Triggers

When evaluating population-based adaptive management triggers, this adaptive management strategy includes consideration of two aspects of population data to ensure that one set of data, if in error for any reason, would not unnecessarily trigger management changes. Population declines will be evaluated using the following two metrics:

- Population trends based on "trend leks," and
- Population growth as indicated by Lambda (λ) (as described below) from one year to the next for monitoring associated with all leks within a priority habitat management area (PHMA).

Trend leks are either leks that have been surveyed consistently in the last 20 years or leks that provide spatial representation within PHMA. Twenty years was chosen as the appropriate time period to identify trend leks with consideration of the cyclic nature of GRSG populations, and to capture monitoring results during the period of time when lek counts were conducted more consistently, and when lek count protocol was more standardized. The Utah GRSG lek counts appear to have been in a low oscillation in the mid-1990s and again in the last few years (2011). During this same time period, standard lek count protocol use was increasing. Criteria for the trend leks are below:

- Starting with 1996, a lek that had > 1 male counted within one of 5 years between 1994-1998,
- Lek counts have occurred on 80 percent of the years since 1994 (16 years), **AND**
- Lek counts on 50 percent of the years are > 1 (8 of 16),
  OR,
- A lek provides spatial representation (in the case of small populations, all leks may be included).

Lambda (λ) is the population change from a given Year 1 to the following Year 2 by dividing the total PHMA males counted in Year 2 by the total males counted in Year 1. If the result equals one (1), there was no change in the population level. A lambda that exceeds one (> 1) means the population is growing. A lambda that is less than one (< 1) indicates a declining population. To generate a consistent and comparable number, lambda can only be calculated on leks that are counted in consecutive years. This is to ensure that the increase in number of leks does not skew population data. This way, lambda can only be calculated for a lek if it is counted in two consecutive years. Some examples of calculating lambda are as follows:

- Males in Year 2/males counted in Year 1 = Lambda (λ)

  Example A – No Change in Population: Assuming in 2000, the total males counted on leks in PHMA is 350 and in 2001, on the same leks counted in 2000, the total males counted are 350.

- 350/350 = 1; since lambda is 1, the population is unchanged.

  Example B: Increasing Population: Assuming in 2000, the total males counted on leks in PHMA is 350 males and in 2001, on the same leks counted in 2000, the total males counted are 430.

- 430/350 = 1.23; since lambda is > 1, the population is increasing.

  Example C: Decreasing Population: Assuming in 2000, the total males counted on leks in PHMA is 350 males and in 2001, on the same leks counted in 2000, the total males counted are 280.

- 280/350 = 0.8; since lambda is < 1, the population is decreasing.

Multiple population triggers were established to account for different potential population trends for which management and monitoring should respond. This includes triggers to address rapid short-term declines in a population, as well as persistent long-term decreases of both trend leks or all monitored leks (using lambda - λ).

Population Soft Triggers

A population soft trigger would be met in PHMA if any one of 1a, 1b, 1c, or 1d are met, AND number 2 is also met:

1a) 4 consecutive years of 10 percent or greater annual decline in average males per lek in each year, based on "trend leks"; **OR**

1b) 6 consecutive years of declining average males per lek in each year, based on "trend leks"; **OR**

1c) 40 percent or greater decline in average males per lek in any single year, based on "trend leks"; **OR**

1d) 50 percent or greater decline in average males per lek in a 4 consecutive year period, based on "trend leks";
AND

2) Lambda of less than 1 in 4 consecutive years, based on all leks in the PHMA. Using criteria 1c, the 40 percent decline in a single year may occur at any point of the four year lambda monitoring window (year one, two, three or four).

For PHMA in the Ibapah and Hamlin Valley population areas, if a GRSG population adaptive management trigger (hard or soft) from a Nevada LUP is met on GRSG habitat in Nevada that is adjacent to the Ibapah or Hamlin Valley PHMA, a soft trigger would be met for the Utah areas, regardless of whether the above criteria have been met or not.

The management to be applied if the soft trigger criteria are met is identified below under the Management Response header. The intent of the population soft trigger is to identify changes to population trends and adjust management before a hard trigger is met.

Population Hard Triggers

A population hard trigger would be met in PHMA if any one of the following criteria (a-d) is identified through monitoring:

Short term Decline

a) 4 consecutive years of 20 percent or greater annual decline in average males per lek in each year, based on "trend leks"; **OR**

b) average males per lek, based on trend leks, drops 75 percent below the 10-year rolling average males per lek in any single year (not a 75 percent decrease, but a decline under 75 percent of the 10-year rolling average); **OR**

Long term Decline

c) Lambda of less than 1 in 6 consecutive years, based on all leks within the PHMA; **OR**

d) Lambda of less than 1 in 8 years of a 10 year window, based on all leks within the PHMA.

The management to be applied if the hard trigger criteria are met is identified below under the Management Response header. Any change in management would only apply to the PHMA where the trigger is tripped.

Habitat Triggers

The adaptive management approach also includes triggers based on GRSG habitat. Habitat quality is addressed by adherence to the objectives contained in the plan amendment. The adaptive management triggers for habitat is based on the availability of habitat within PHMA, measured using a percent of habitat loss from a baseline of available GRSG habitat at the signing of the final plan amendments.

Available habitat will be mapped within each PHMA using available information such as vegetation data from satellite imagery (e.g., reGAP, LANDFIRE), local monitoring, soils data, etc. As additional information is made available in the future it can be used to refine the baseline habitat areas that existed at the point the plan amendments are finalized (e.g., removing areas of high juniper density, cliffs, salt-desert scrublands). However, any such changes should reflect habitat as it occurred at the signing of the plan amendments and not reflect changes to habitat from that time. Changes from the baseline acreage could occur through either the addition of habitat (e.g., juniper reduction projects) or reduction of habitat (e.g., wildfire). In either case, the percentages identified in the triggers are generated by comparing the availability of habitat at a point in time to the acres of habitat available at the signing of the plan amendments.

For both soft and hard triggers, nesting areas will be delineated using lek buffers based on published peer-reviewed data, unless local nesting areas have been specifically mapped by BLM and Forest Service and UDWR biologists using telemetry or other methods with appropriate sampling across the population. Wintering areas will be identified using UDWR mapping, in coordination with BLM and Forest Service biologists.

Habitat Soft Triggers

A habitat soft trigger would be met in PHMA if one of the following criteria is identified through monitoring:

a) 10 percent loss of total GRSG habitat in PHMA; **OR**

b) 10 percent loss of habitat within nesting areas in PHMA; **OR**

c) 5 percent loss of habitat within UDWR mapped wintering areas in PHMA; **OR**

d) any one fire that burns 5 percent of total GRSG habitat in PHMA.

For PHMA in the Ibapah and Hamlin Valley population areas, if a GRSG habitat adaptive management trigger (hard or soft) from a Nevada LUP is met on GRSG habitat in Nevada that is adjacent to the Ibapah or Hamlin Valley PHMA, a soft trigger would be met for the Utah areas, regardless of whether the above criteria have been met or not.

The management to be applied if the soft trigger criteria are met is identified below under the Management Response header. The intent of the population soft trigger is to identify decreases in the availability of GRSG habitat and adjust management before a hard trigger is met.

Habitat Hard Triggers

a) 20 percent loss of total GRSG habitat in PHMA; **OR**

b) 20 percent loss of habitat within nesting areas in PHMA; **OR**

c) 20 percent loss of habitat within UDWR mapped wintering areas in PHMA.

The management to be applied if the hard trigger criteria are met is identified below under the Management Response header. Any change in management would only apply to the PHMA where the trigger is tripped.

MANAGEMENT RESPONSE

To be successful, an adaptive management strategy couples a change in management direction to an identified change in resource condition (e.g., meeting an identified trigger). The type of management response would vary whether a soft trigger is met versus a hard trigger. The larger deviation from natural variation associated with a hard trigger would necessarily correspond with a greater change in management.

Ideally, the adaptive change in management is targeted to respond/resolve the cause of the observed change in resource condition. A causal factor may be associated with one of the threats the USFWS identified in its 2010 listing determination, though additional monitoring information and research may also identify other causes that could result in reaching population or habitat triggers. It is also important to note that while one or more factors may be associated with a habitat or population decline, directly attributing a change to a specific cause or causes may not be possible. The complexity of some interactions may make it difficult to establish a direct cause-and-effect relationship for a specific cause or causes. Many factors have been suggested as affecting GRSG populations and habitats throughout the species' range. These factors can interact in numerous potential complex relationships, making the identification of "the" specific cause or causes difficult. It can be difficult to separate proximate factors from

ultimate factors leading to population declines. Further, GRSG populations that use habitat owned or administered by multiple jurisdictions (e.g., private, state, tribal, or other federal) could result in causes of population or habitat declines that are not able to be ameliorated by the BLM and Forest Service.

If direct cause or causes cannot be identified, the change in management may need to address multiple threats that were identified in the area where the trigger was been met in order to alter a negative trend. Absence of a clear cause is not justification to not take some action to reverse a trend.

Management Response to Meeting Soft Triggers

Upon an annual review of monitoring data, if it is apparent that soft trigger criteria have been met for an area (see Spatial Scale discussion below) the BLM and Forest Service will determine if there is a specific cause or causes that are contributing to the decline. In completing this evaluation, the BLM and Forest Service will coordinate with GRSG biologists from multiple agencies including the USFWS, NRCS, and UDWR. Through this coordination, the BLM and Forest Service will review available national, state-wide, and local data to determine if there is additional information that could identify the cause/causes of the declines. The BLM and Forest Service will also coordinate with field office/district and state agency specialists and local GRSG working groups to identify additional information that could assist in identifying the cause/causes.

If it is determined that the decline is related to a natural population variation, no specific management actions would be required. However, if BLM and Forest Service management actions are determined to cause or contribute to the decline, the BLM and Forest Service manager would apply measures within their implementation-level discretion to mitigate the decline of populations and/or habitats to the area where the trigger has been met. These measures would apply more conservative or restrictive implementation conservation conditions, terms, or decisions within the agencies' discretion to mitigate the decline of populations and/or habitats. If identified, the management measures should address the specific causal factor(s) that resulted in the decline, with consideration of local knowledge and conditions.

Responses to soft triggers may require the adjustment of future project level/plan implementation activities in the short- or long-term, as consistent with the individual site-specific NEPA analyses. Soft trigger responses can come in the form of terms, conditions, design features, BMPs, or site specific mitigation measures. Examples of soft trigger responses could include, but are not limited to:

- Extending seasonal restrictions for seasonal surface disturbing activities (provided as stipulations to a right-of-way grant or a condition of approval to an oil and gas lease),
- Reprioritizing wild horse and burro gathers;
- Applying sequential development after reclamation;
- Temporary area closures related to travel management; (2-year maximum);
- Modifying seasons of use for livestock grazing through annual permit authorizations; and/or

- Applying additional restrictions on discretionary activities, or reject the authorization if mitigation criteria cannot be met.

It is expected that monitoring and management in response to soft-triggers should preclude tripping a "hard" trigger, which signals more severe habitat loss or population declines.

Management Response to Meeting Hard Triggers

Hard triggers represent a threshold indicating that immediate action is necessary to stop a severe deviation from GRSG conservation objectives set forth in the BLM and Forest Service plans. As such, the Proposed LUPA/Final EIS includes a "hard-wired" plan-level response; that is, it provides that, upon reaching the trigger, a more restrictive alternative, or an appropriate component of a more restrictive alternative analyzed in the EIS will be implemented without further action by the BLM and Forest Service in the area where the trigger has been met. Specific "hard-wired" changes in management are identified in **Table B.1**, Specific Management Responses. This table also identifies which decision from the BLM Proposed Plan and Forest Service Proposed Plan would be changed.

In addition to the specific changes identified in **Table B.1**, the BLM and Forest Service will review available and pertinent data, in coordination GRSG biologists from multiple agencies including UDWR, USFWS, and NRCS, to determine the causal factor(s) and implement a corrective strategy in the area where the trigger has been met. The corrective strategy would include the changes identified in **Table B.1**, and could also include the need to amend or revise the RMP/LRMP to address the situation and modify management accordingly.

Table B.1
Specific Management Responses

Program	Adaptive Management Response[1]	Affected Decision Number		Where considered in the Draft LUPA/EIS (DEIS)
		BLM	Forest Service	
Sage-Grouse Management	If a hard-trigger is tripped in the Sheeprocks Population Area, adopt the PHMA boundary from Alternative B and apply management as described in the Proposed Plan, except as modified below.	Modify MA-GRSG-1 specific to Sheeprocks	Not applicable	The Alternative B PHMA boundary was analyzed in the DEIS (463,100 acres). There are no National Forest System lands within the Sheeprocks Population Area, therefore the Forest Service does not have a proposed management action for this area.
	PHMA within a biologically significant unit (BSU) where a soft trigger has been reached would be the top priority for habitat improvement and	Adjust: MA-VEG-1 MA-FIRE-1 MA-GRSG-	GRSG-GRSGH-ST-001 GRSG-FM-	Prioritizing fuels reduction treatments was a component of MA-

Table B.1
Specific Management Responses

Program	Adaptive Management Response[1]	Affected Decision Number		Where considered in the Draft LUPA/EIS (DEIS)
		BLM	Forest Service	
	restoration projects and for fuels reduction treatments. Areas within and adjacent to PHMA within a BSU where a hard trigger has been reached would be the top priority for regional mitigation habitat restoration and fuels reduction treatments.	3A to address specific area	GL-003 GRSG-GEN-ST-002	FIRE-1 under Alternative D in the DEIS. Prioritizing restoration based on environmental variables and in seasonal habitats that are thought to be limiting to GRSG distribution and/or abundance was a component of MA-VEG-1 under Alternatives B, C, and D in the DEIS. Prioritizing mitigation sites, projects, and measures was a component of the Regional Mitigation Strategy in the DEIS (Appendix F, Page F-2, Item 5).
	Collaborate with applicable government entities to implement intensive programs to reduce populations of GRSG predators (e.g., ravens, red fox, badgers, raccoons, skunks, raptors), focusing on area-specific predators to provide GRSG populations the best opportunity to recover while improving habitat conditions.	Adjust MA-GRSG-3D to focus on area-specific predators	Not applicable	Applying activities and practices to reduce opportunities for and decrease the effectiveness of GRSG predators was a component of MA-GRSG-6 under Alternatives D and E in the DEIS. The Forest Service Wyoming proposed plan includes a similar management action.
Vegetation Management	PHMA, within a BSU, would be the top priority for regional mitigation, habitat restoration and fuels reduction treatments.	Adjust: MA-GRSG-3A MA-VEG-1 MA-FIRE-1 to address	GRSG-GRSGH-ST-001 GRSG-FM-GL-003 GRSG-GEN-	Prioritizing mitigation sites, projects, and measures was a component of the Regional Mitigation

Table B.1
Specific Management Responses

Program	Adaptive Management Response[1]	Affected Decision Number		Where considered in the Draft LUPA/EIS (DEIS)
		BLM	Forest Service	
		specific area	ST-002	Strategy in the DEIS (Appendix F, Page F-2, Item 5). Prioritizing fuels reduction treatments was a component of MA-FIRE-1 under Alternative D in the DEIS. Prioritizing restoration based on environmental variables and in seasonal habitats that are thought to be limiting to GRSG distribution and/or abundance was a component of MA-VEG-1 under Alternatives B, C, and D in the DEIS.
Wild Horse and Burro Management	Initiate emergency gathers to reduce wild horse and burro populations within affected area to low end of AML, subject to funding and holding space availability. If the population is within AML and the area does not meet GRSG habitat objectives, reduce AML for the HMA within the affected area up to 25 percent to facilitate meeting habitat objectives.	Adjust: MA-WHB-7 MA-WHB-3 MA-WHB-4 to address specific area	Not applicable	Prioritizing gathers in PHMA to prevent catastrophic environmental issues was a component of MA-WHB-1 under Alternatives B, C, and D in the DEIS. Reducing AML by 25% in GRSG occupied habitat to reduce grazing pressure on vegetation was analyzed under Alternative C1 (MA-WHB-1) in the DEIS. The Forest Service does not manage any WHB populations.

Table B.1
Specific Management Responses

Program	Adaptive Management Response[1]	Affected Decision Number		Where considered in the Draft LUPA/EIS (DEIS)
		BLM	Forest Service	
Wildland Fire Management	Reassess GRSG habitat needs to determine if priorities for at risk habitats, fuels management areas, preparedness, suppression and restoration have changed.	Adjust MA-FIRE-1to address specific area	GRSG-GRSGH-ST-001	Assessments to prioritize at risk habitats and identify fuels management, preparedness, suppression and restoration priorities was analyzed as a component of MA-FIRE-1 under Alternative D in the DEIS.
Livestock Grazing	In areas where a soft trigger was met, prioritize the completion of rangeland health assessments to determine if the area is meeting Utah's Rangeland Health Standards and is achieving the GRSG habitat objectives (Objective GRSG-2). Focus monitoring and management activities on allotments found not to be achieving Utah's Rangeland Health Standards and that have the best opportunities for conserving, enhancing or restoring habitat for GRSG. For areas not achieving the GRSG habitat objectives (Objective GRSG-2), apply one or more of the adjustments to livestock grazing from MA-GRA-6.	Adjust: MA-GRA-4 MA-GRA-5 to address specific area	GRSG-LG-GL-001 GRSG-LG-GL-002	Prioritizing completion of land health assessments was analyzed as a component of MA-GRA-4 under Alternatives B and C2. Focusing management activities on allotments found not to be achieving Utah's Rangeland Health Standards and that have the best opportunity for conserving, enhancing or restoring habitat for GRSG was a component of MA-GRA-4 under Alternative D. Applying adjustments or otherwise modifying to grazing management to help meet GRSG seasonal habitat objectives was a component of MA-GRA-8 under Alternatives B, C2, and D.

Table B.1
Specific Management Responses

Program	Adaptive Management Response[1]	Affected Decision Number		Where considered in the Draft LUPA/EIS (DEIS)
		BLM	Forest Service	
Rights of Way – Existing Corridors	Retain the corridors as mapped, but limit the size of new lines within the corridors to same as existing structures, or not larger than 138kV.	Augment MA-LAR-2 MA-LAR-4 MA-LAR-8 with additional criteria	GRSG-LR-SUA-ST-007	Collocating new ROW/SUAs within existing corridors (as long as entire footprint of the proposed project can be completed within the existing disturbance) was a component of MA-LAR-3 analyzed under Alternative B in the DEIS.
Rights of Way – Outside of Corridors	Management of the affected BSU would change to exclude high voltage transmission lines (greater than or equal to 100kv) and major pipelines (greater than or equal to 24 inch). No change in management would be made to transmission lines under 100kv or pipelines less than 24 inches.	Augment MA-LAR-2 with additional criteria	GRSG-LR-SUA-GL-001	Designating PHMA (within 4 mi. of occupied lek) as exclusion for new above ground linear transmission lines and avoidance for new permanent underground/on-ground lines was a component of MA-LAR-2 analyzed under Alternative D in the DEIS.
Wind Energy Development	No change from Proposed Plan.	Not applicable	Not applicable	PHMA is already excluded from wind development therefore no additional restrictive response is available.
Industrial Solar	No change from Proposed Plan.	Not applicable	Not applicable	During development of the DEIS it was determined no existing or proposed solar development poses a threat to GRSG in the planning area.

Table B.1
Specific Management Responses

Program	Adaptive Management Response[1]	Affected Decision Number		Where considered in the Draft LUPA/EIS (DEIS)
		BLM	Forest Service	
Comprehensive Travel and Transportation Management	If travel management planning has not been completed within GRSG habitat, PHMA areas where the hard trigger was met would be the highest priority for future travel management planning efforts. If travel management has been completed within GRSG habitat in the PHMA where the hard trigger was met, re-evaluate designated routes to determine their effects on GRSG. If routes are found to be causing population-level impacts, revise their designation status to reduce the effect.	Adjust: MA-TTM-4 MA-TTM-2 MA-TTM-5 MA-TTM-3 to address specific area	Not applicable	Completing travel management planning in Utah's top priority areas, minimizing impacts to have a neutral or positive effect on GRSG habitat, and adjusting route designations to avoid impacts to GRSG were similar conceptual components of MA-TTM-2, 3, 4, and 5 analyzed under Alternative D in the DEIS.
Fluid Minerals	No change from Proposed Plan.	Not applicable	Not applicable	In coordination with USFWS, it was determined that additional restrictions beyond existing plan level conservation measures (e.g., stipulations, 3 percent disturbance cap, RDFs, 1/640 acre density, lek buffers, noise, and seasonal restrictions) would be unlikely to elicit improvement.
Locatable Minerals	No change from Proposed Plan.	Not applicable	Not applicable	In coordination with USFWS, it was determined that additional restrictions would be unlikely to elicit improvement.

Table B.1
Specific Management Responses

Program	Adaptive Management Response[1]	Affected Decision Number		Where considered in the Draft LUPA/EIS (DEIS)
		BLM	Forest Service	
Salable Minerals	No change from Proposed Plan.	Not applicable	Not applicable	In coordination with USFWS, it was determined that additional restrictions would be unlikely to elicit improvement.
Nonenergy Leasable Minerals	No change from Proposed Plan.	Not applicable	Not applicable	In coordination with USFWS, it was determined that additional restrictions would be unlikely to elicit improvement.

[1]Any change in management would only apply to the PHMA where the trigger is tripped.
Unless otherwise noted as a soft trigger response, all Adaptive Management Responses would be implemented where a hard trigger is reached.

In addition to implementing the hard wired plan-level response, in the event that new scientific information becomes available demonstrating that the hard wired response would be insufficient to stop a severe deviation from GRSG conservation objectives set forth in the BLM and Forest Service plans, the BLM or Forest Service will immediately implement a formal directive akin to BLM Instruction Memorandum 2012-043 to protect GRSG and its habitat and to ensure that conservation options are not foreclosed in the area where the trigger has been met. To the extent that it is supported scientifically, this formal directive will be drawn from the range of alternatives analyzed in the development of the LUPA.

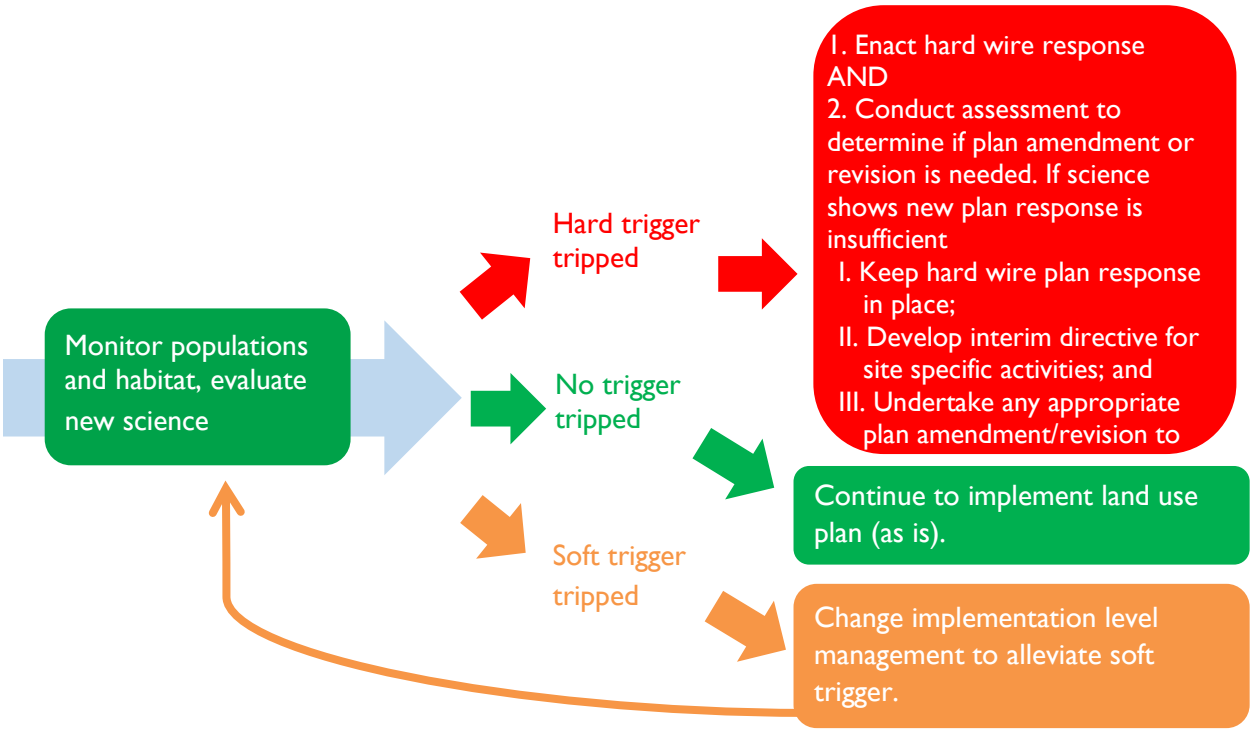
For those BSUs that are directly connected to BSUs in adjacent states (Box Elder, Hamlin Valley, Uintah, and Rich), if a hard trigger is reached on one of the connected BSUs outside of the Utah sub-region, the applicable WAFWA Management Zone Greater Sage-Grouse Conservation Team will convene to determine the causal factor and propose project level responses, as appropriate, and discuss further appropriate actions that could be applied. The team will also investigate the status of the hard triggers in other BSUs within the PAC and will recommend the appropriate plan response. Adoption of any further actions at the plan level may require initiating a plan amendment process.

MONITORING

Monitoring is a critical part of implementing adaptive management. Through monitoring, the agencies determine when a trigger has been met, as well as whether management actions taken, including adaptive responses, are effective in increasing GRSG habitat and populations. The

following image shows how monitoring information will be integrated into implementation of the adaptive management plan.

This EIS contains a Monitoring Framework Plan (**Appendix C**) that monitoring of several aspects of GRSG biological criteria and aspects of monitoring LUP effectiveness. The information collected through the Monitoring Framework Plan will be used by the BLM and Forest Service to determine when adaptive management hard and soft triggers are met.



The BLM and Forest Service will organize an adaptive management working group, inviting participation from USFWS, local governments, and UDWR. This group will annually review monitoring information related to GRSG populations and habitat availability to determine if an adaptive management trigger has been met.

The working group will evaluate GRSG population data collected by the UDWR's lek counts, as well as habitat information available from the BLM's National Operation Center. Habitat information available from the BLM National Operation Center is based on remotely sensed sagebrush vegetation collected as part of the LANDFIRE Existing Vegetation Type layer. Habitat information may be adjusted based on locally available vegetation data, if agreed upon by all adaptive management working group members. However, the baseline for determining the percent loss for the purposes of the adaptive management triggers must remain associated with a consistent vintage, namely the finalization of the RMP-decisions. It is also important that the vegetation data remain at a scale consistent with implementation of the adaptive management plan (BSUs), and remain at such a consistent scale over time.

SPATIAL SCALE

GRSG biologists, assigned to the multi-agency adaptive management working group, will assess population and habitat adaptive management triggers for distinct BSUs. The BSU is a geographical/spatial area that contains the relevant habitats which are used by GRSG. In Utah, the BLM and Forest Service have defined BSUs as the total PHMA area associated with a GRSG population area. These areas generally align with habitat areas within the State of Utah's Sage-Grouse Management Areas (SGMAs) with two adjustments. One adjustment includes some PHMA in the Carbon area that was not identified as an SGMA. Portions of the Anthro Mountain and West Tavaputs areas are combined with Emma Park area for adaptive management purposes. The other adjustment is the Emery population (Wildcat Knoll and Horn Mountain) that is combined with the Parker Mountain SGMA but will be considered separately because the population is small in size and effects to this population would be masked by what is going on in the much larger Parker SGMA. As a result, PHMA in the following areas will be monitored and evaluated for population and habitat adaptive management triggers: Box Elder, Rich, Uinta, Strawberry, Carbon, Emery, Parker, Panguitch, Bald Hills, Hamlin, Sheeprocks, and Ibapah. These areas generally represent population use areas within the sub-region.

As described in the Monitoring Framework Plan, habitat data can be collected at these BSU scales, and can be both aggregated up to the state-wide population, WAFWA Management Zone, or other reporting units. Similarly, more specific habitat delineation may be gathered identifying specific seasonal use patterns and even daily movements and preferences. However, in monitoring landscape changes in habitat and effects on GRSG populations, the interagency team of GRSG biologists identified the BSU scale as best capturing the needed metrics at a meaningful and consistent scale. The boundaries of the BSUs and other reporting units may be adjusted over time based on the understanding of local population interactions and climate variation.

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Emmons, S. R., and C. E. Braun. 1984. Lek attendance of male sage grouse. Journal of Wildlife Management 48:1023-1028.

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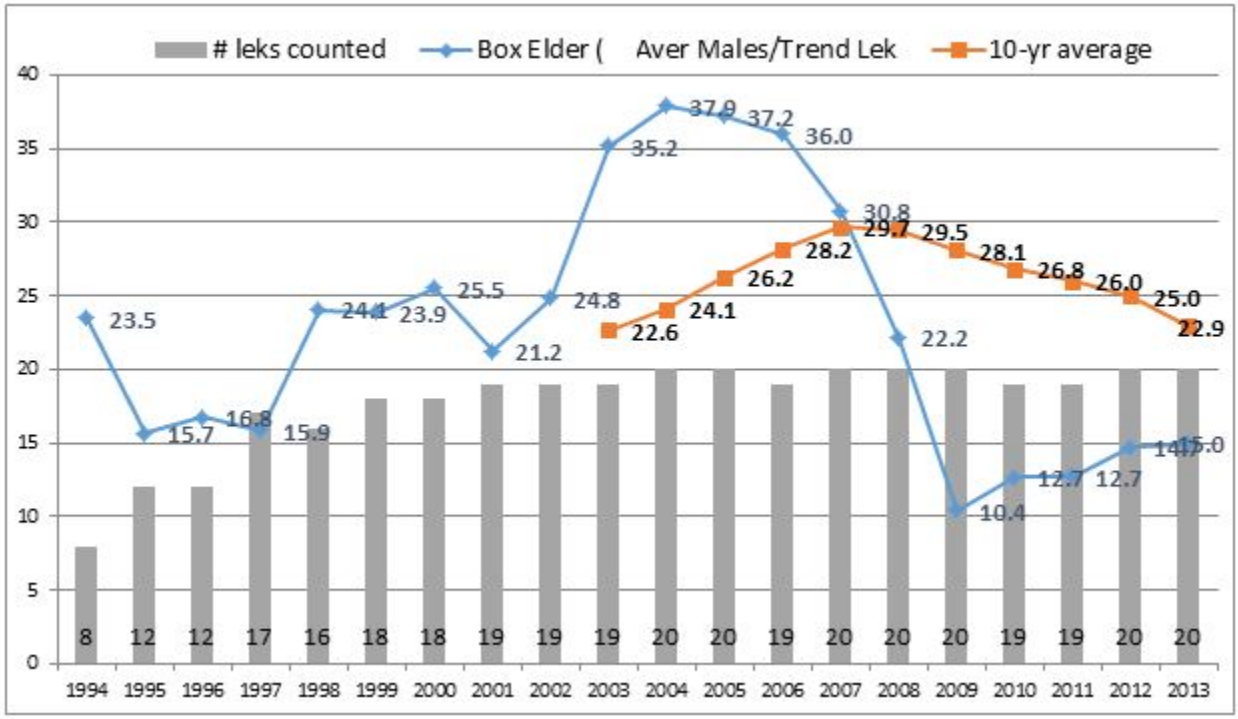
ATTACHMENT A - POPULATION TREND GRAPHS

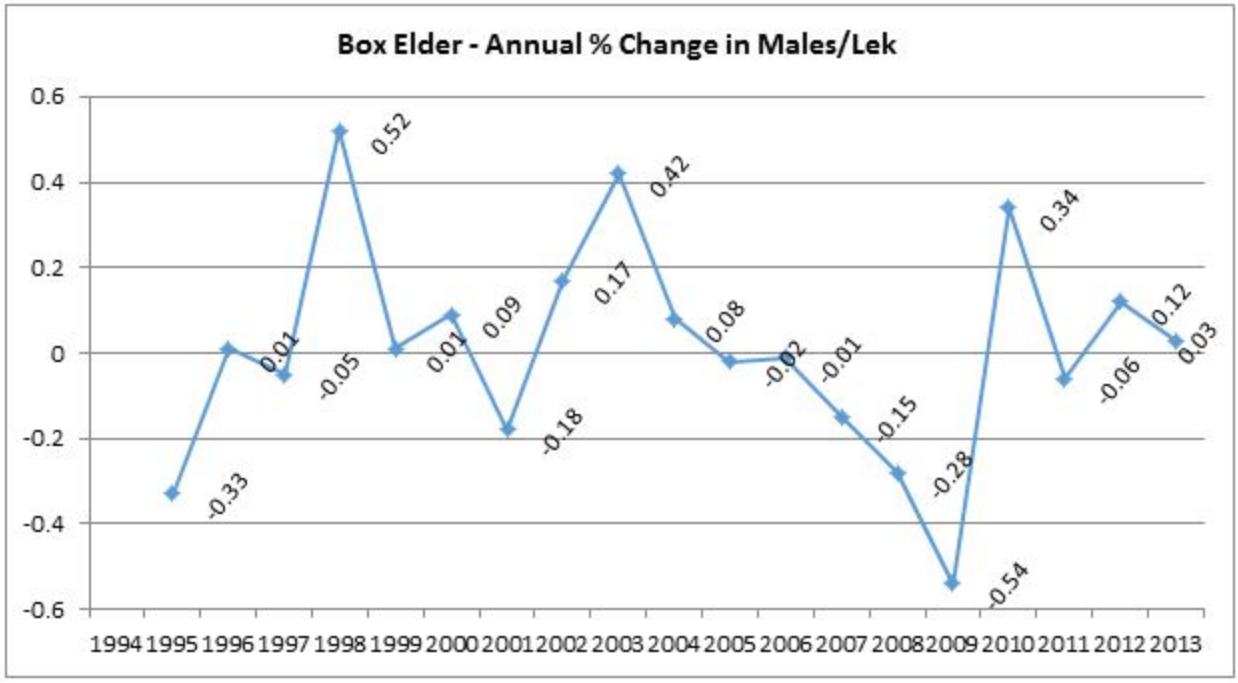
Explanation of Graphs

The following information is provided for the purposes of adaptive management, and identifies each GRSG population unit being considered specifically for adaptive management triggers. For each population, we list the leks that will be closely monitored for the population adaptive management triggers. The first graph represents the average males per trend lek (blue line) and the 10-year running average of males per lek for the trend leks (red line). The second graph is the change from year to year on the trend leks. If the number is < 0, average males on trend leks have declined since the previous year. If it is > 0, the average males on trend leks have increased since the previous year. The third graph is the Lambda for all the leks in the population, as a means of ensuring that the trend leks are representative of what is going on with the entire population. If Lambda is < 1, the entire population declined from the previous year. If Lambda is >1, the entire population increased from the previous year.

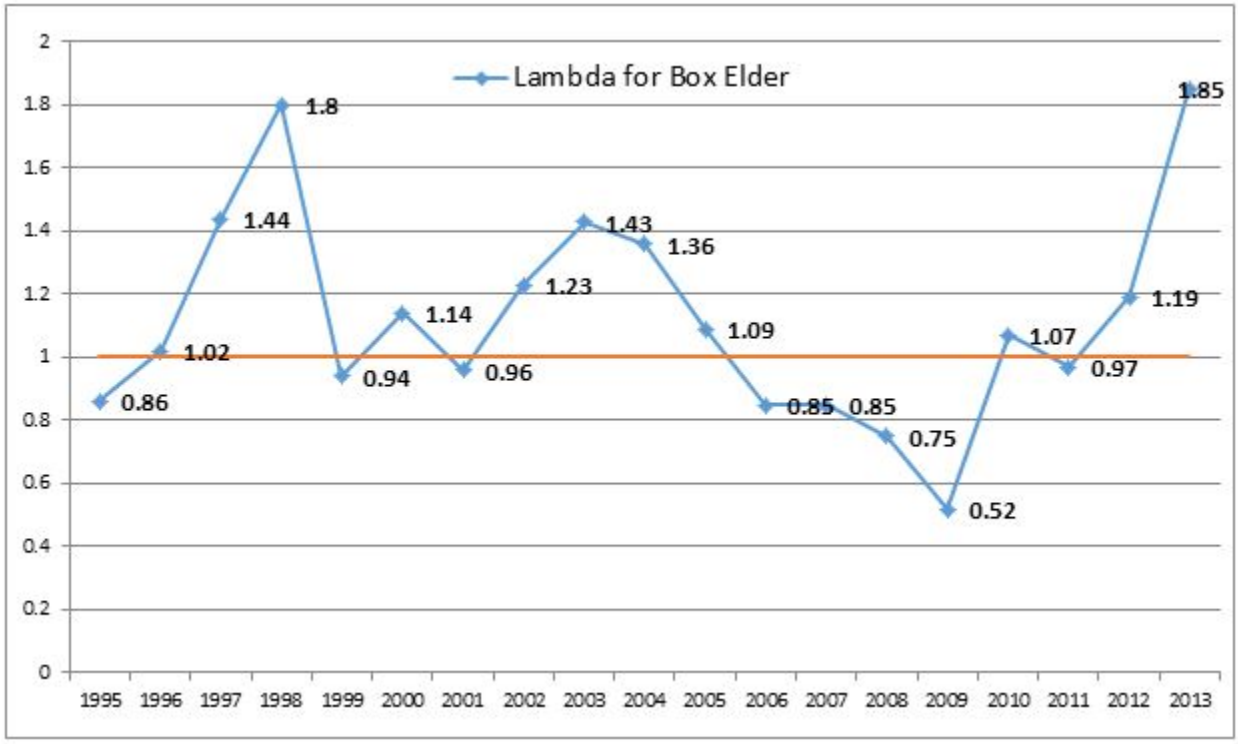
Box Elder

In this PHMA, 21 of 79 leks were identified as trend leks (Badger Flat, Cotton Thomas, Dove Creek Sign, Dove Creek Upper West, Dry Basin, Dry Canyon Mountain North, Goose Creek South, Hardister, Highway Cut, Keg Spring Turnoff, Lynn Reservoir North, Meadow Creek pass, Park Valley M53, Red Bank Spring, Sickle Spring, Warm Springs Road, Dakes Pass, with Cliff Reservoir, Middle Canyon, Ray Kimber Ranch, and Wildcat Knoll for spatial representation). In addition, some leks were clumped because they were previously reported as one number of strutting males but were split to reflect the exact location of the multiple strutting spots (Hardister leks, Red Bank Spring leks, and the Cotton Thomas/First leks).



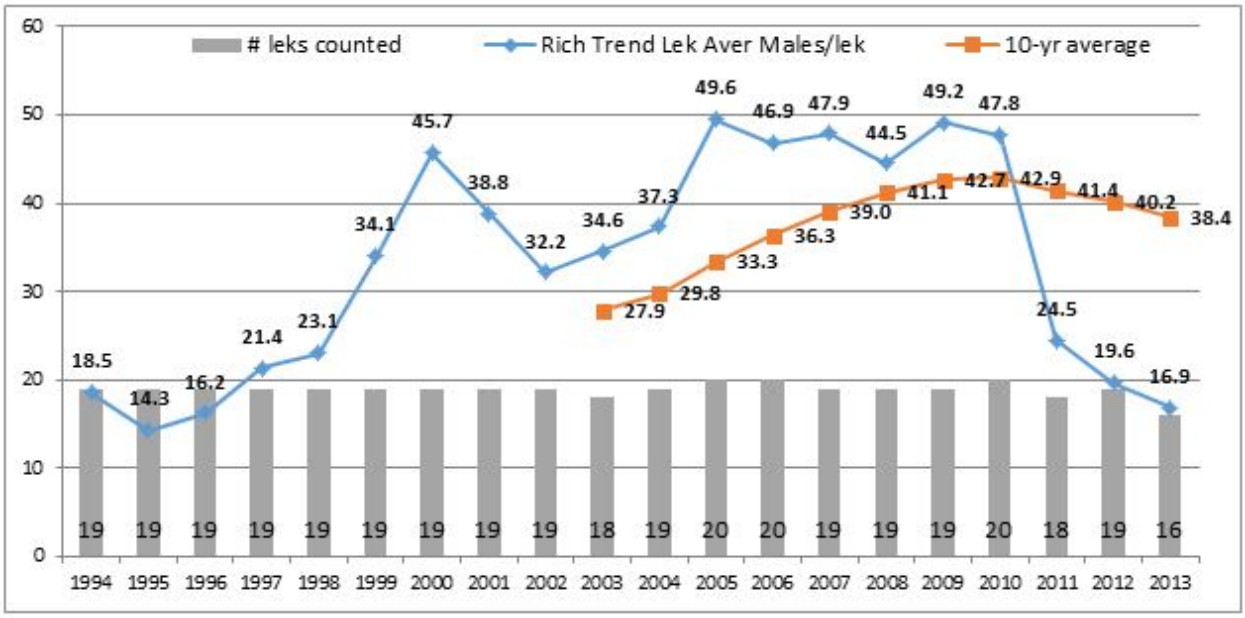


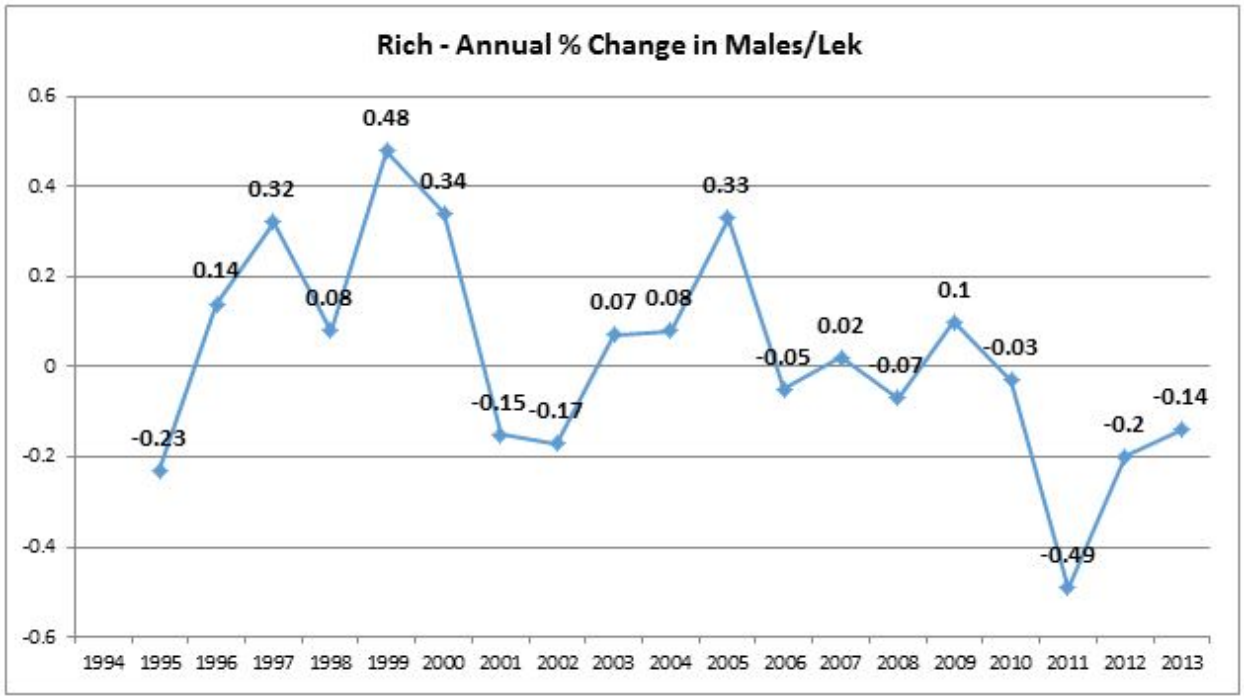
Note: Any time the annual change goes below 0, there is a decline in the population between years. Similarly, any time the annual change is above 0, that represents an increase between years.

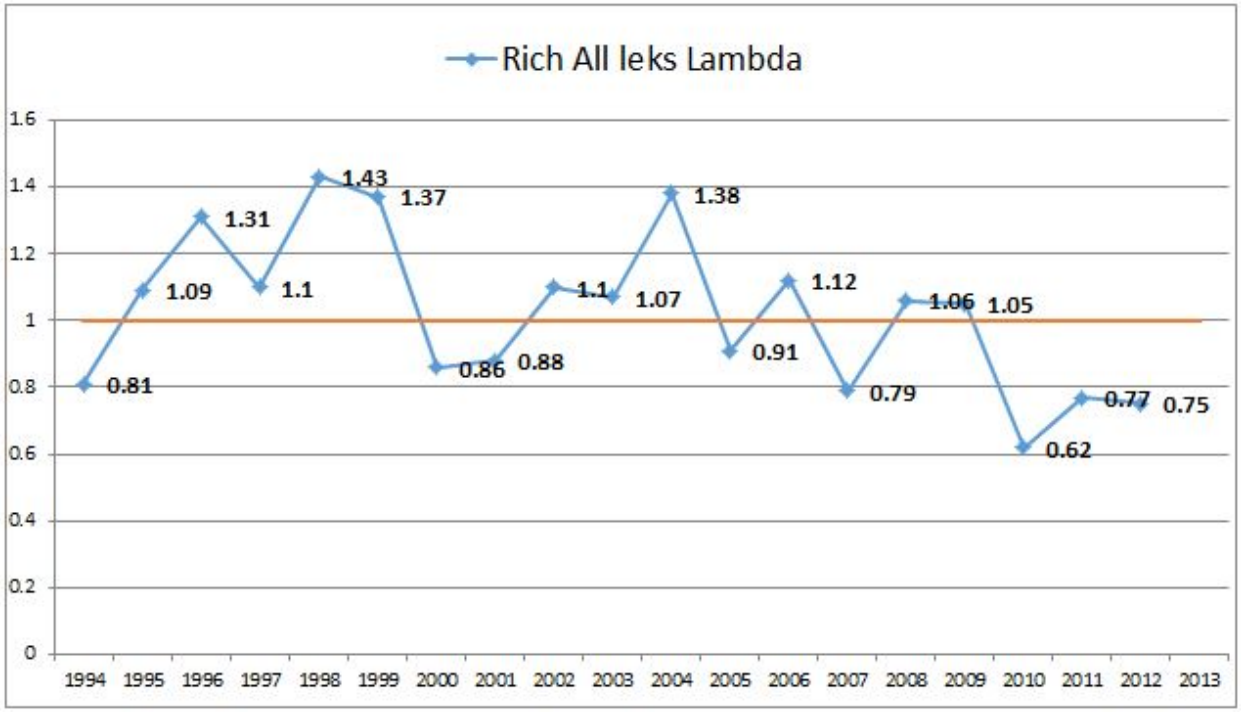


Rich

In this PHMA, 18 of 54 leks were identified as trend leks (Alkali Hollow, Black Tank, Cabin Hollow, Chicken Treatment, Dixon Hole, Dry Hollow North, Dry Hollow South, Hardware Plateau, Henefer Divide, Lake Ridge, McKay Hollow, Neponset, North Eden, Otter Creek, Six Mile, South Lake North, Spring Canyon North, Stacey Hollow and for spatial representation, Little Creek and Woodruff leks).

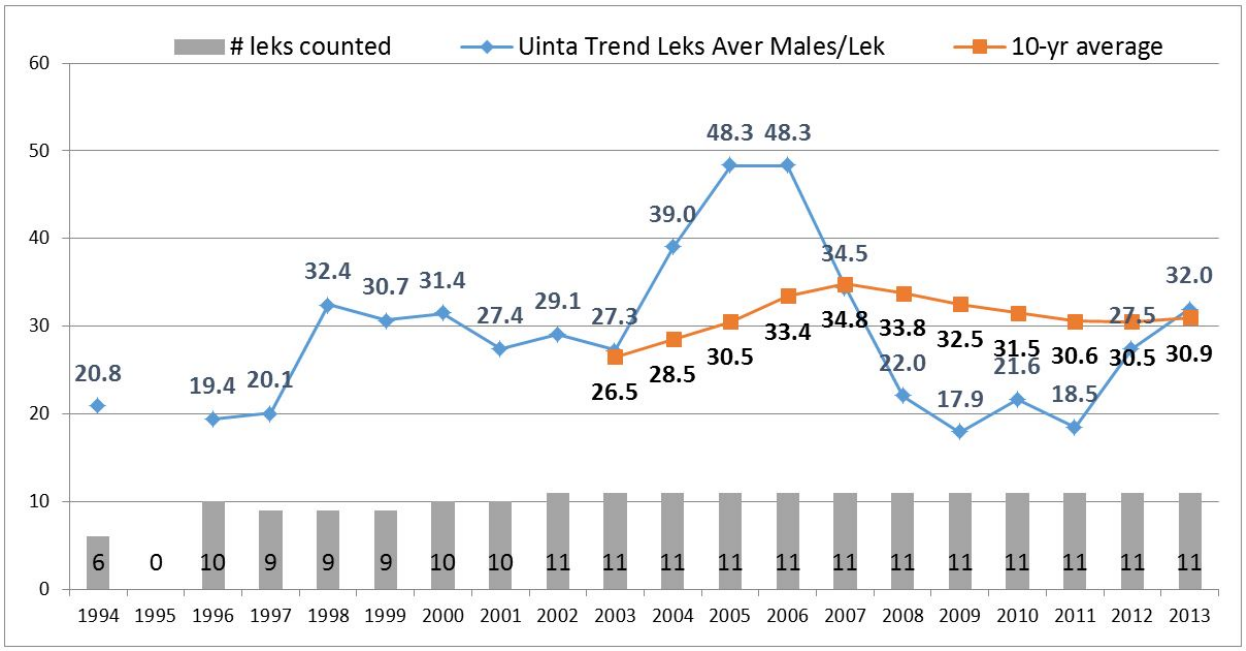


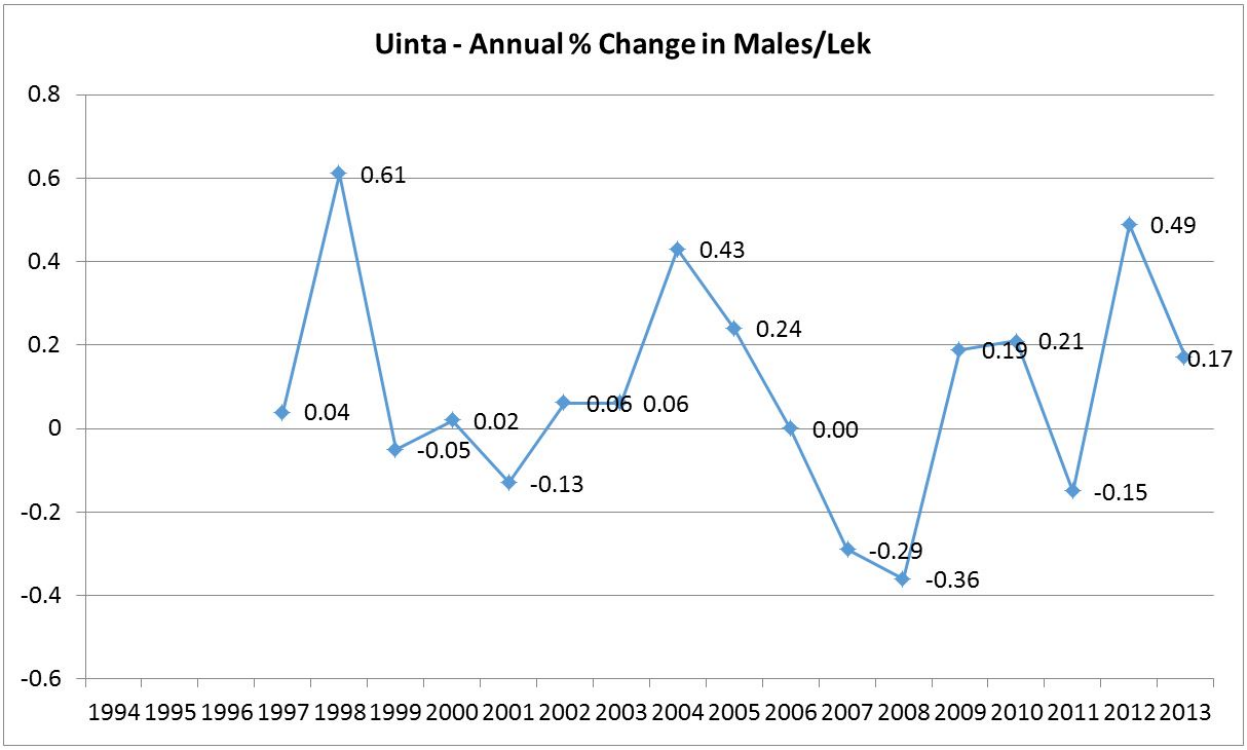


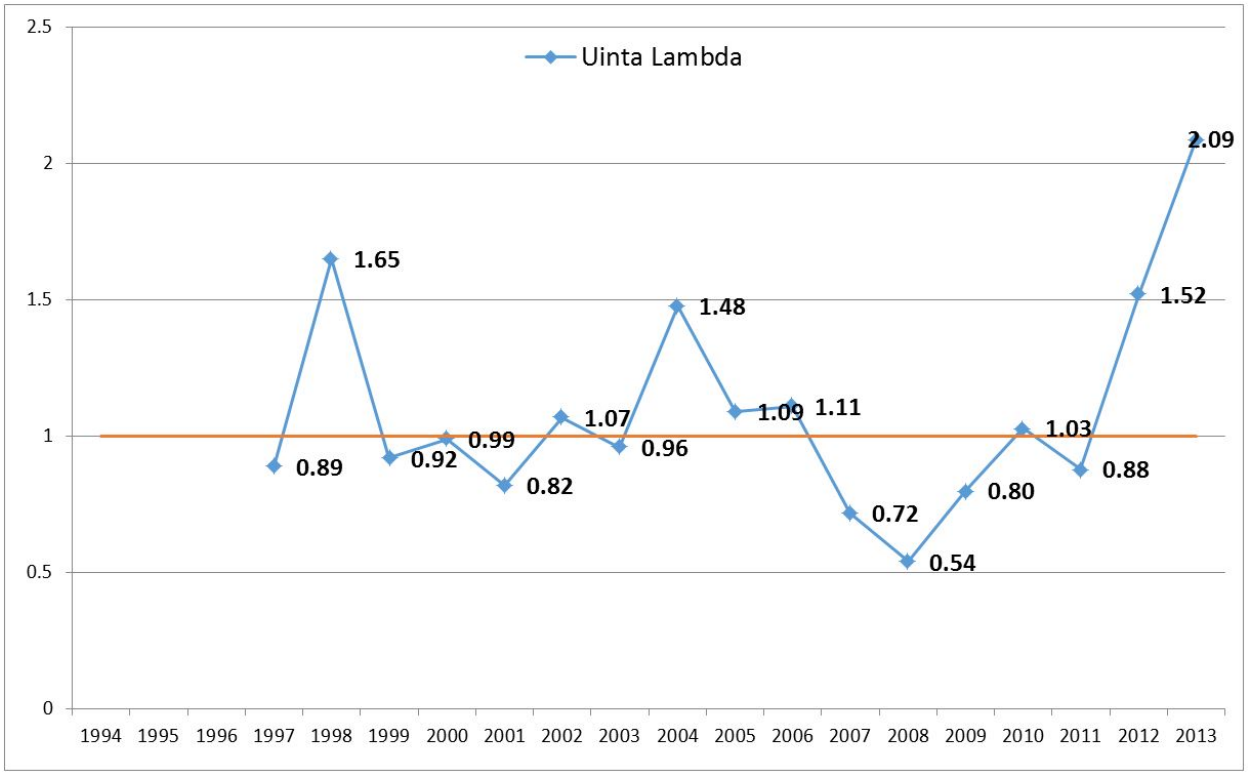


Uinta Basin

In this PHMA, 11 of 53 leks were identified as trend leks (Seedskadee, Blue Mountain, Goslin Mountain, Benchmark, Borens Salt Shed, Diamond Mountain Burn, Diamond Springs, Taylor Mountain Face, West McKeaknie, Red Narrows West, and Little Mountain South). These leks represent 2 of 6 leks in Three Corners/Browns Park area, 2 of 8 leks in Blue Mountain, 5 of 24 leks on Diamond Mountain, and 2 of 7 leks on Halfway Hollow.

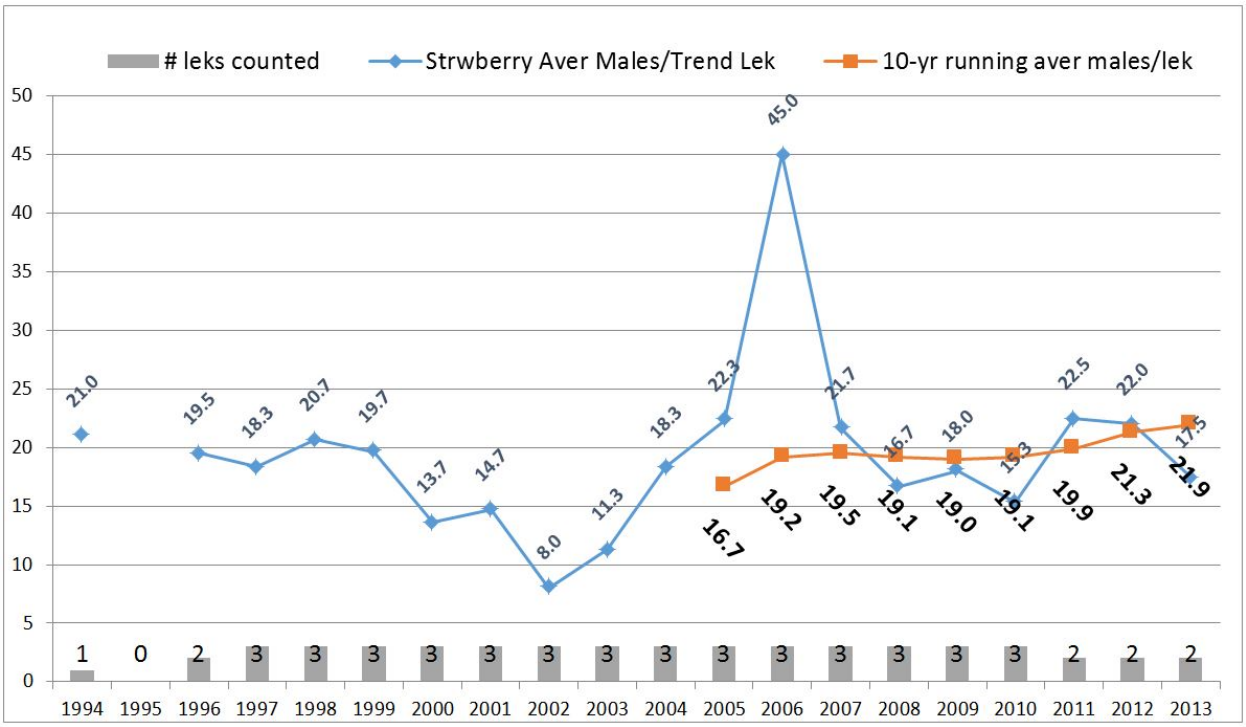


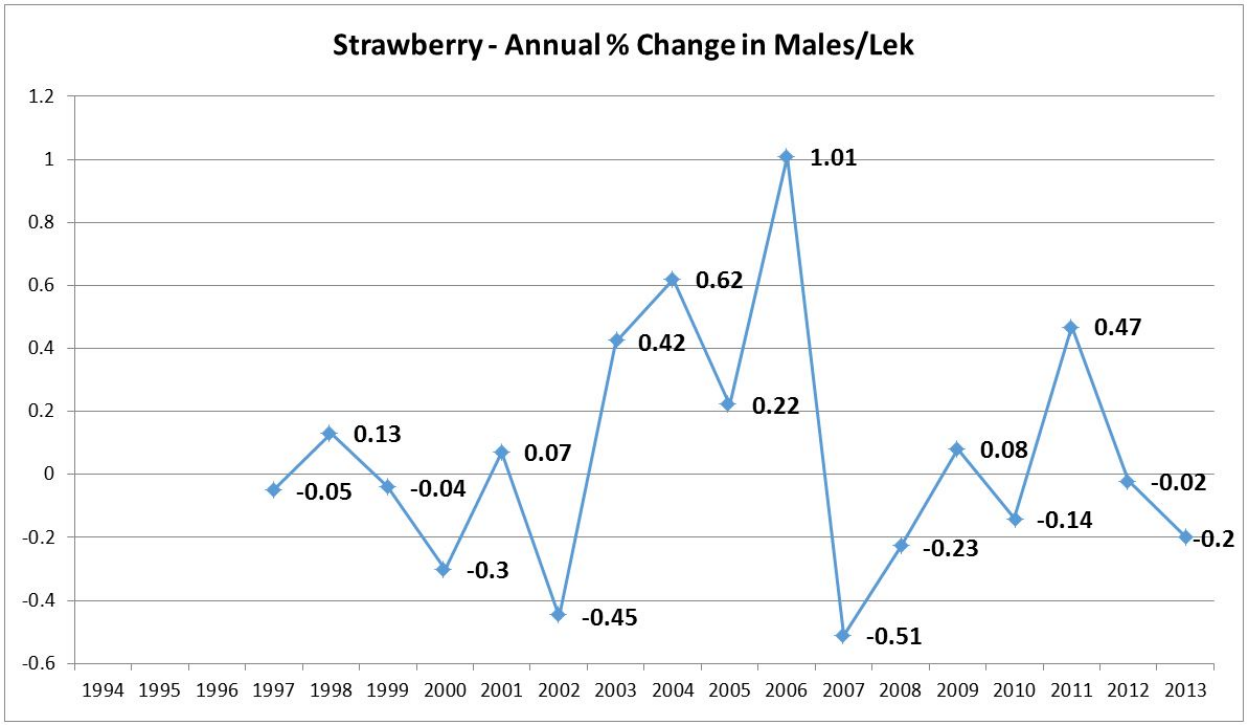

Uinta - Annual % Change in Males/Lek
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
0.04
0.61
-0.05
0.02
-0.13
0.06
0.06
0.43
0.24
0.00
-0.29
-0.36
0.19
0.21
-0.15
0.49
0.17
1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013

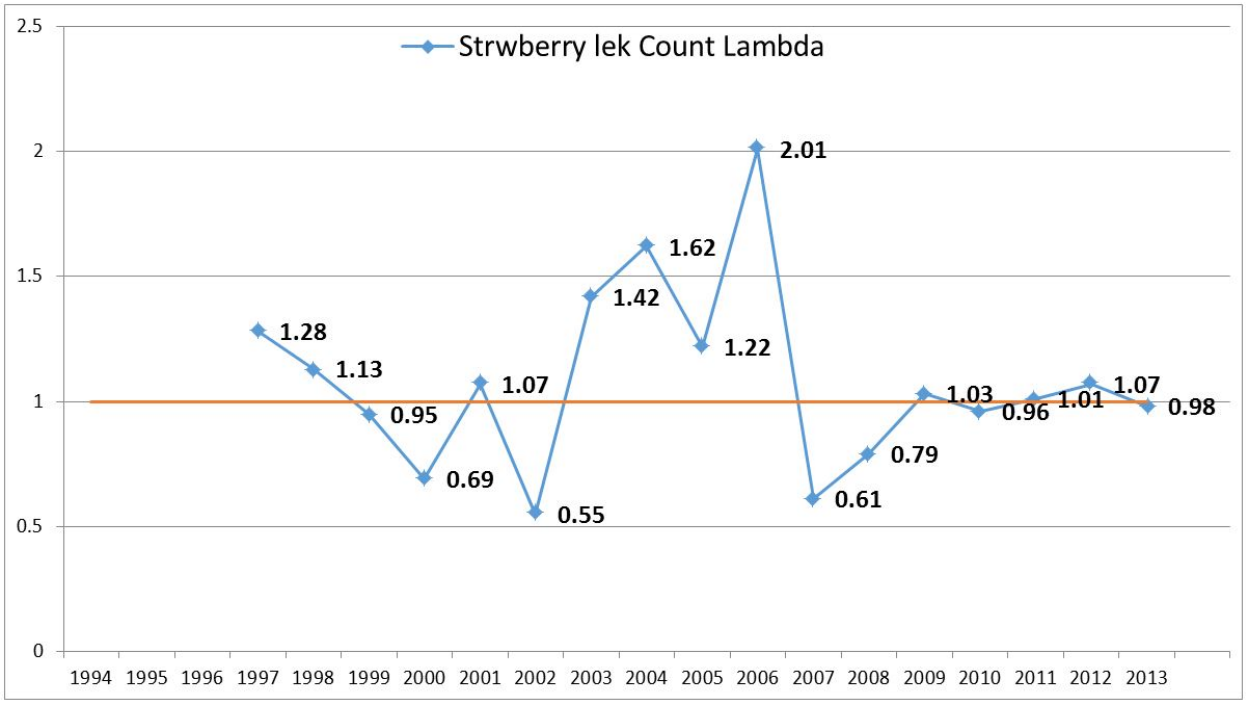

Uinta Lambda
2.5
2
1.5
1
0.5
0
0.89
1.65
0.92
0.99
0.82
1.07
0.96
1.48
1.09
1.11
0.72
0.54
0.80
1.03
0.88
1.52
2.09
1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013

Strawberry-Fruitland

In this PHMA, 3 of 8 leks were identified as trend leks (Lower Red Creek, Road Hollow, and Saleratus Upper).

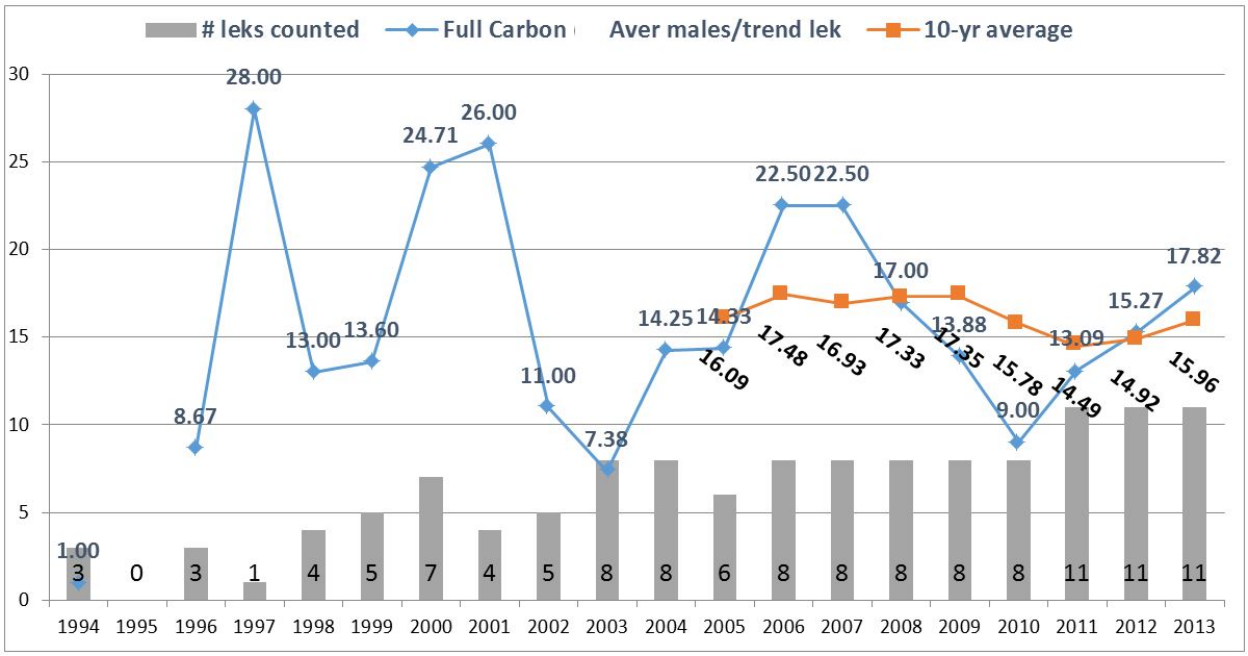


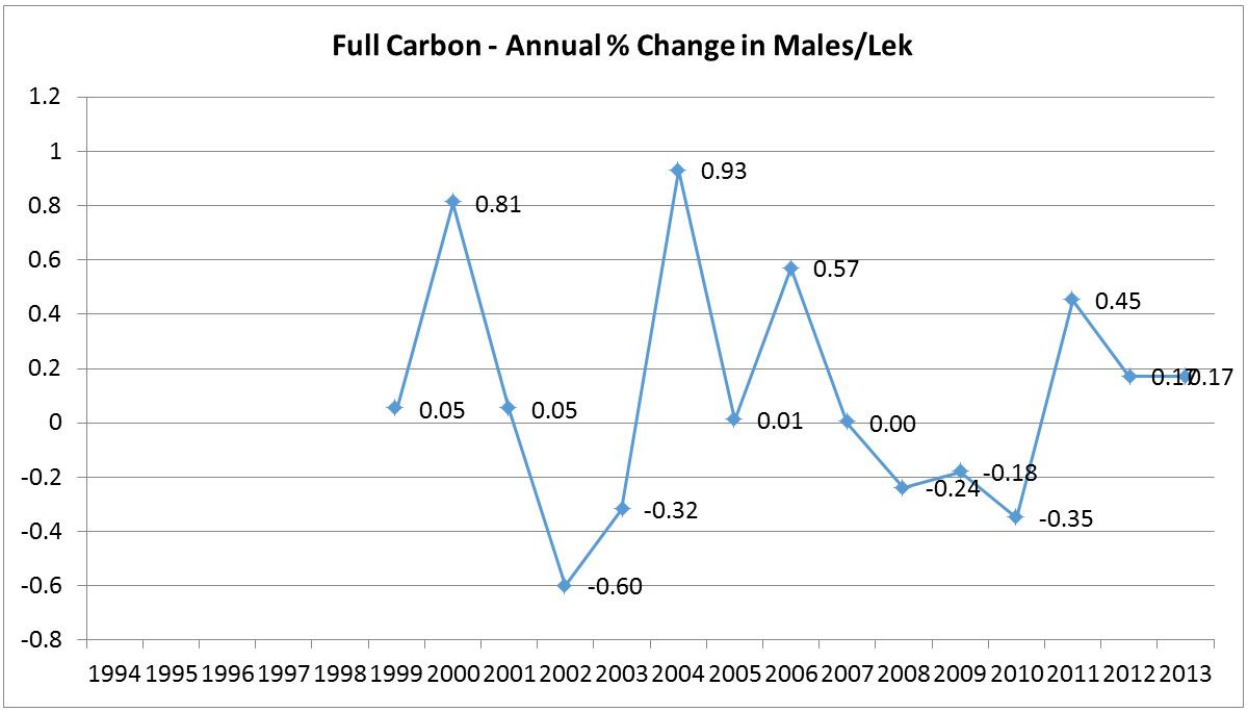


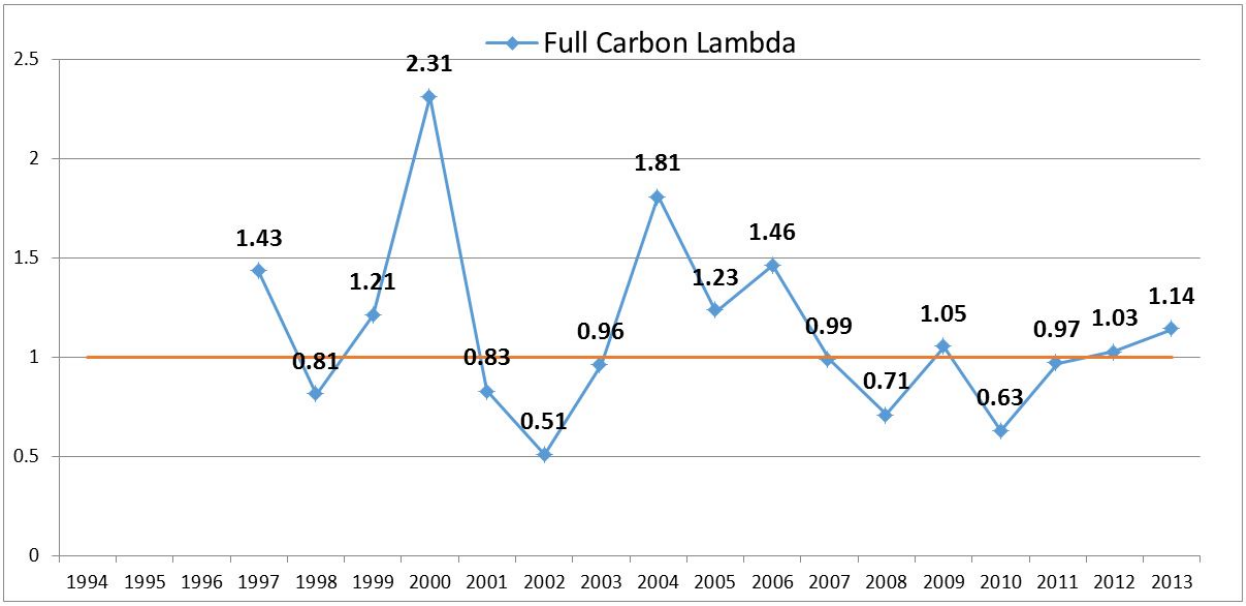


All Carbon (Emma Park, Anthro Mountain, and West Tavaputs)

BLM decided to group Emma Park, West Tavaputs, and Anthro Mountain into "All Carbon", similar to the Uinta Basin grouping but more justifiable because of documented movements. In these populations, 11 of 24 leks were used as trend leks (Antone Creek, Brook Meadow, Moynier Meadows, Houston, Lost Creek, Matt's Summit, Jeep Trail, Nutters Ridge, Bishop Ridge Corral, Steer Ridge Pond, and Steer Ridge Snag). These trend leks represent Anthro Moutain (2 leks), West Tavaputs (3 leks), and Emma Park (6 leks).

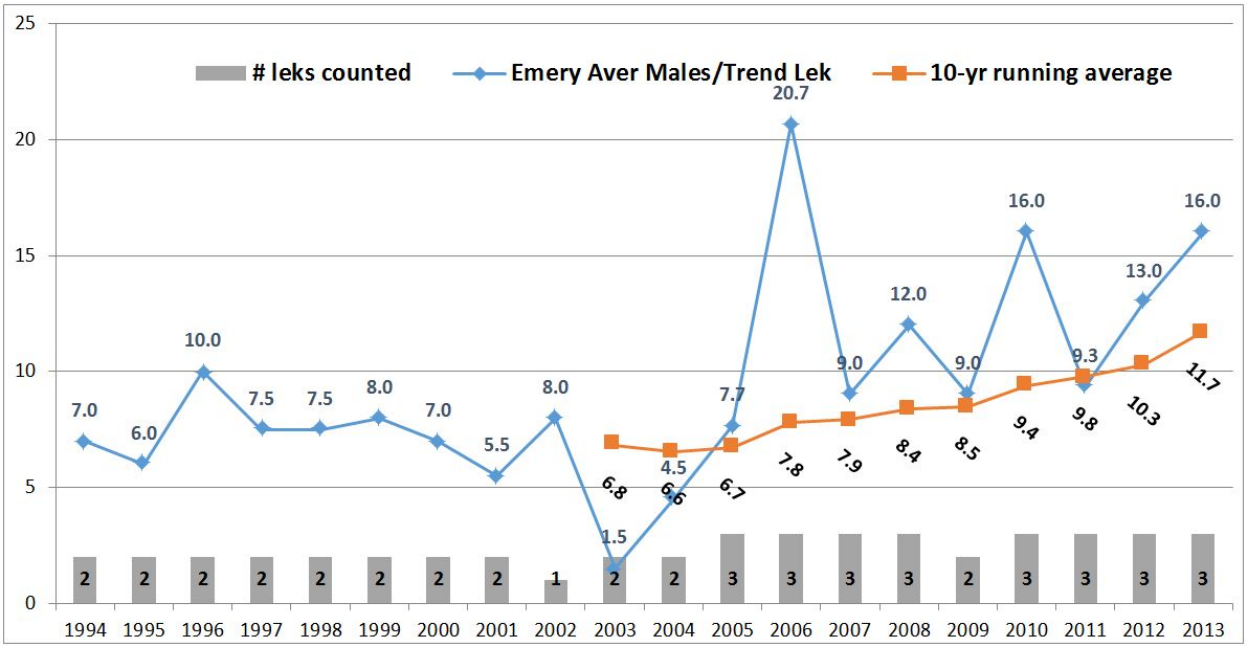


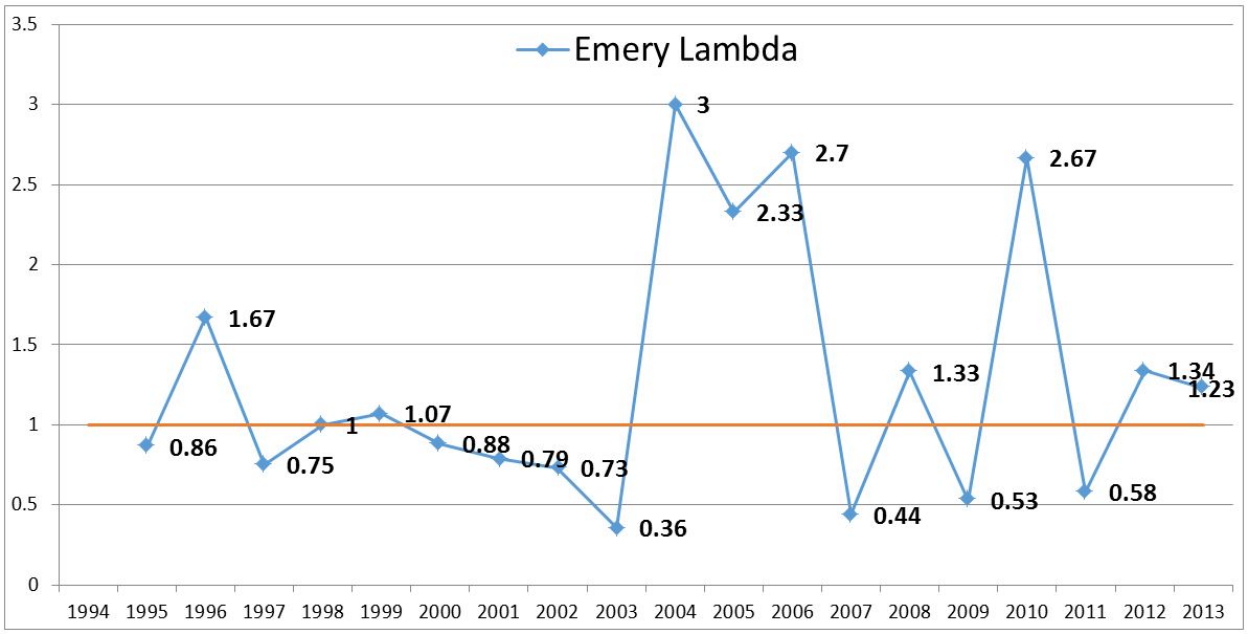

Full Carbon - Annual % Change in Males/Lek
1.2
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
0.05
0.81
0.05
-0.60
-0.32
0.93
0.01
0.57
0.00
-0.24
-0.18
-0.35
0.45
0.17
0.17
1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013


Full Carbon Lambda
2.5
2
1.5
1
0.5
0
1.43
0.81
1.21
2.31
0.83
0.51
0.96
1.81
1.23
1.46
0.99
0.71
1.05
0.63
0.97
1.03
1.14
1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013

Emery

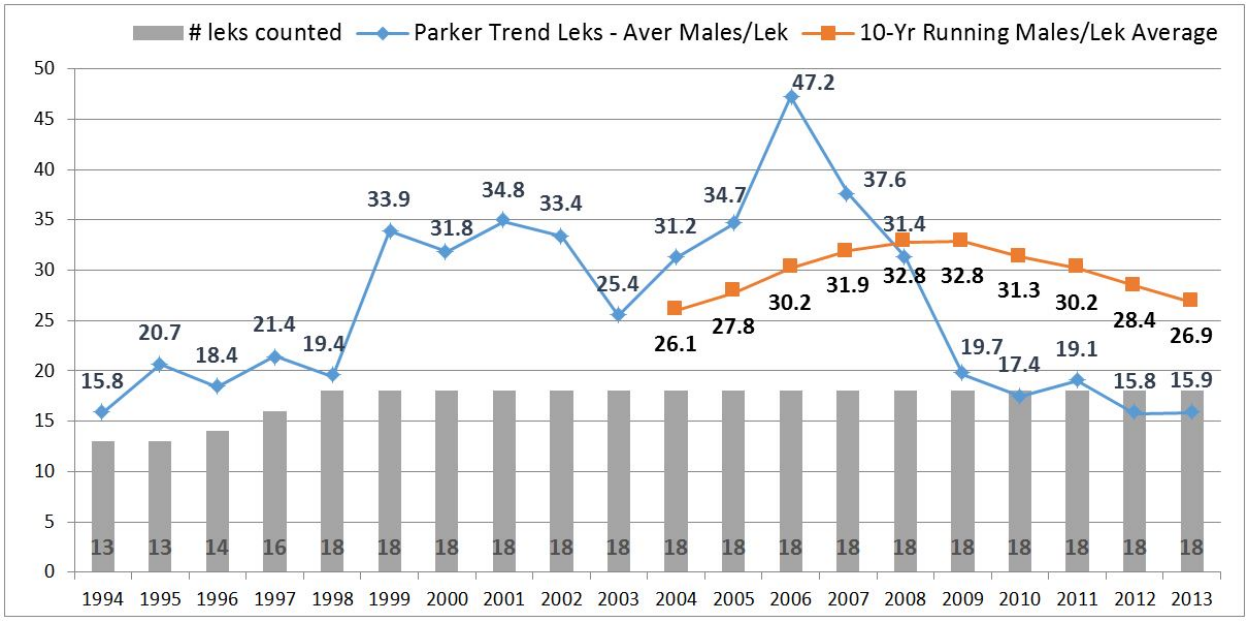
This PHMA is Wildcat Knoll and Horn Mountain and was specifically considered separately from the larger Parker Mountain PHMA because there is no documented bird movement between the two areas. This was also done to provide that substantial declines in the smaller Emery area would be detected and appropriate management actions made. There are only 3 occupied leks in Emery and all 3 leks will be used as trend leks for the adaptive management assessment. For this population, all the leks are being monitored for changes in average males per lek. Therefore, it is not necessary to calculate annual changes from year to year separately, because Lambda already captures this.

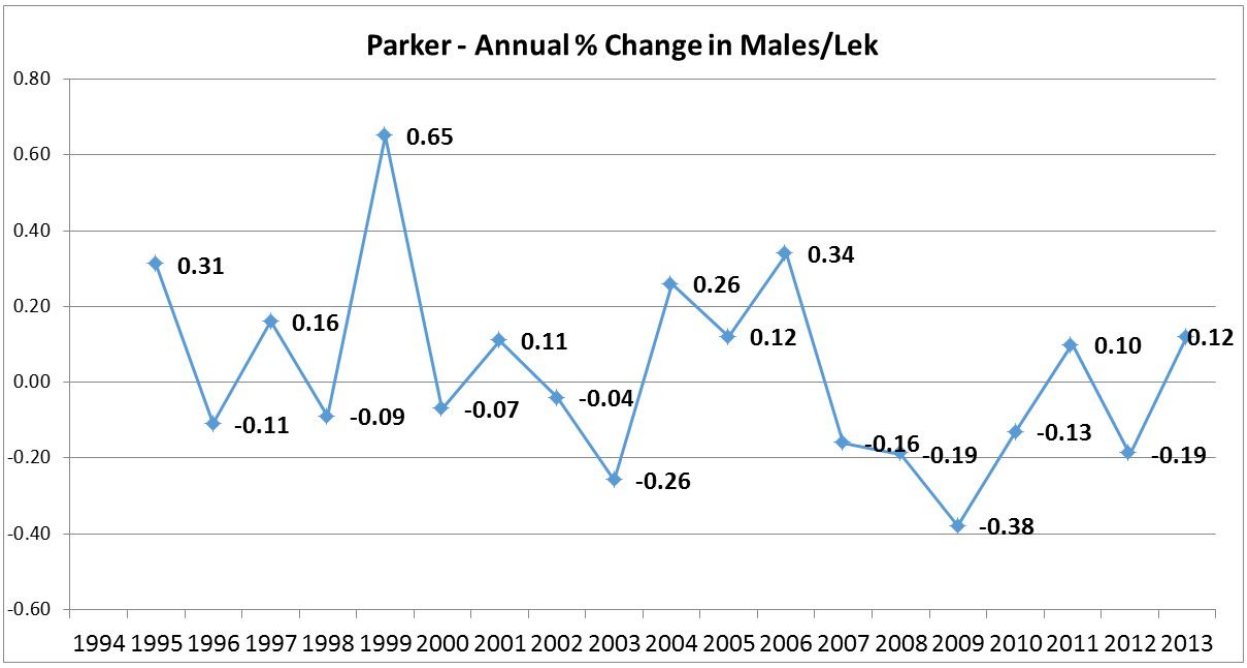


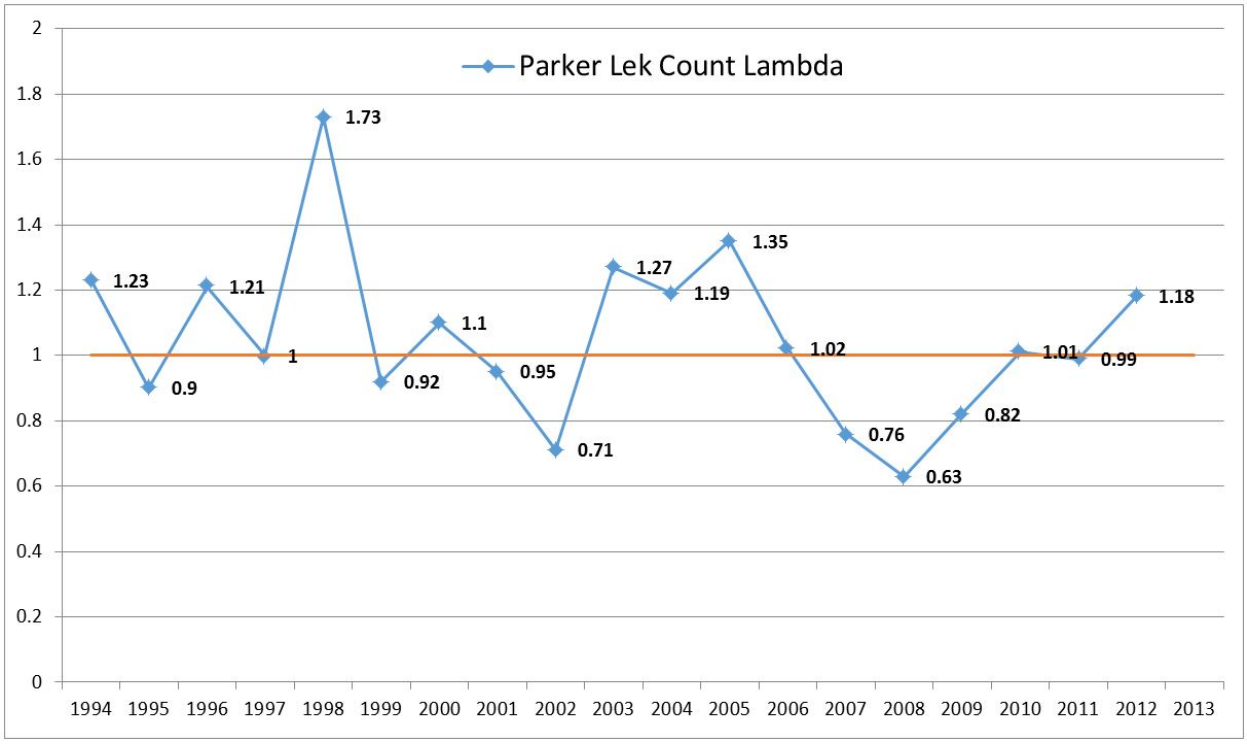


Parker Mountain

In this PHMA, 18 of 50 leks are trend leks (Angle, Bald Knoll Reservoir, Balsam Hollow Reservoir, Black Point, Bull Roost, Cedar Peak, Dog Flat, Dry Lake, Hare Lake, Hunts Reservoir, John L. Swale, John's Valley Cottonwood, Mud Lake Reservoir, Sage Reservoir, Tom Best Spring, Vance Corral, Vance Reservoir, and Widstoe).

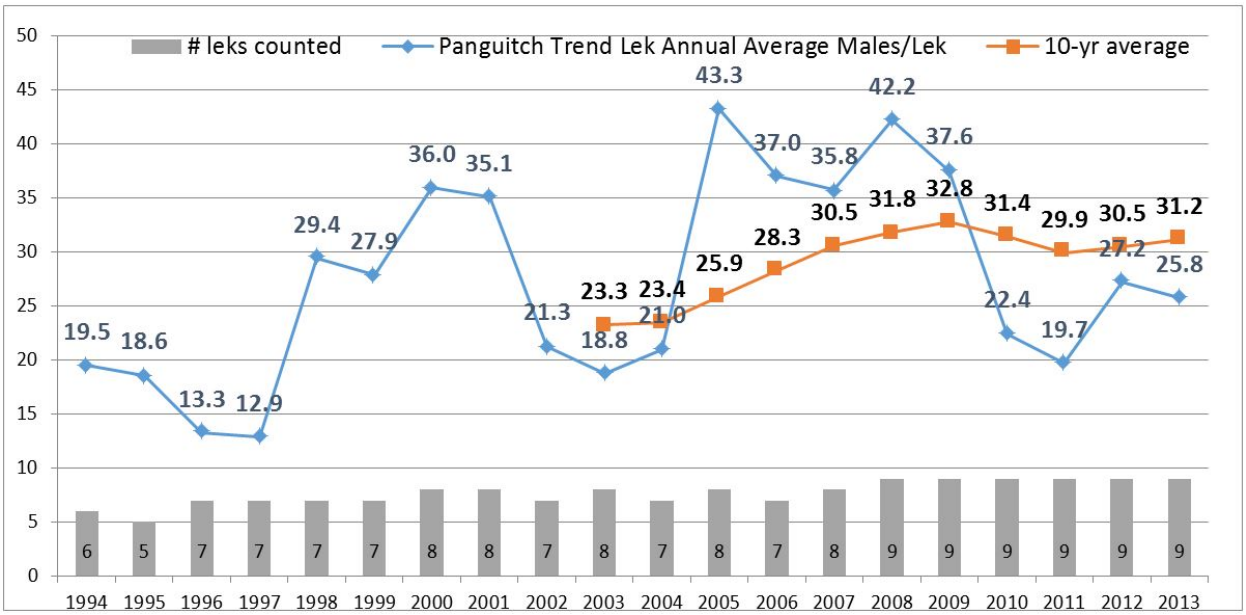


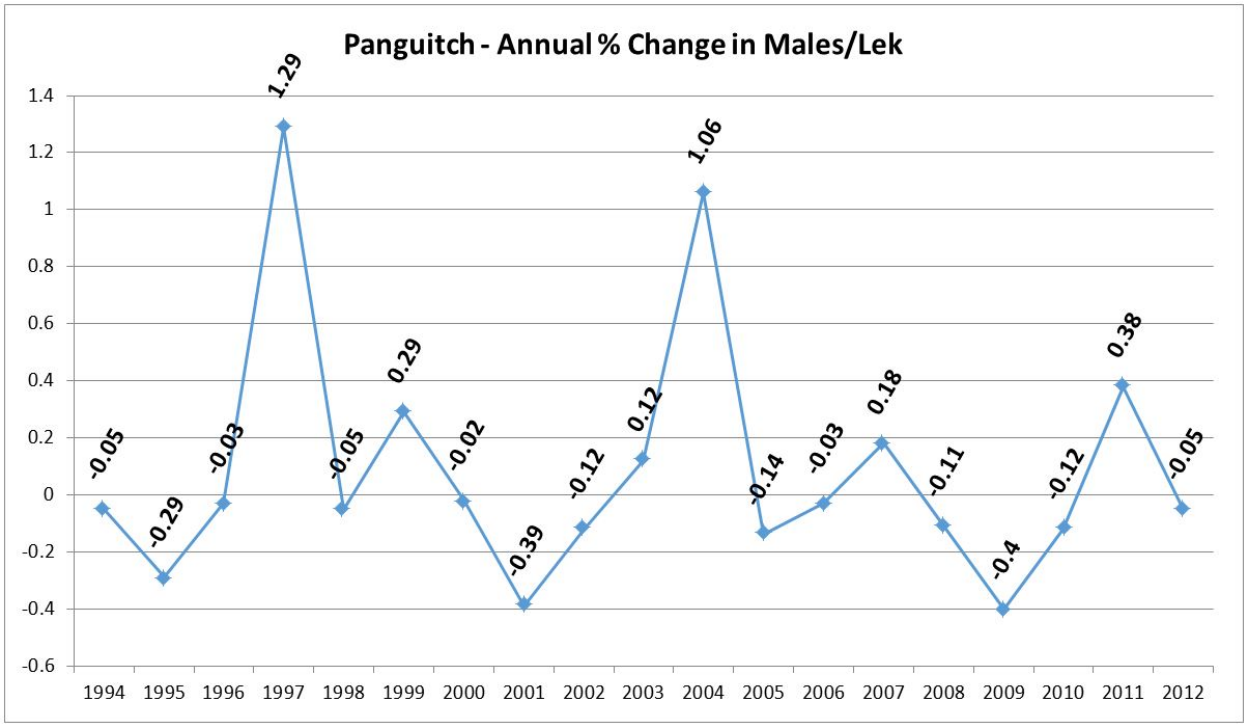


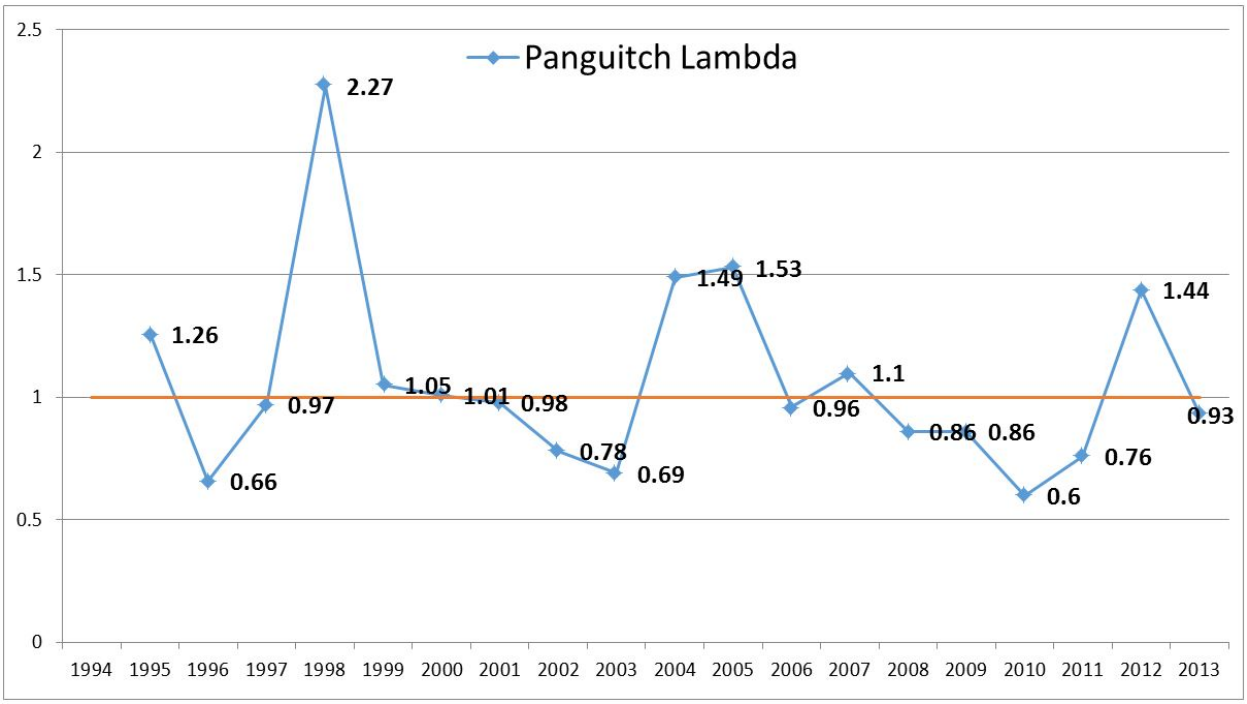


Panguitch

In this PHMA, 9 of 17 occupied leks are trend leks (Sage Hen Hollow, Panguitch Valley East Bench, Pole Hollow Ridge, Butler Creek, Hoyt's Ranch, Sink Hollow and for spatial representation, Buckskin Valley, Dog Valley, and Upper Bear Valley North leks were added).

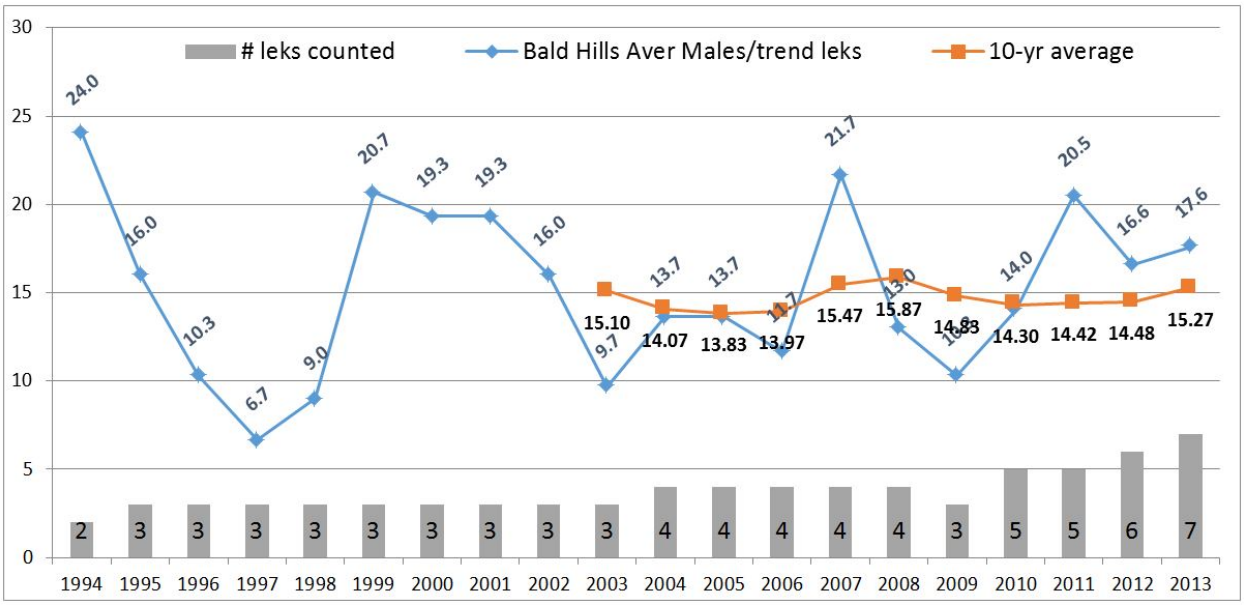


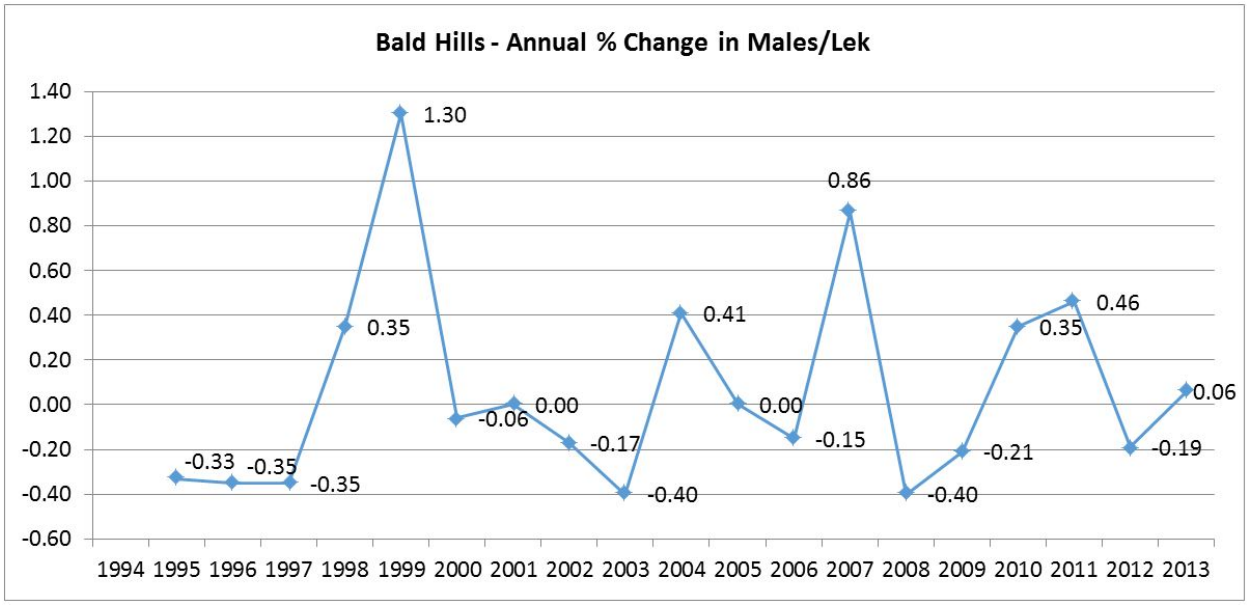

Panguitch - Annual % Change in Males/Lek
1.4
1.2
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.05
-0.29
-0.03
1.29
-0.05
0.29
-0.02
-0.39
-0.12
0.12
1.06
-0.14
-0.03
0.18
-0.11
-0.4
-0.12
0.38
-0.05
1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012

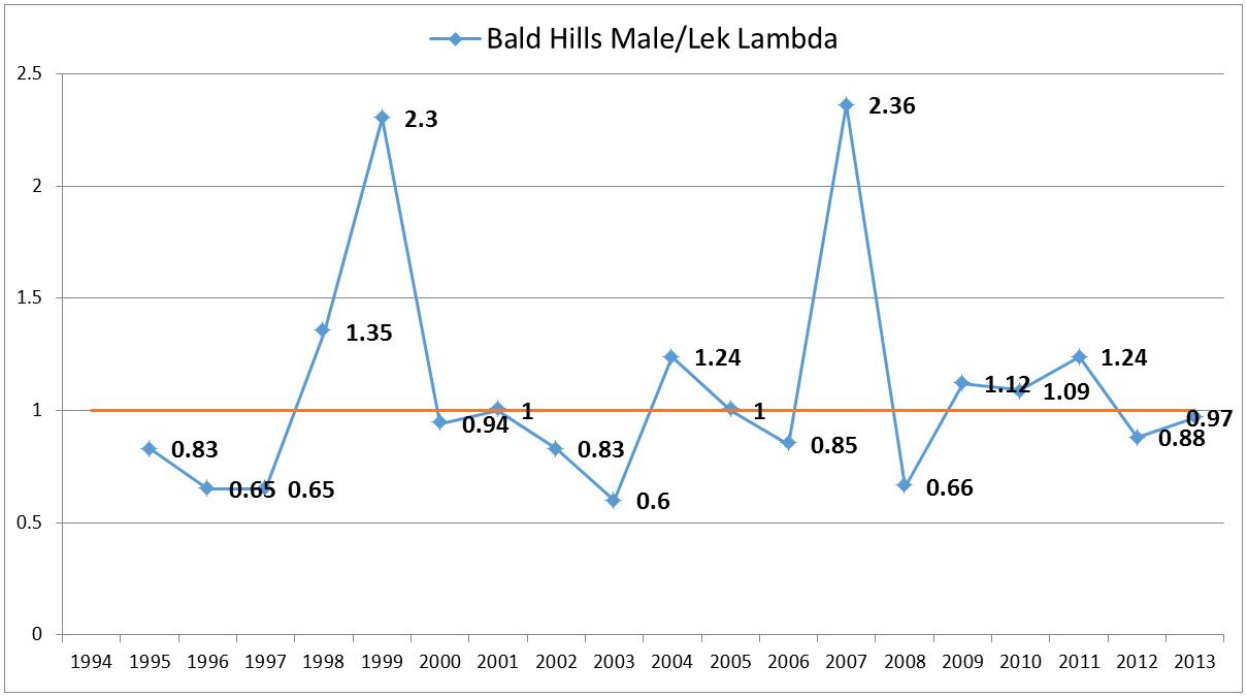

Panguitch Lambda
2.5
2
1.5
1
0.5
0
1.26
0.66
0.97
2.27
1.05
1.01
0.98
0.78
0.69
1.49
1.53
0.96
1.1
0.86
0.86
0.6
0.76
1.44
0.93
1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013

Bald Hills

In this PHMA, 7 of 12 leks are trend leks but four leks have been combined into two leks since the newer lek is anticipated to be the result of fire to the old lek (Minersville and Poorman Ridge). As a result, for the purposes of adaptive management, the Minersville lek is combined with the Marshall lek and the Poorman Ridge lek is combined with the Poorman Jeff lek.

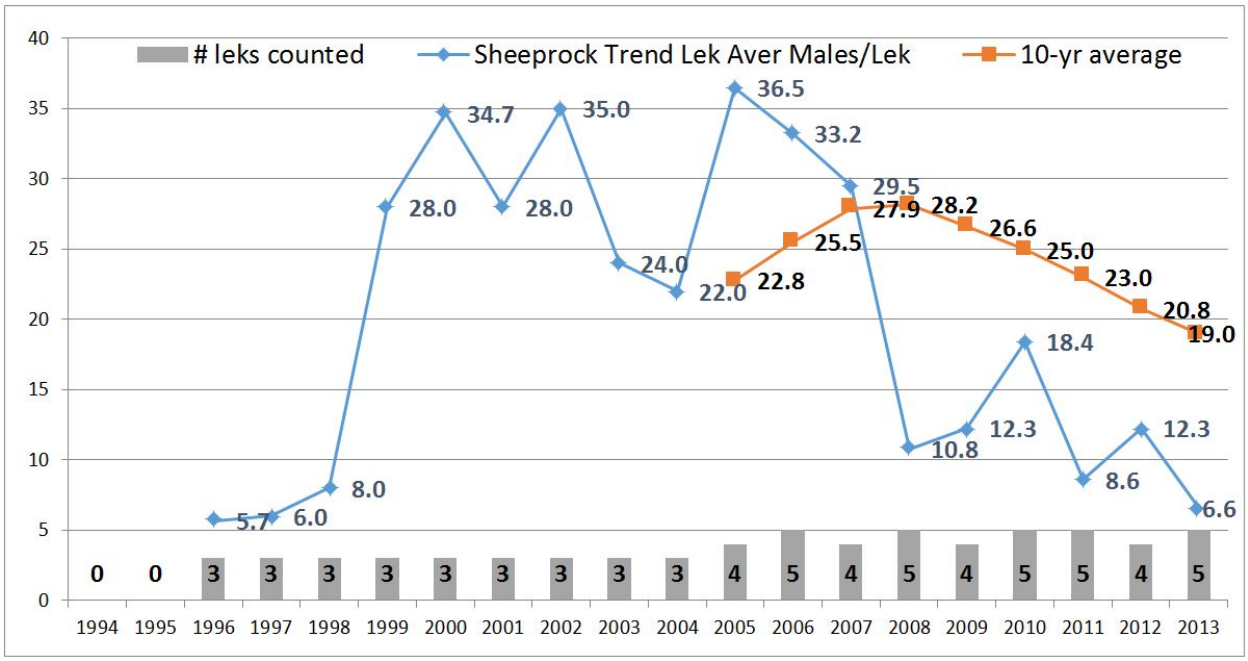


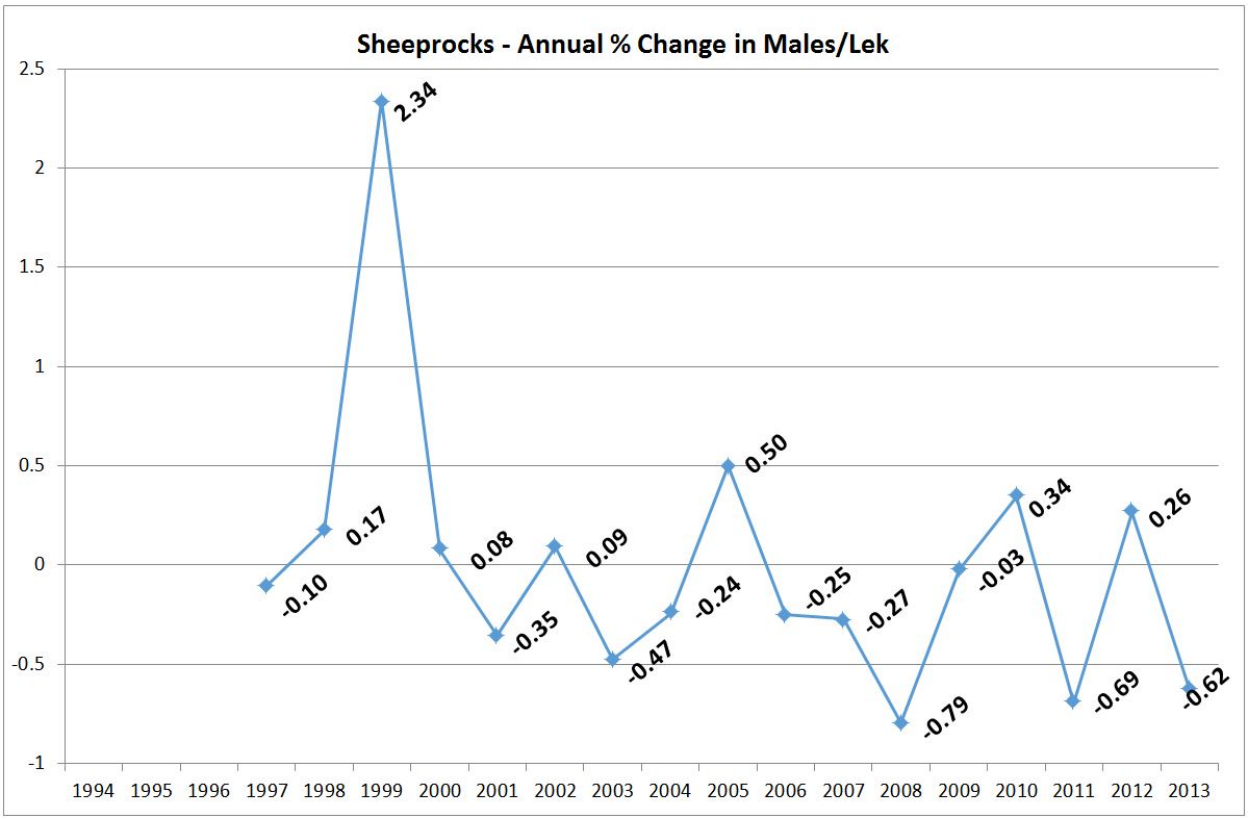


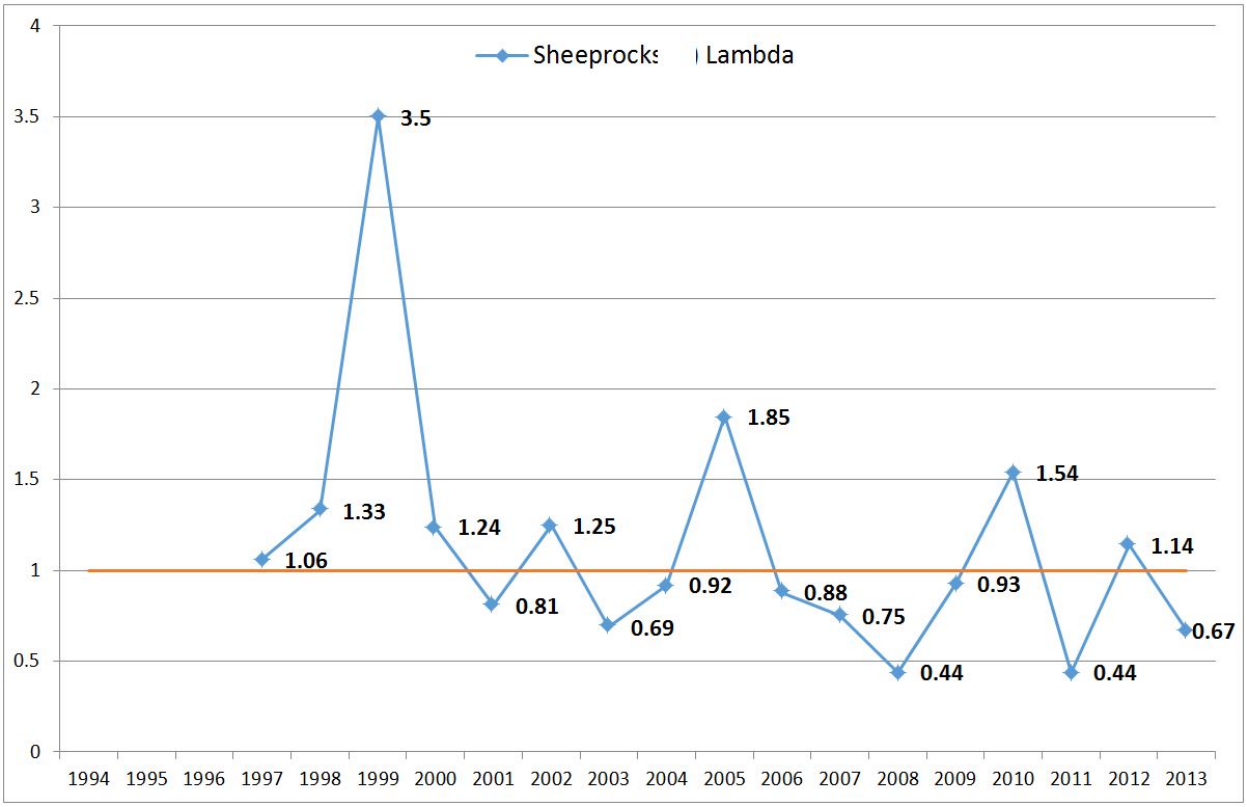


Sheeprocks

In this PHMA, 5 of 7 leks are trend leks (McIntyre Meadow, McIntyre Ridge, Vernon Little Valley, and for spatial representation Benmore Pastures and Government Creek leks were added).

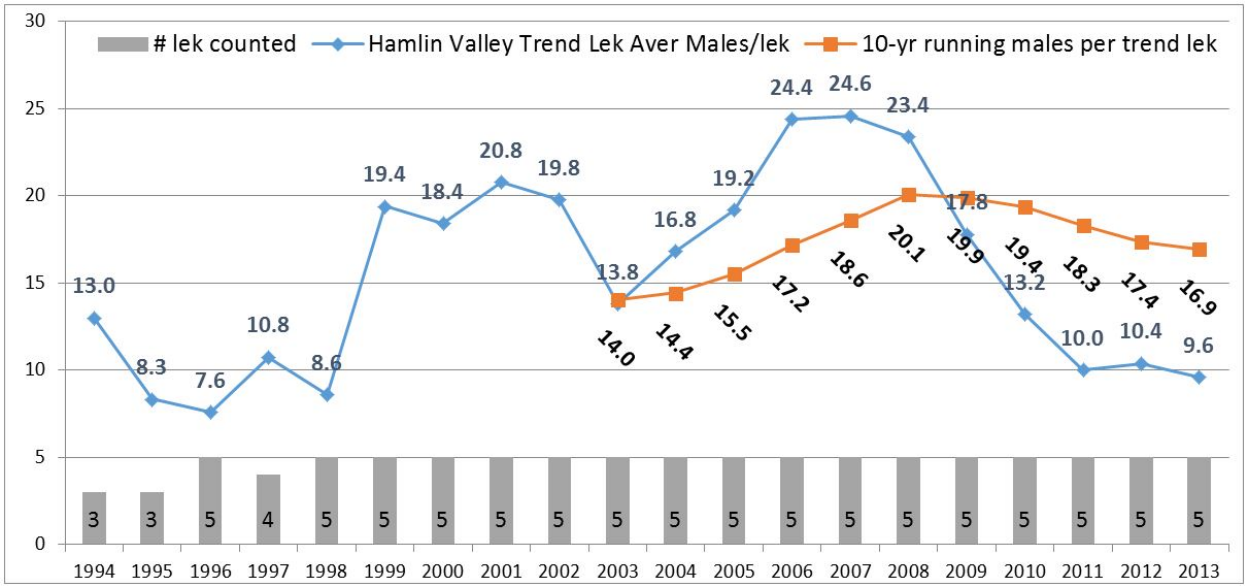


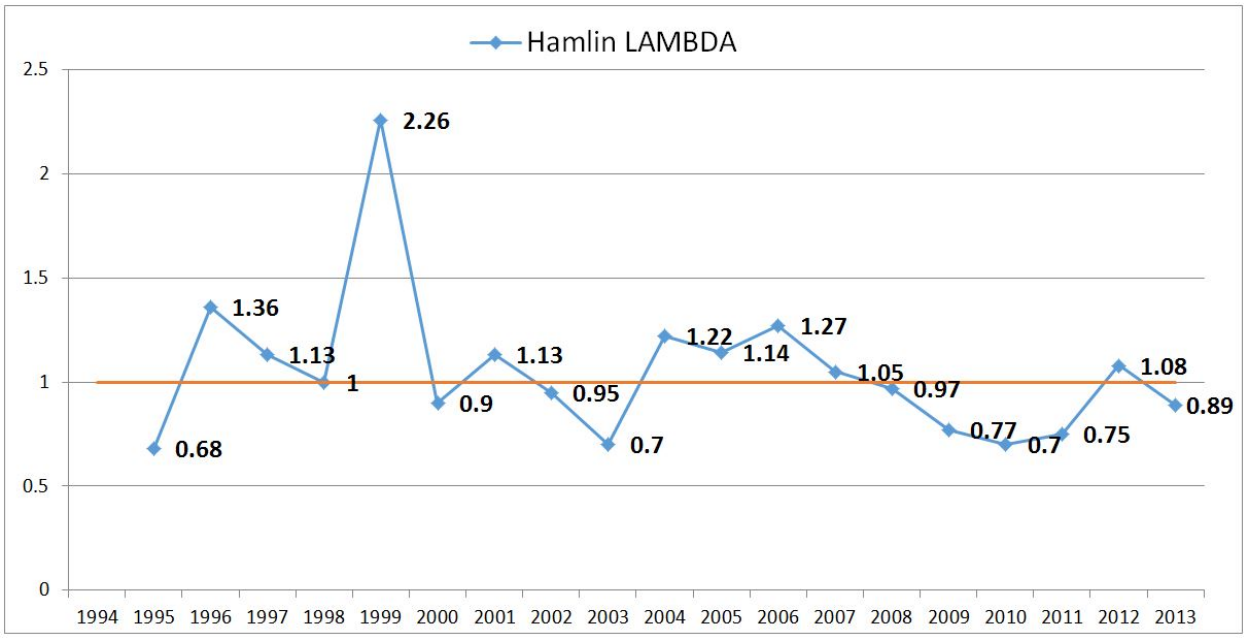

Sheeprocks - Annual % Change in Males/Lek
2.5
2
1.5
1
0.5
0
-0.5
-1
2.34
0.17
-0.10
0.08
-0.35
0.09
-0.47
-0.24
0.50
-0.25
-0.27
-0.79
-0.03
0.34
-0.69
0.26
-0.62
1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013

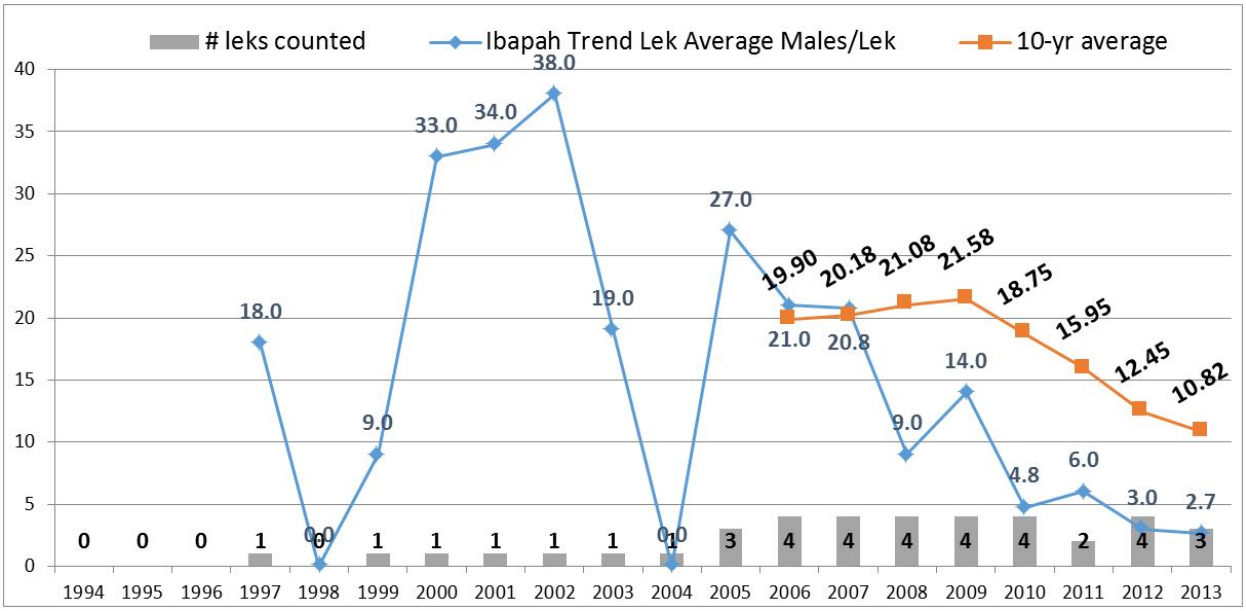
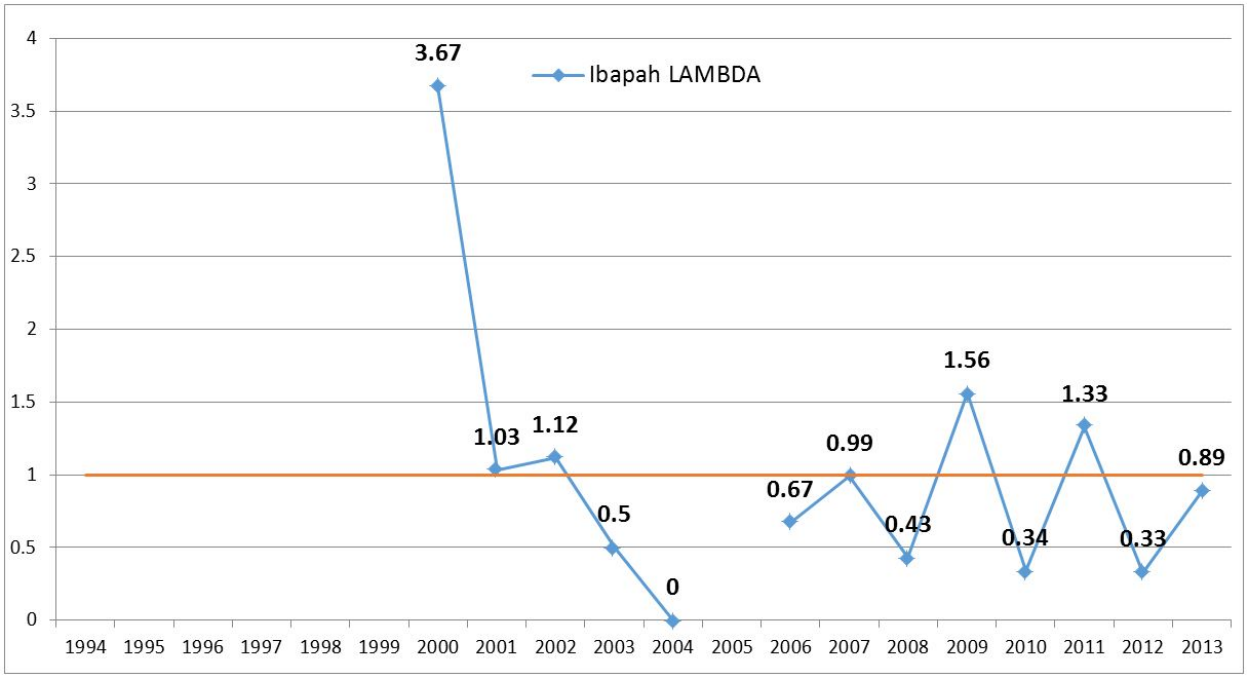

Sheeprocks
Lambda
4
3.5
3
2.5
2
1.5
1
0.5
0
3.5
1.06
1.33
1.24
0.81
1.25
0.69
0.92
1.85
0.88
0.75
0.44
0.93
1.54
0.44
1.14
0.67
1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013

Hamlin Valley

In this PHMA, 5 of 6 are trend leks. For this population, all the leks are being monitored for changes in average males per lek. Therefore, it is not necessary to calculate annual changes from year to year separately, because Lambda already captures this.





Ibapah

In this PHMA, only one of 4 leks met the trend lek criteria but all leks will be used as trend leks. For this population, all the leks are being monitored for changes in average males per lek. Therefore, it is not necessary to calculate annual changes from year to year separately, because Lambda already captures this.