

WACs 220-415-020 and 220-415-030

Deer General Seasons and Deer Special Permits



Washington Department of
FISH and WILDLIFE

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Wildlife Program

Content

1. Recommendations not specific to a management zone
2. Brief statewide overview
3. Status update and recommendations for each deer management zone
4. Public comment summary
5. Questions



Deer Special Permits

WAC 220-415-030

- Added language that clarifies the bag limit is one deer, even if permits are drawn in more than one category
- Added 10 antlerless permits for modern firearm and muzzleloader youth hunters in Designated Areas of Region 3



Deer Special Permits

WAC 220-415-030

- Hunter Education Instructor Incentive Permits
 - Increase the number of permits for Any White-Tailed Deer in Region 1 from 2 to 3
 - Increase the number of permits for Any Deer in Region 4 from 2 to 4
 - Increase the number of permits for Any Deer in Region 6 from 2 to 4



2015 Drought






Drought Monitor August 2001, 2005 and 2015 (2001 and 2005 were previous years of statewide drought in Washington)


<http://droughtmonitor.unl.edu/>

August 2001



Intensity:






-  D0 Abnormally Dry
-  D1 Moderate Drought
-  D2 Severe Drought
-  D3 Extreme Drought
-  D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

August 2005



Intensity:






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-  D1 Moderate Drought
-  D2 Severe Drought
-  D3 Extreme Drought
-  D4 Exceptional Drought

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August 2015



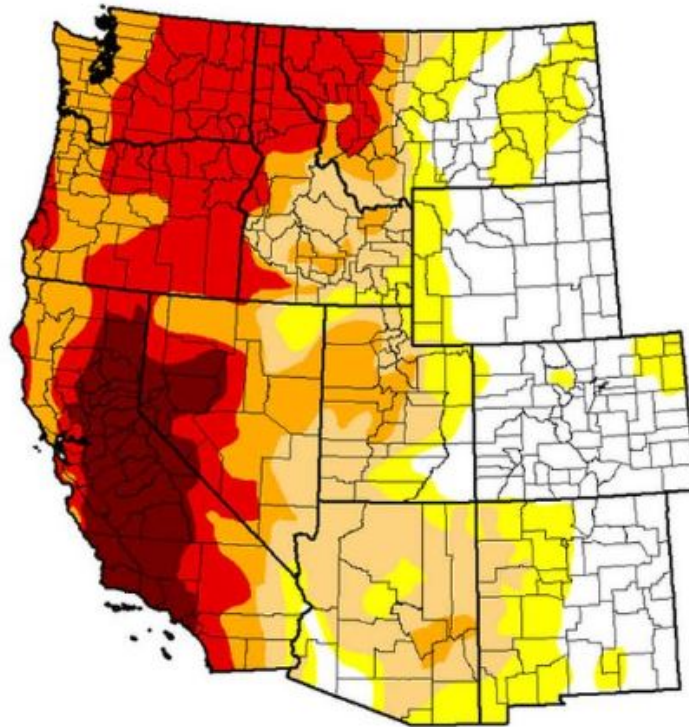
Intensity:

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The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

2015 Drought

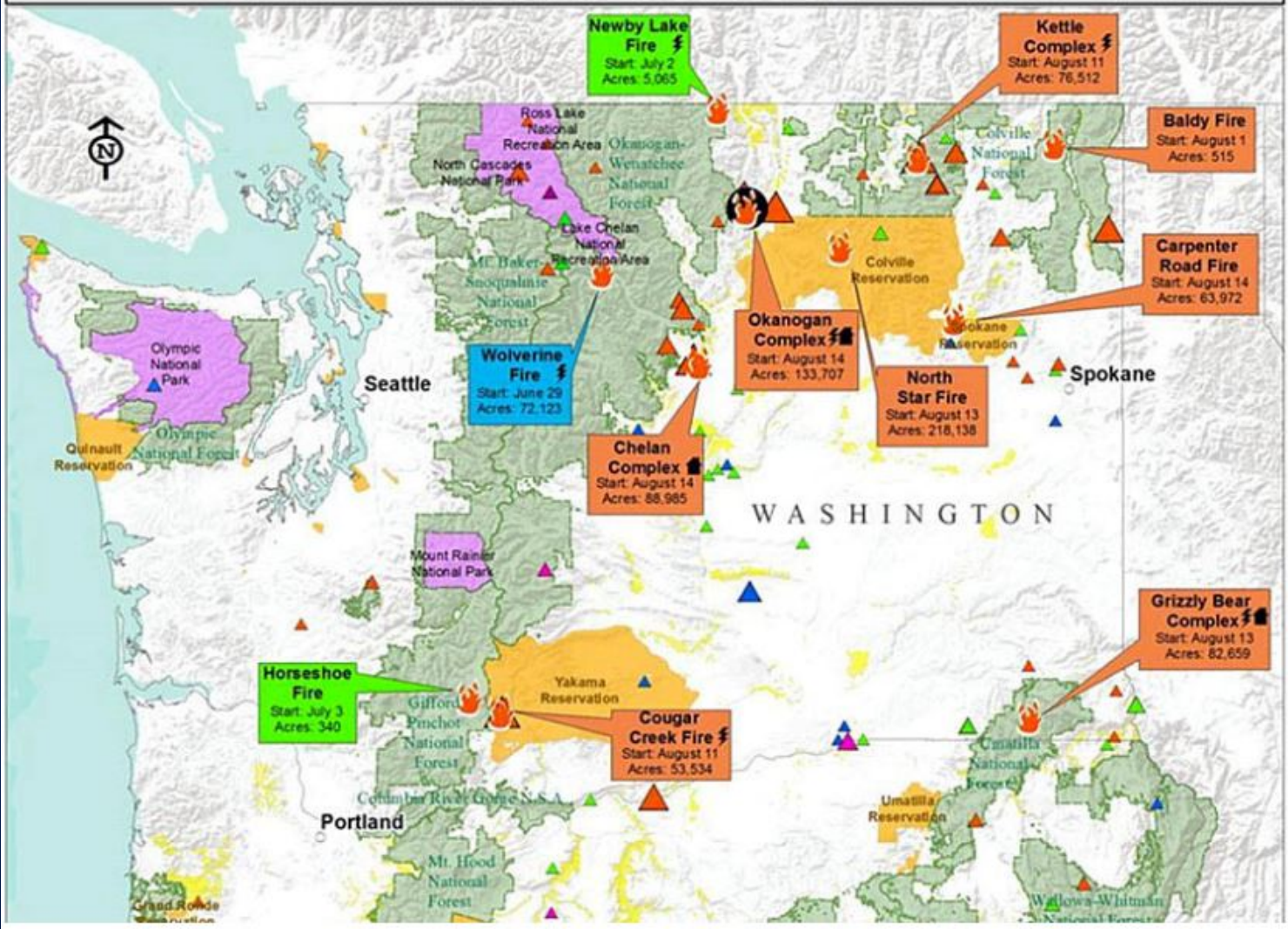
U.S. Drought Monitor West



September 15, 2015
(Released Thursday September 17, 2015)
Valid 8 a.m. EDT

2015 Drought

NARRATIVE TIMELINE OF THE PACIFIC NORTHWEST 2015 FIRE SEASON



2015 Drought

Warm Water Blamed for Huge Columbia River Sockeye Die-off

JULY 31, 2015 JOHN HARRISON



THE PACIFIC NORTHWEST FIRE SEASON



2015 Drought

Warm Water Blamed for Huge Columbia River Sockeye Die-off

JULY 31, 2015 JOHN HARRISON



Dozens of sturgeon found dead

Originally published July 16, 2015 at 6:56 am | Updated July 16, 2015 at 12:23 pm



THE PACIFIC NORTHWEST FIRE SEASON



2015 Drought

Warm Water Blamed for Huge Columbia River Sockeye Die-off

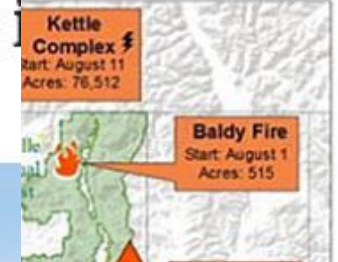
JULY 31, 2015 JOHN HARRISON



THE PACIFIC NORTHWEST FIRE SEASON

Dozens of sturgeon found dead

Originally published July 16, 2015 at 6:56 am | Updated July 16, 2015 at 12:23 pm



Bluetongue outbreak confirmed in Eastern Washington deer

Twitter

Facebook

Reddit

UPDATE: Idaho confirms bluetongue-like outbreak killing whitetails in Clearwater region. [See post here.](#)

WILDLIFE -- A deadly outbreak of bluetongue among Spokane-region white-tailed deer -- which I reported earlier this week -- has been officially confirmed by the Washington Department of Fish and Wildlife.

Although hundreds of deer may be dying from the disease in the state's drought-stricken eastern region, wildlife managers say this year's hunting seasons will not be affected.

WDFW veterinarian Kristin Mansfield said today that bluetongue is a common virus transmitted by biting gnats at water sources where deer congregate during dry conditions. Every year in late summer and early fall, some white-tailed deer are lost to bluetongue and a similar virus known as EHD (epizootic hemorrhagic disease).

She said the department does not know precisely how many deer have been affected, but reports are more widespread and numerous than in the past, probably because of the severe drought across the region.



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2016-2017 Winter

Seven western states report heavy winter losses of deer, elk

July 3, 2017 by Associated Press

CHEYENNE, Wyo. managers are reporting heavy losses of deer and other wildlife in the snowiest winters found:

Harsh winter took heavy toll on wildlife across western U.S.

UPDATED: Sun., July 2, 2017

Twitter

Facebook

Email

Reddit

By Bob Moen

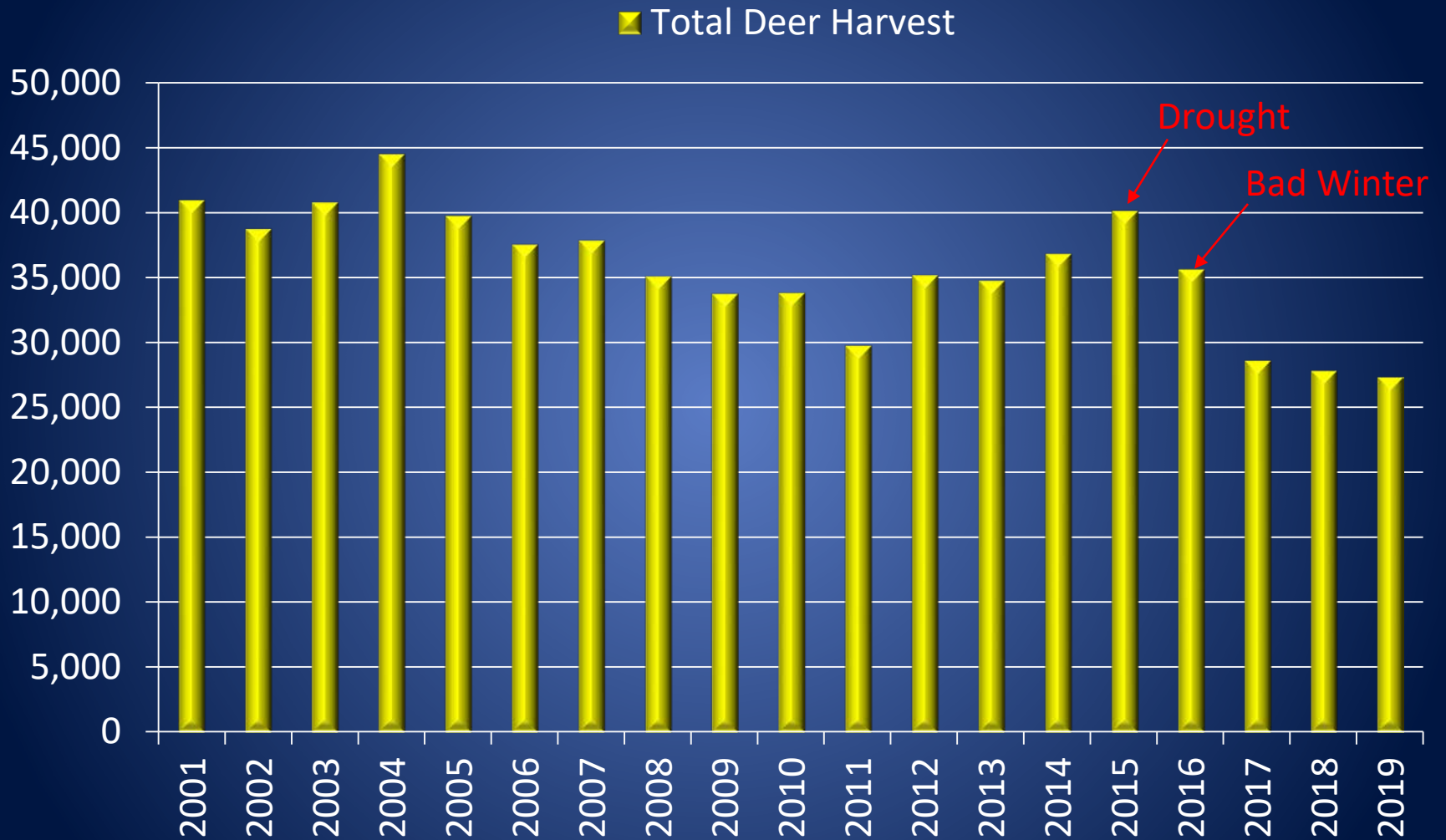
Deer Hunting Limited In Colorado, Other Western U.S. States After Tough Winter

November 25, 2017 at 10:30 am Filed Under: Elk, Mule Deer

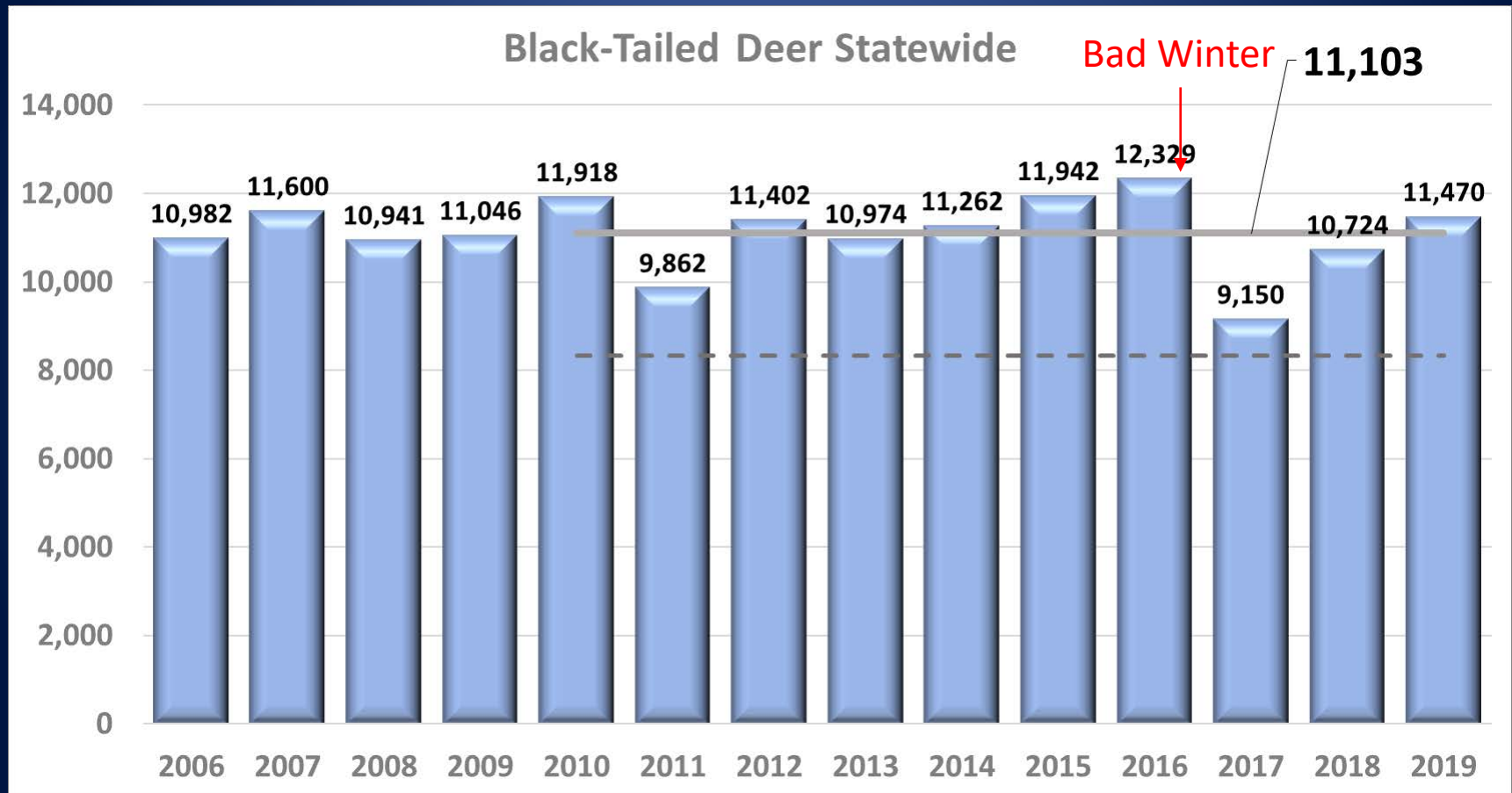
Phillips: Winter kills Idaho mule deer fawns at 2nd-highest rate in nearly 20 years

ROGER PHILLIPS Idaho Department of Fish and Game Jun 27, 2017 0

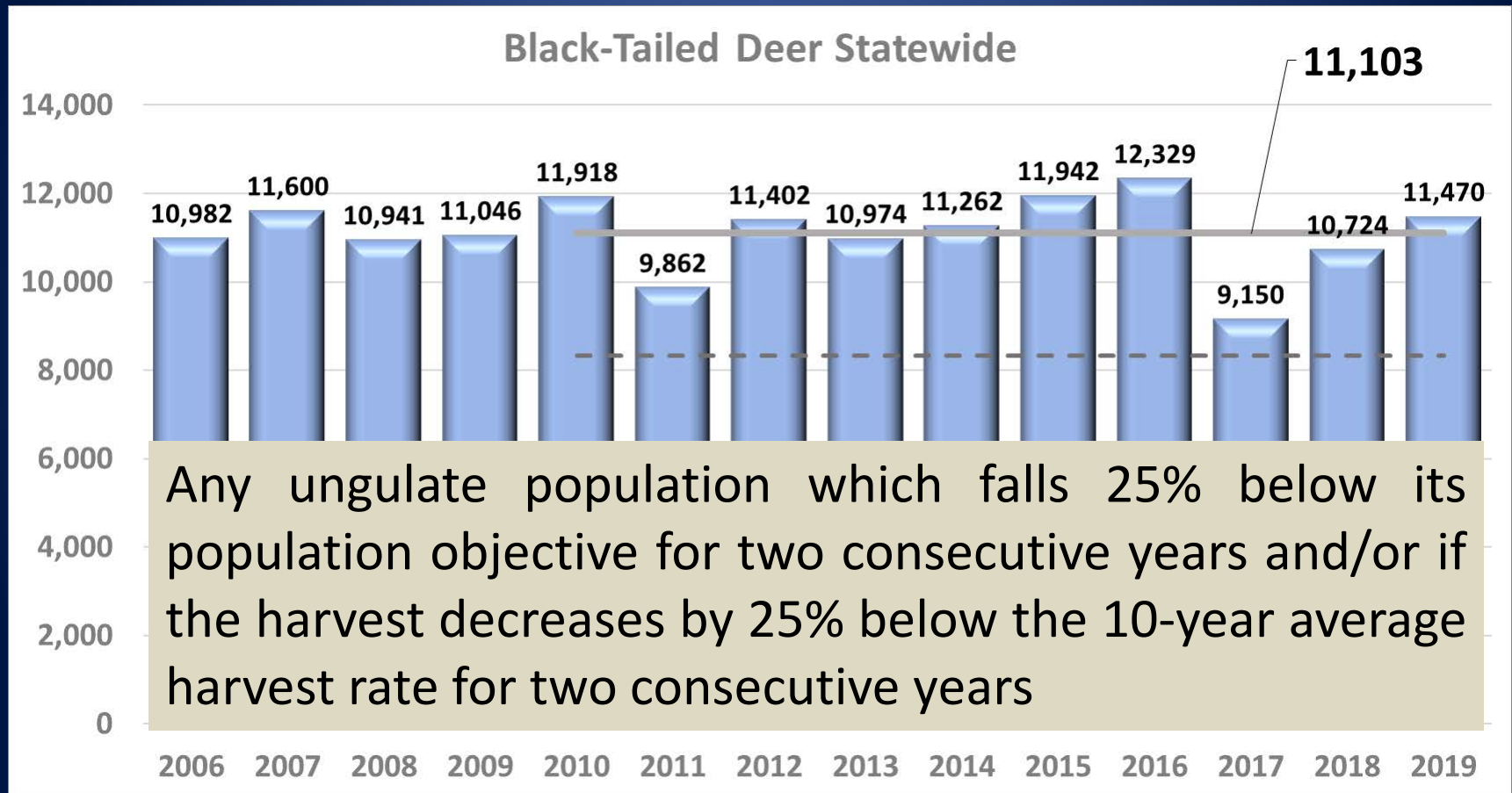
Statewide Deer Harvest 2001-2018



Black-Tailed Deer General Season Harvest 2006-2019

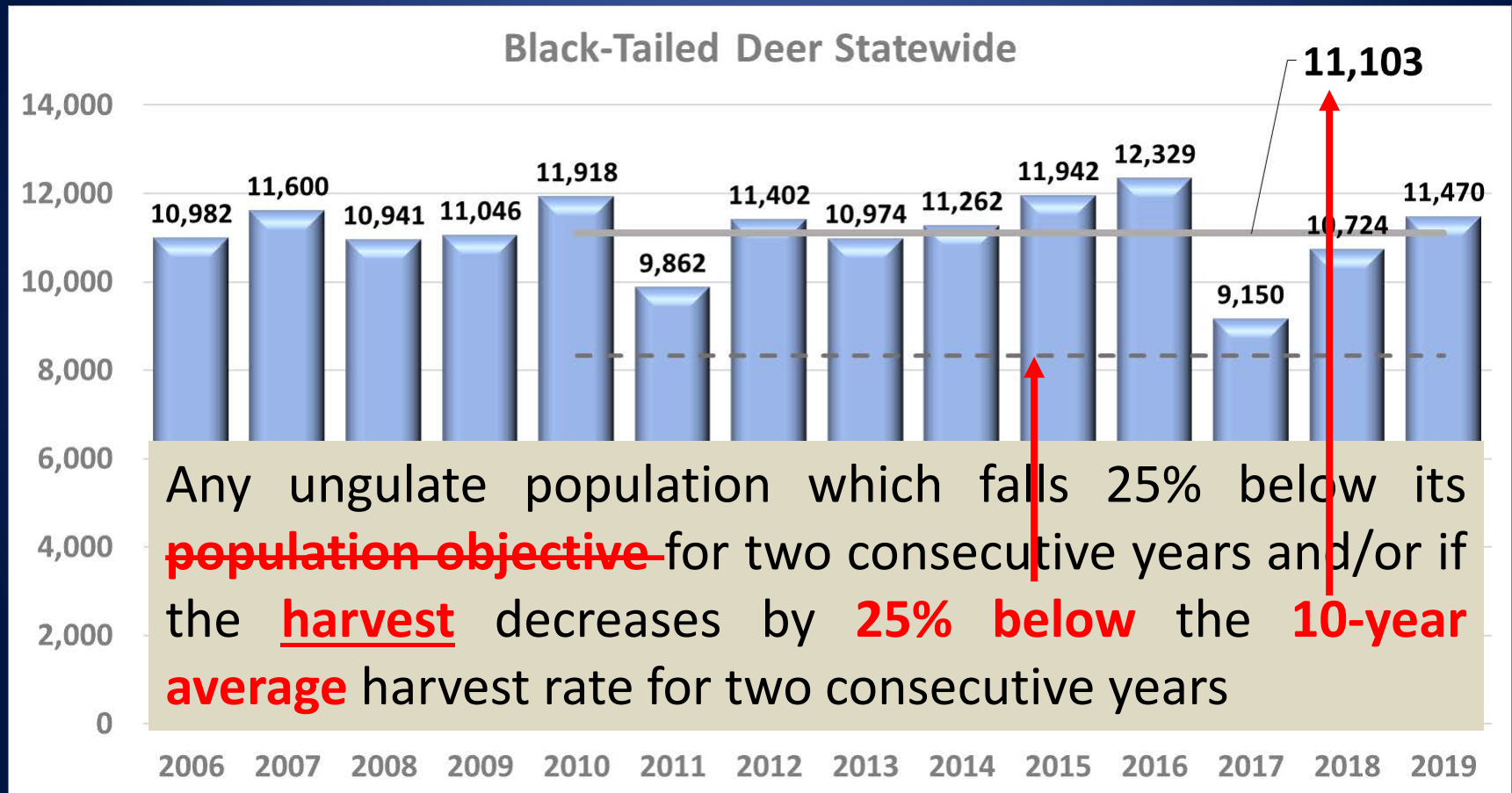


Black-Tailed Deer General Season Harvest 2006-2019



Black-Tailed Deer

General Season Harvest 2006-2019



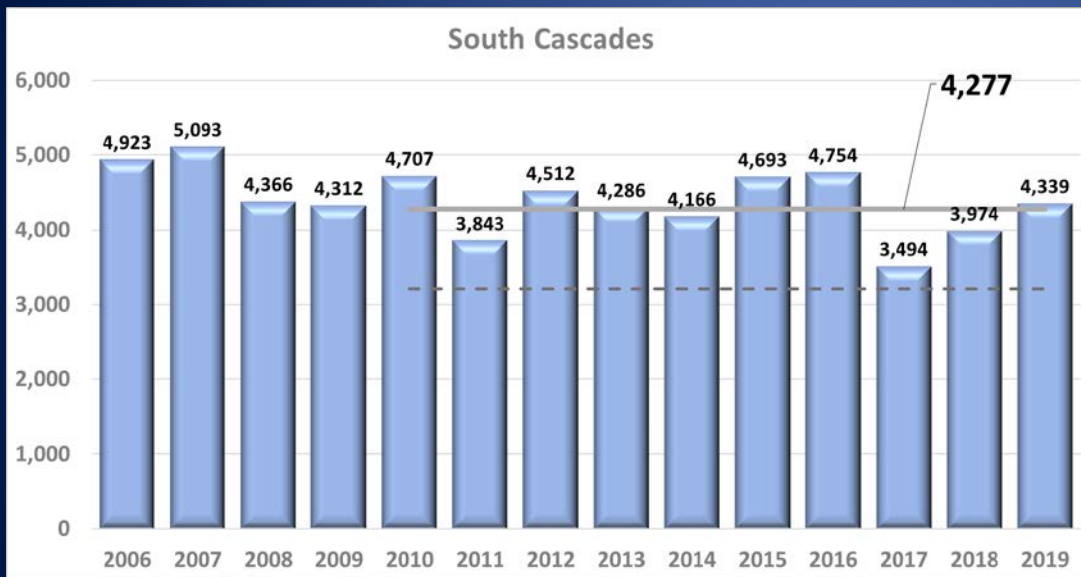
Black-Tailed Deer



South Cascades

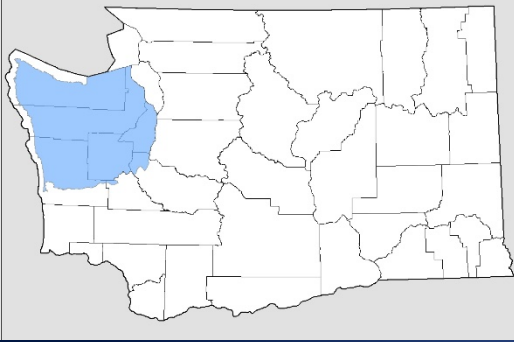


Where is the South Cascades Zone?

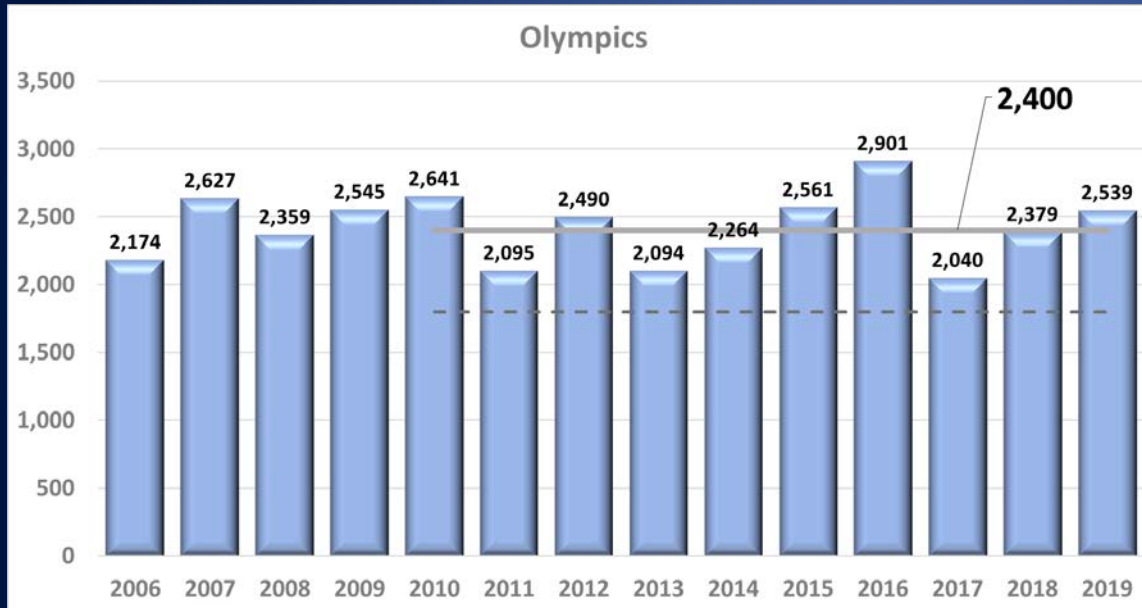


- Changed a legal deer from “Any Buck” to “Any Deer” in GMU 654 during the late-muzzleloader season

Quality Permits		2018	2019
GMU 485	Any Weapon	5	5
GMU 505	Modern Firearm	4	2
Total		9	7
Buck Permits		2018	2019
GMU 485	Youth	5	0
GMU 485	Disabled	0	5
Total		5	5
Antlerless Permits		2018	2019
GMU 554	Youth	10	5
GMU 510	65+	5	0
GMU 513	65+	5	0
GMU 516	65+	5	0
GMU 554	65+	5	2
GMU 560	65+	2	0
GMU 572	65+	2	0
GMU 574	65+	2	0
GMU 578	65+	2	0
GMU 510	Disabled, MF	2	0
GMU 513	Disabled, MF	2	0
GMU 516	Disabled, MF	2	0
GMU 554	Disabled, MF	2	0
GMU 560	Disabled, MF	1	0
GMU 572	Disabled, MF	1	0
GMU 574	Disabled, MF	1	0
GMU 578	Disabled, MF	1	0
GMU 574	Disabled, Archery	1	0
GMU 578	Disabled, Archery	1	0
Total		52	7



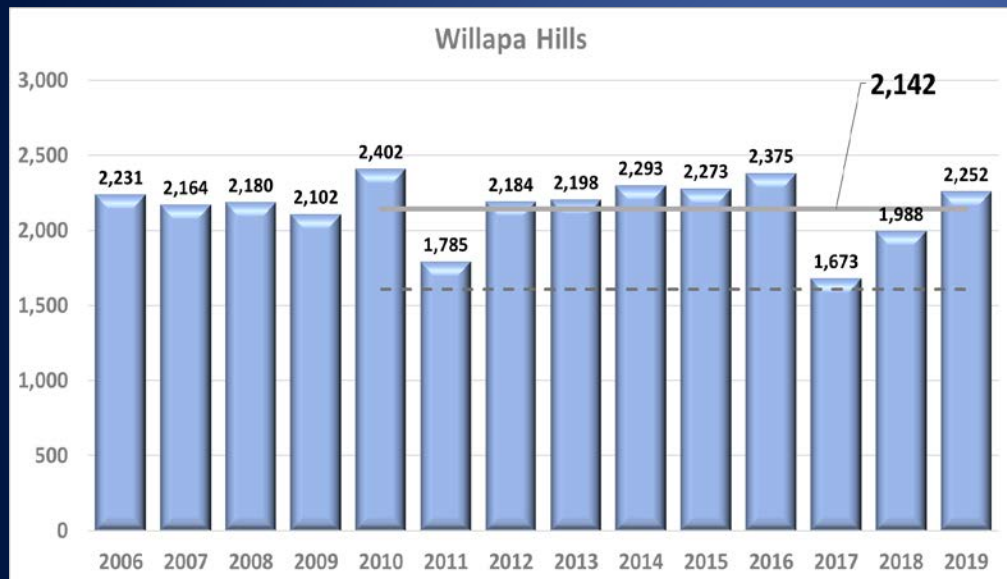
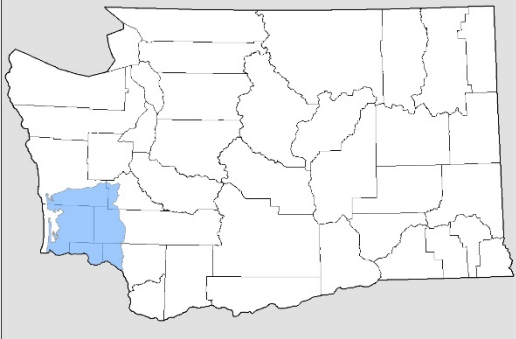
Olympics



- No changes proposed for general seasons

Antlerless Permits		2018	2019
GMU 624	Modern Firearm	20	15
GMU 648	Modern Firearm	20	30
GMU 621	Muzzleloader	20	30
GMU 624	Muzzleloader	15	20
GMU 627	Muzzleloader	10	0
GMU 648	Muzzleloader	15	25
GMU 651	Muzzleloader	15	20
GMU 621	Youth, Any Deer	15	20
GMU 648	Youth, Any Deer	12	20
GMU 621	65+	10	15
GMU 648	65+	10	15
GMU 658	65+	10	15
GMU 660	65+	10	15
GMU 663	65+	12	15
GMU 621	Disabled, MF	10	15
GMU 627	Disabled, MF	5	0
GMU 633	Disabled, MF	5	0
GMU 636	Disabled, MF	10	15
GMU 621	Disabled, Muzz	10	0
GMU 633	Disabled, Muzz	5	0
GMU 636	Disabled, Muzz	5	0
GMU 648	Disabled, Muzz	5	10
GMU 651	Disabled, Muzz	10	0
Total		259	295

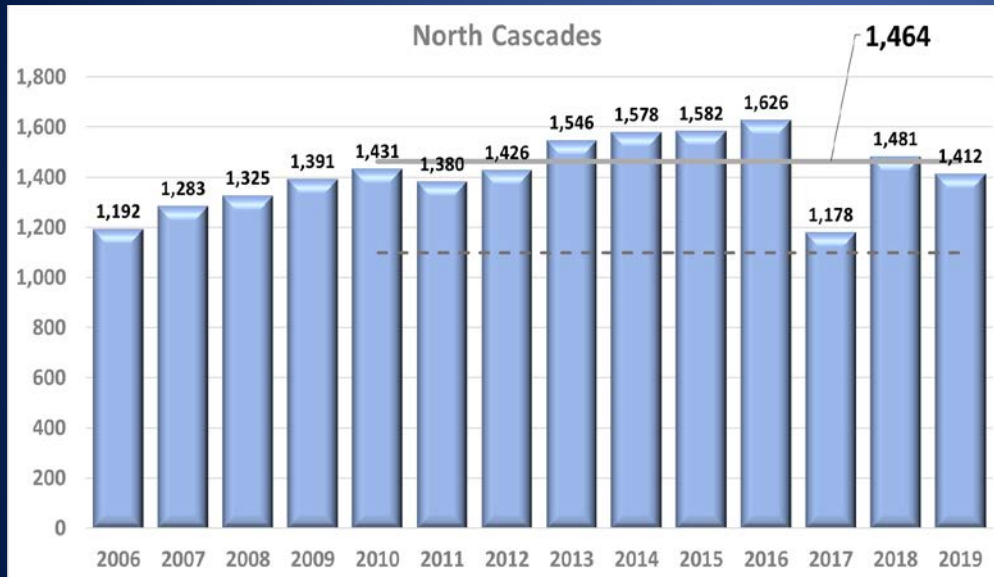
Willapa Hills



- No changes proposed for general seasons

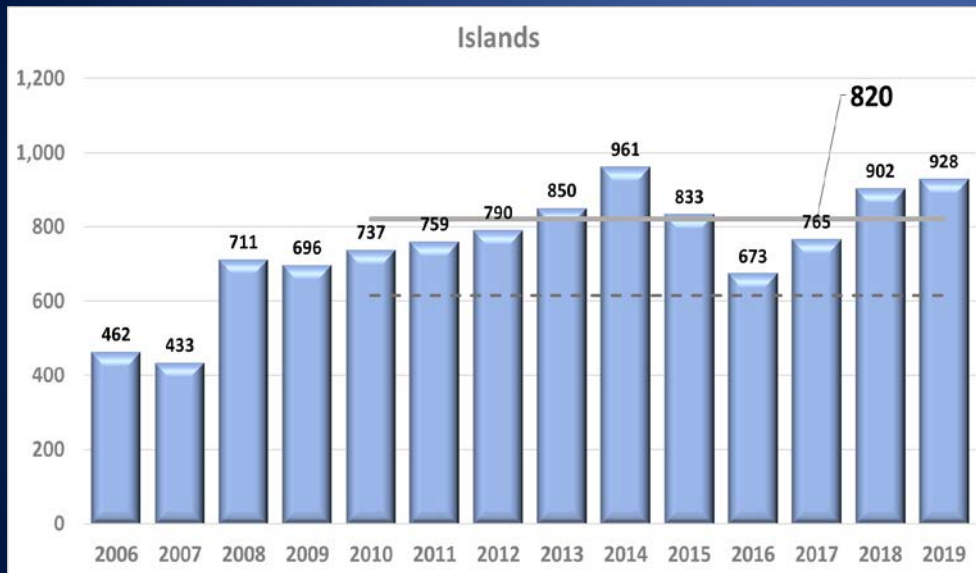
Quality Permits		2018	2019
GMU 660	Modern Firearm	4	5
GMU 663	Modern Firearm	7	8
GMU 672	Modern Firearm	4	5
Total		15	18
Buck Permits		2018	2019
GMU 673	Modern Firearm	7	5
Total		7	5
Antlerless Permits		2018	2019
GMU 660	Modern Firearm	15	20
GMU 663	Modern Firearm	12	15
GMU 660	Muzzleloader	5	10
GMU 663	Muzzleloader	18	20
GMU 673	Muzzleloader	5	10
GMU 660	Youth, Any Deer	6	10
GMU 663	Youth, Any Deer	8	15
GMU 663	Disabled, MF	5	10
GMU 658	Disabled, Muzz	5	3
GMU 663	Disabled, Muzz	8	5
Total		87	118

North Cascades



- No changes proposed for general or special permit seasons

Islands



Antlerless Permits		2018	2019
Orcas	MF, 2nd Deer	60	70
San Juan	MF, 2nd Deer	50	60
Lopez	MF, 2nd Deer	60	70
Blakely	MF, 2nd Deer	30	40
Whidbey	MF, 2nd Deer	150	175
Orcas	Archery, 2nd Deer	40	45
San Juan	Archery, 2nd Deer	30	40
Lopez	Archery, 2nd Deer	30	40
Whidbey	Archery, 2nd Deer	50	75
Whidbey	Muzz, 2nd Deer	20	25
Total		520	640

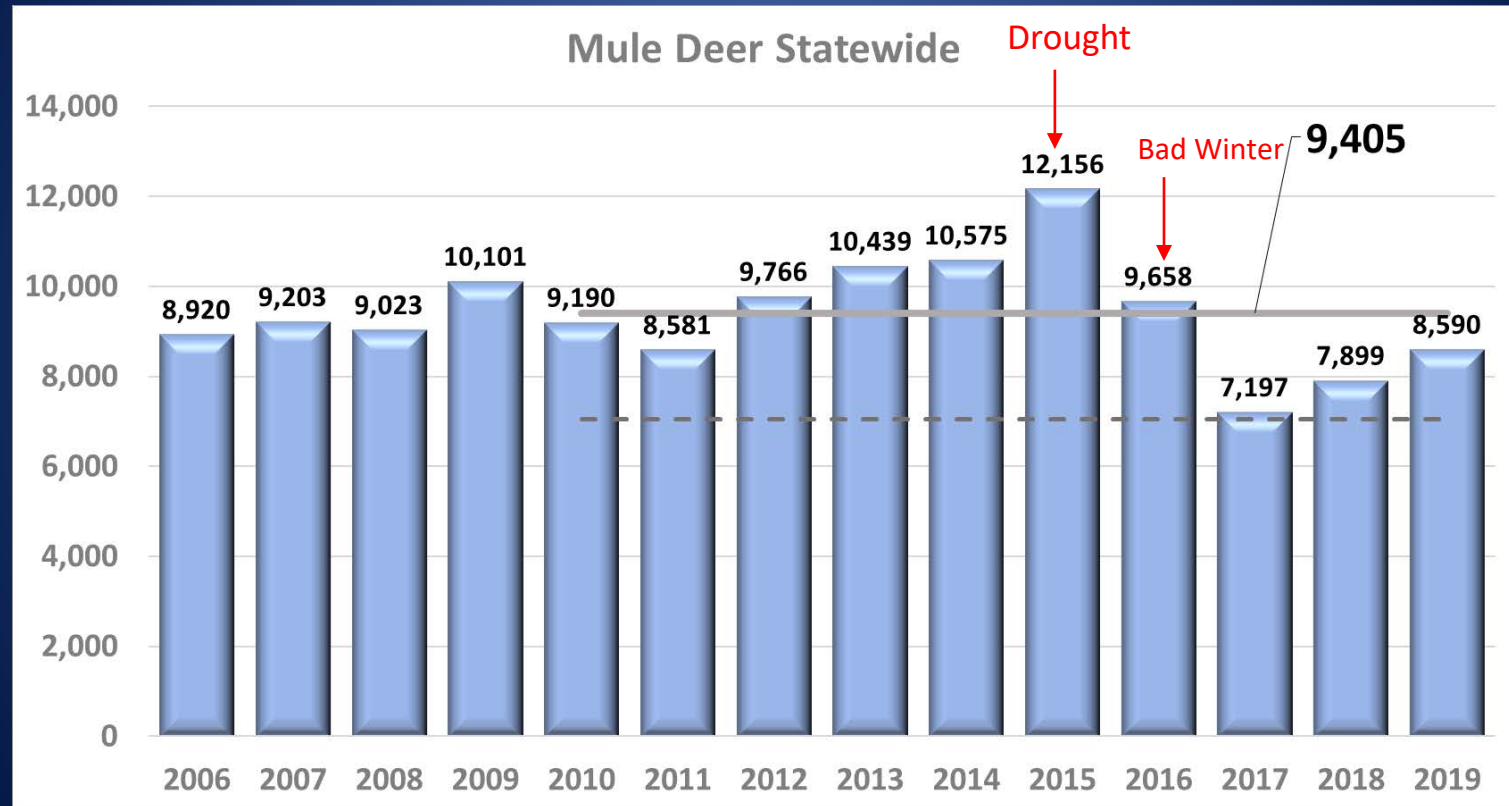
- No changes proposed for general seasons

Questions?

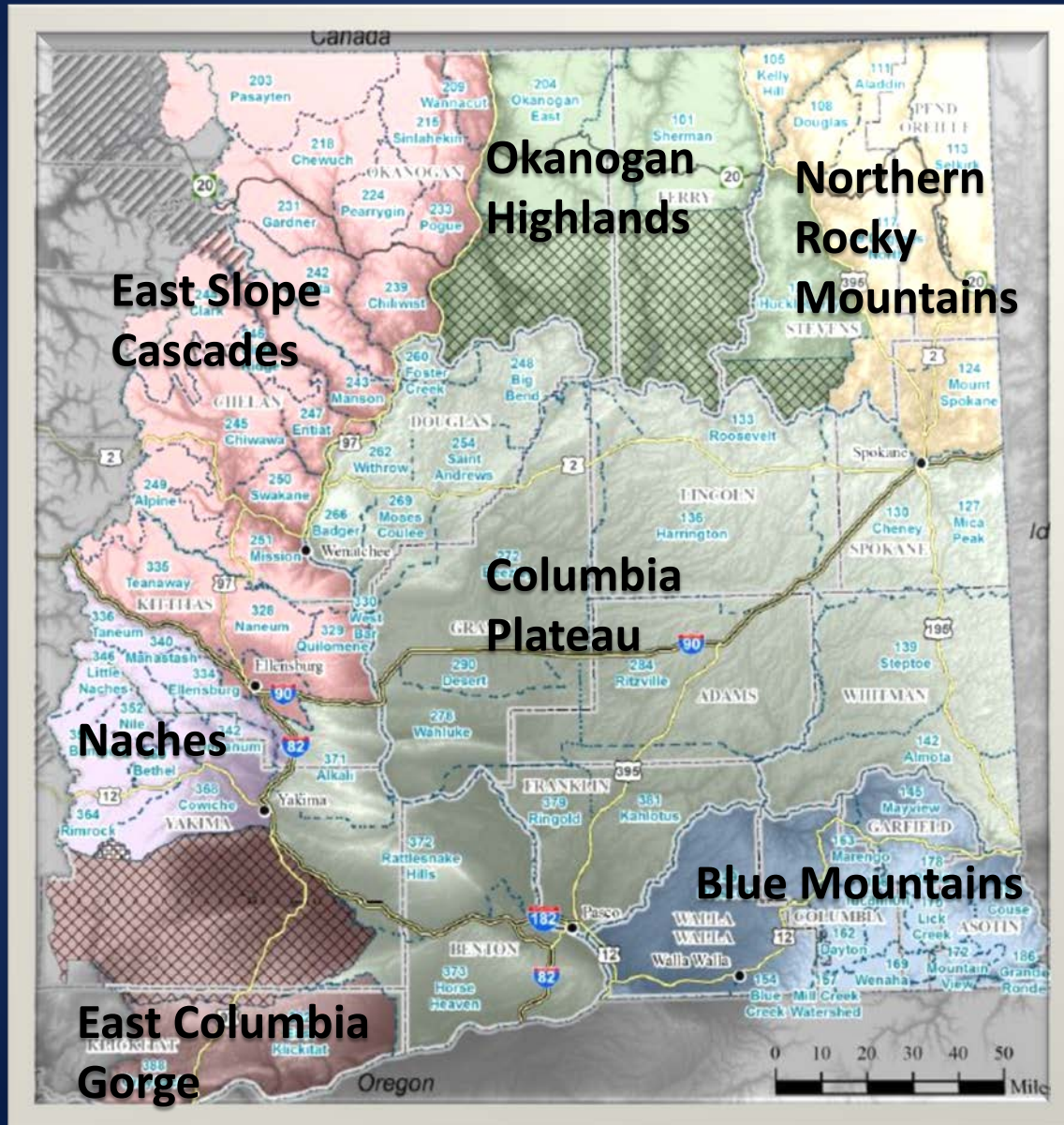


Mule Deer

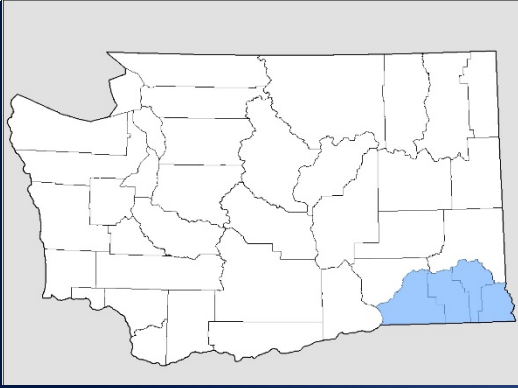
General Season Harvest 2006-2018



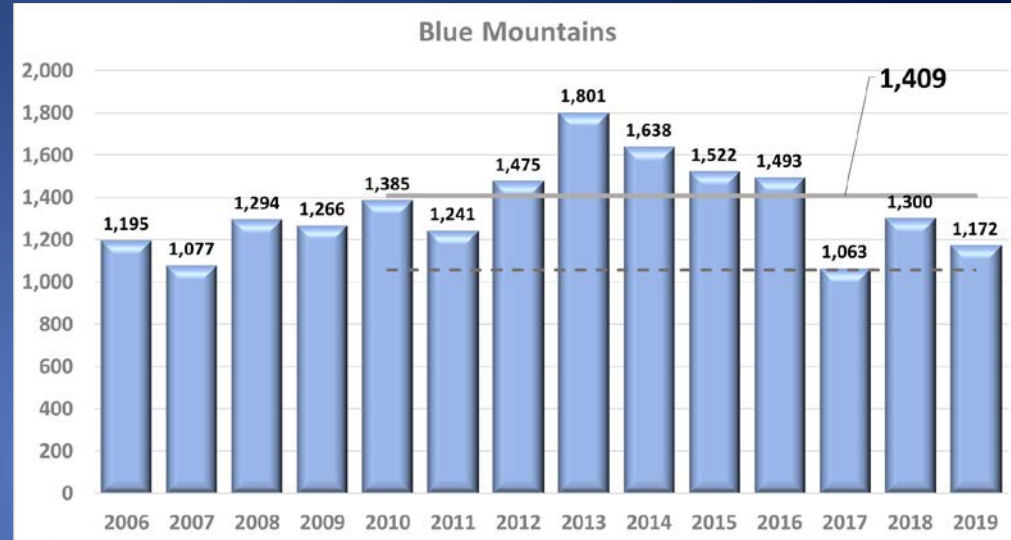
Mule Deer



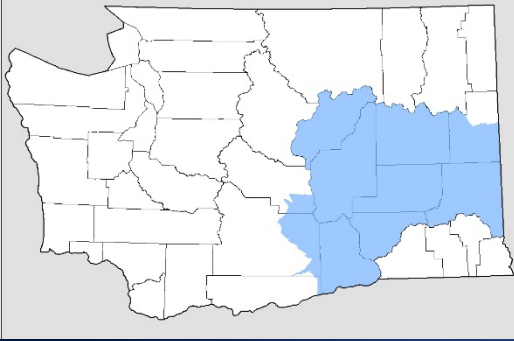
Blue Mountains



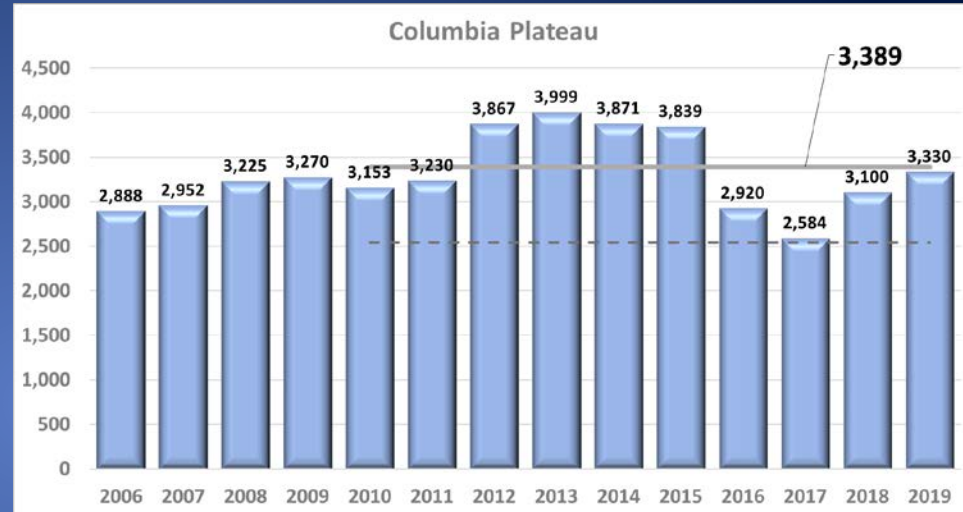
- Buck:Doe ratios at objective
- Fawn:Doe ratios have hovered around long-term average (~55-60:100)
- No changes proposed for general or special permit seasons



Columbia Plateau



- 3 subherds
- Buck:Doe ratios at objective
- Fawn:Doe ratios have hovered around long-term average (~65-70:100) or have been increasing
- No changes proposed for general seasons
- Added 5 archery buck (3-pt. min) permits in GMU 379, Nov. 15-24

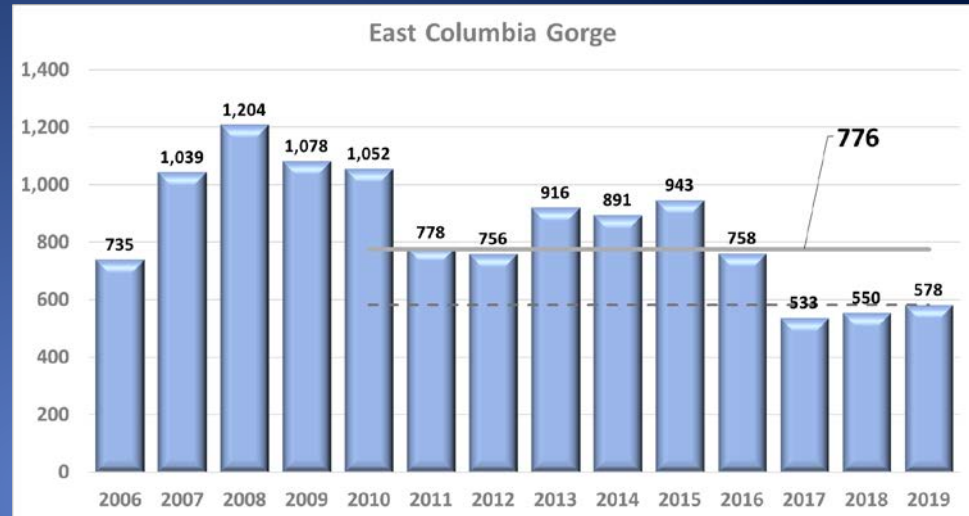


Antlerless Permits		2018	2019
GMU 133	2nd Deer	100	75
GMUs 139, 142, 284, 381	2nd Deer	350	300
GMU 290	Youth	2	3
Total		452	378



East Columbia Gorge

- Initiated formal surveys in 2016
- Buck:Doe ratios at objective
- Fawn:Doe ratios have been stable (~60:100)
- Extended the season for archery Buck permits in Deer Area 5382 to include Sep. 1-25 and **Dec. 1-8**

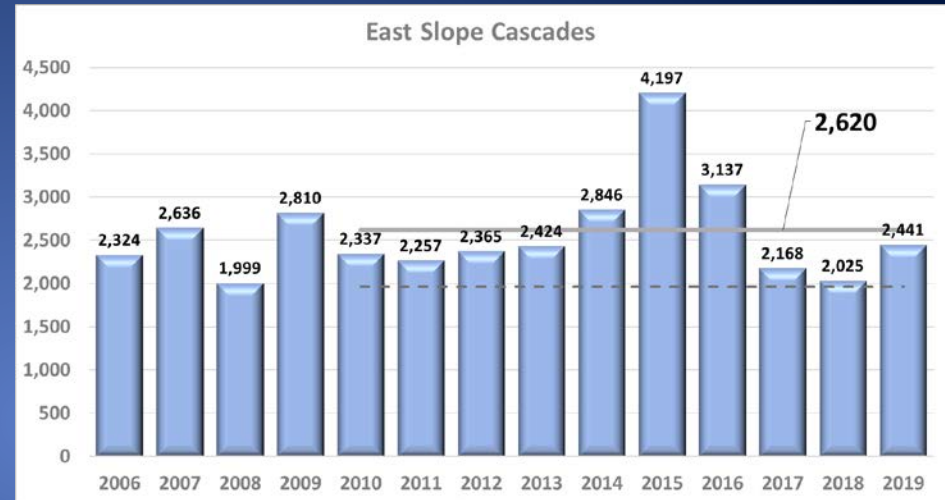


Buck Permits		2018	2019
DA 5382	Modern Firearm	3	5
Total		3	5
Antlerless Permits		2018	2019
DA 5382	Youth, Any Deer	2	3
GMU-382	65+	2	0
GMU-382	Disabled	2	0
Total		6	3



East Slope Cascades

- 3 subherds
 - Surveys in Northern and Chelan subherds
- Buck:Doe ratios in the Northern subherd have declined in recent years to levels at the lower end of our objective (15-19:100)
- Fawn:Doe ratios declined below long-term average (~75:100), 2016-2018, but returned to normal in 2019
- No changes proposed for general seasons

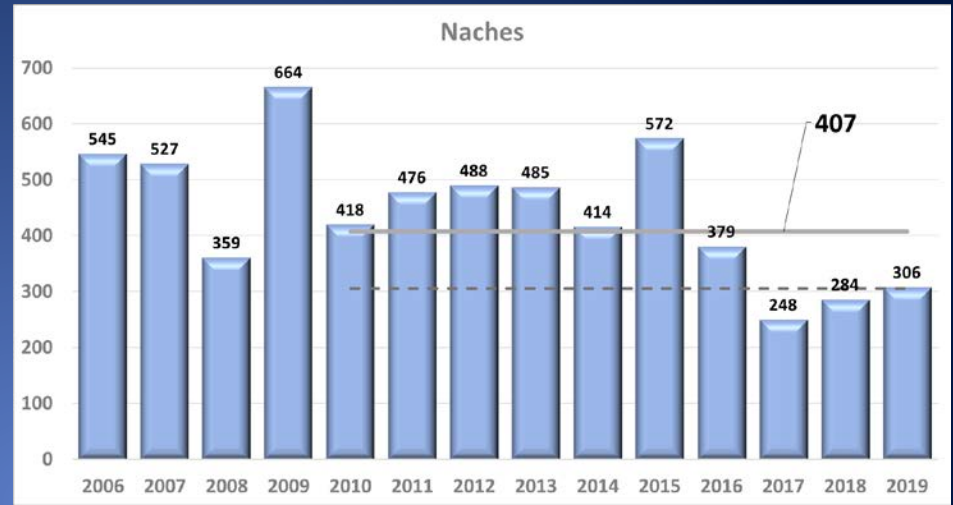


Quality Permits		2018	2019
GMU 224	Modern Firearm	20	15
GMU 231	Modern Firearm	12	10
GMU 242	Modern Firearm	18	15
GMU 242	Muzzleloader	15	10
Total		65	50

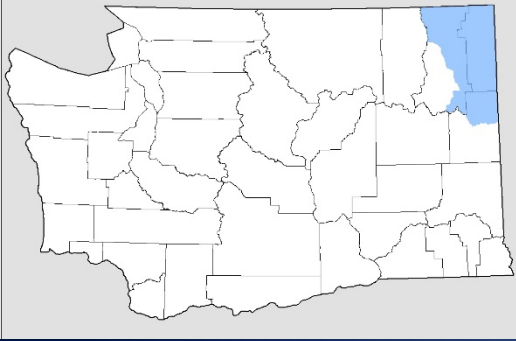
Naches



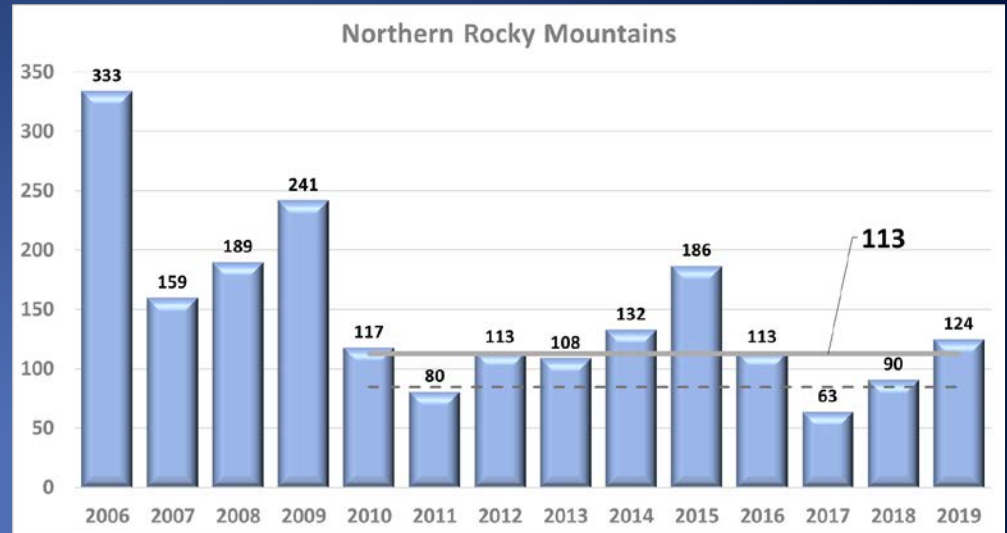
- Historically, surveys conducted in spring to estimate abundance
- Mix of black-tailed deer and mule deer make it difficult to classify deer
- Ground surveys in December to estimate ratios, but not conducted since 2017 because few deer observed
- No changes proposed for general or special permit seasons



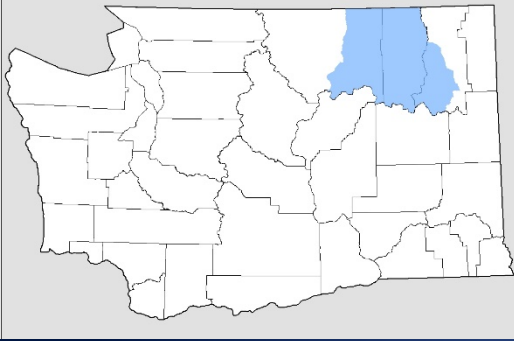
Northern Rocky Mountains



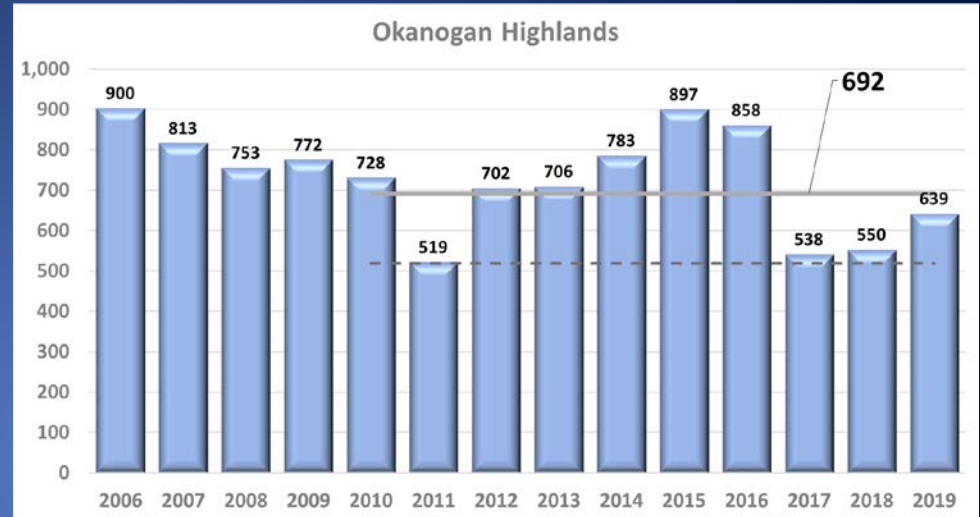
- Mule deer occur throughout the zone, but in low numbers
- White-Tailed deer are management priority in this zone
- No formal surveys for mule deer
- No proposed changes for general or special permit seasons



Okanogan Highlands



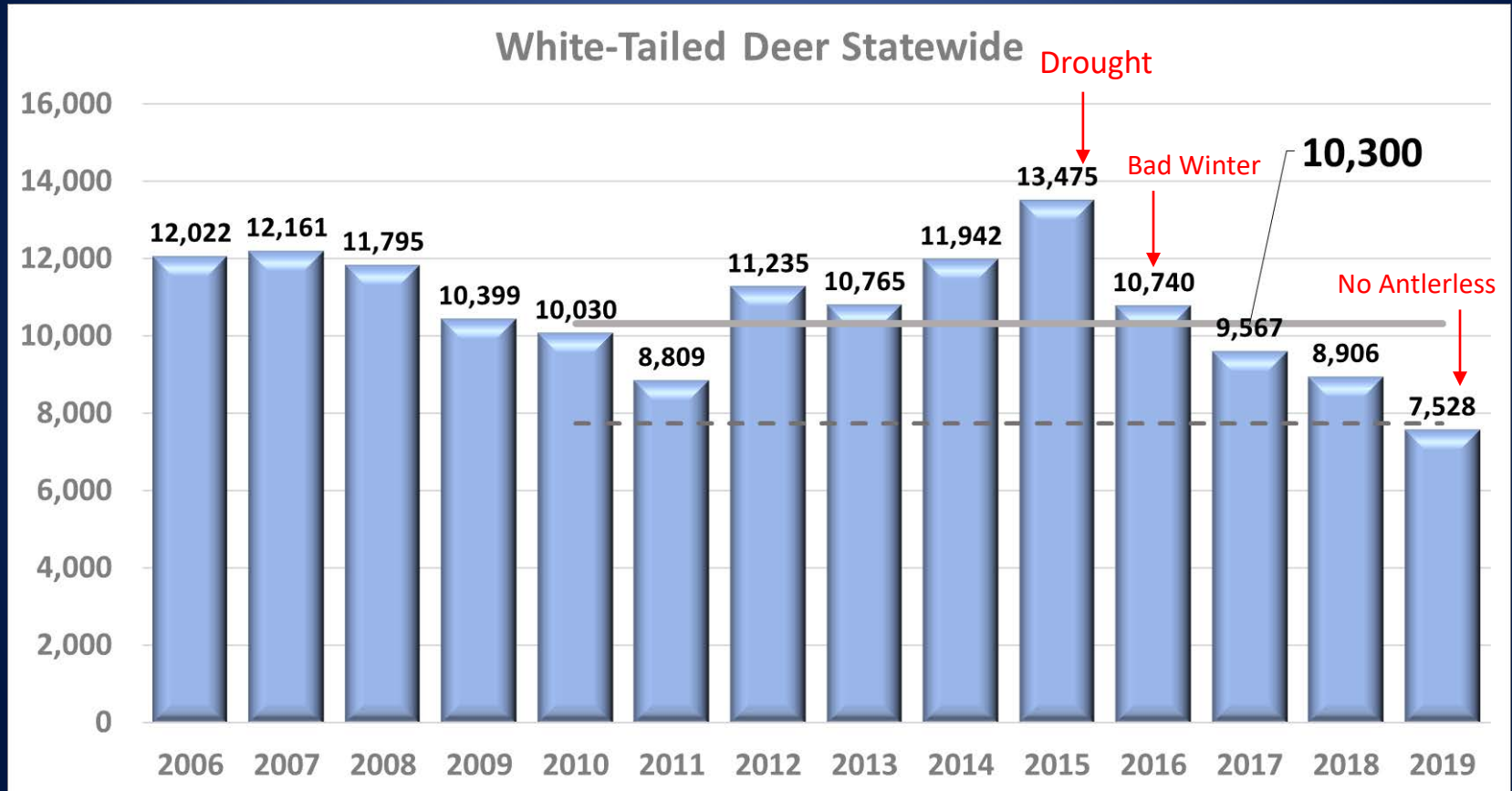
- Mule deer present throughout the zone, but much more common in western portion
- No formal surveys for mule deer
- No changes proposed for general or special permit seasons



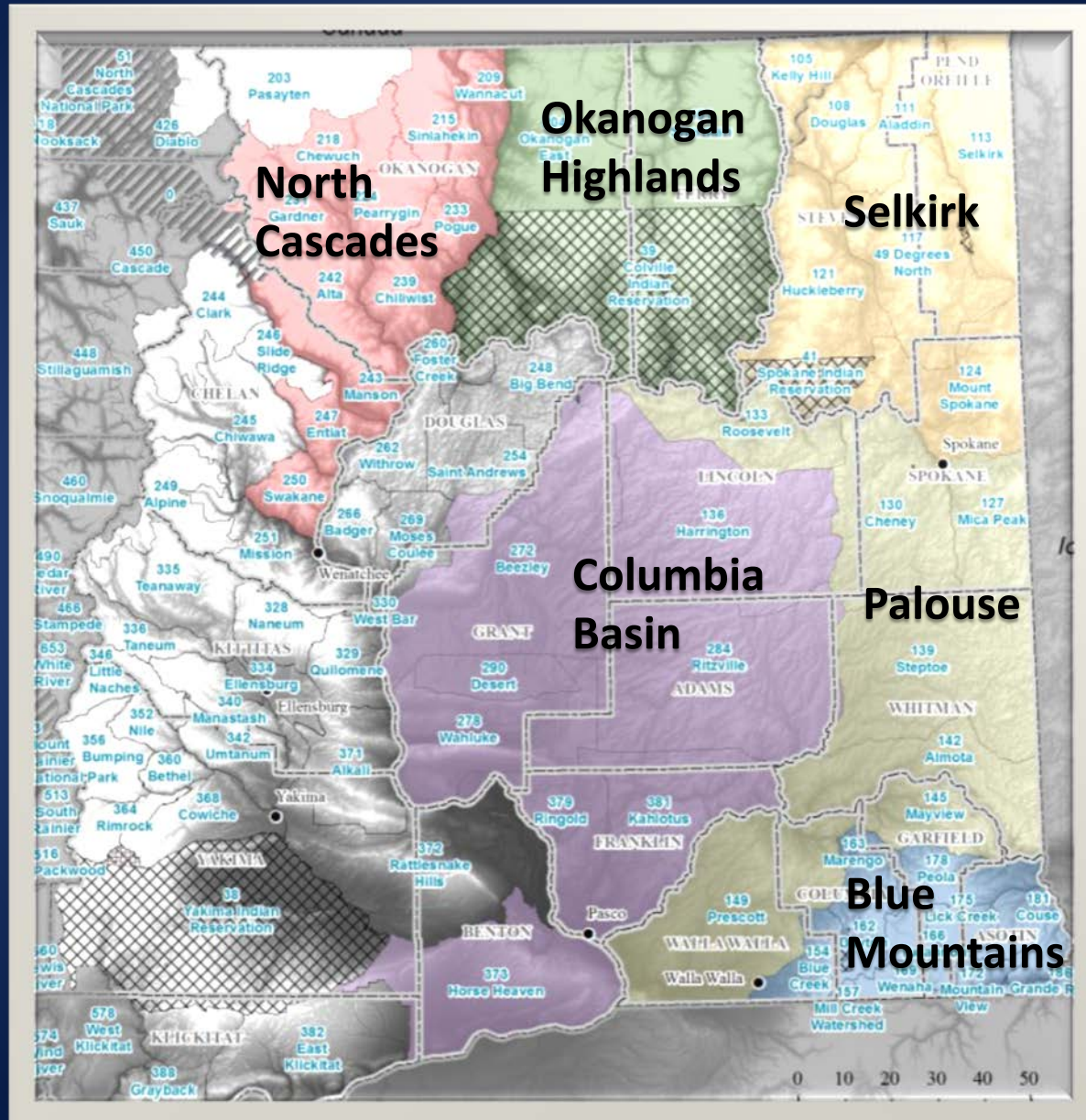
Questions?

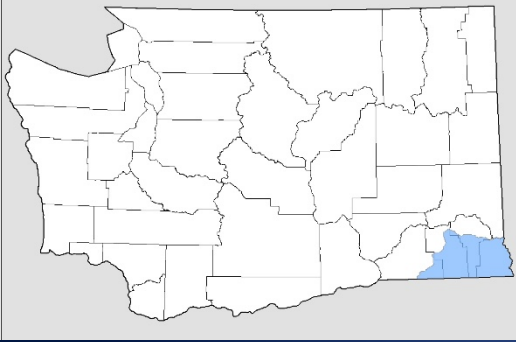


White-Tailed Deer General Season Harvest 2006-2018



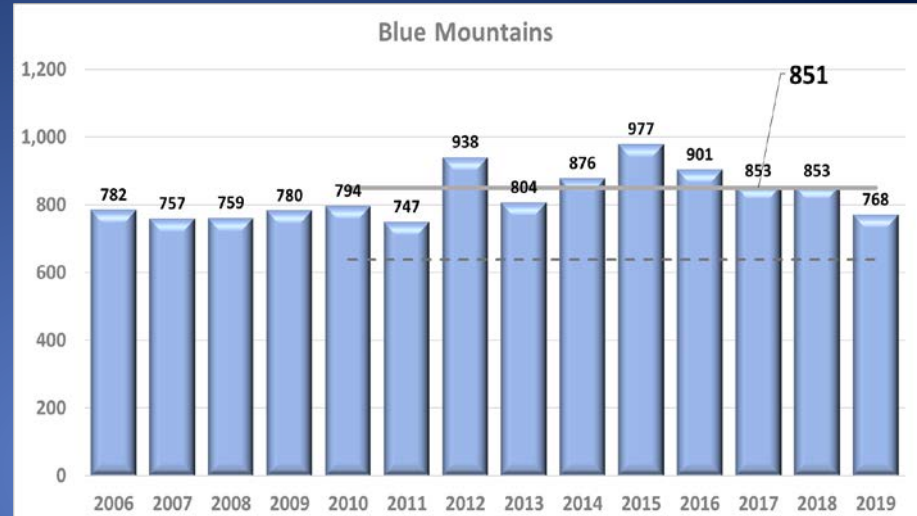
White-Tailed Deer





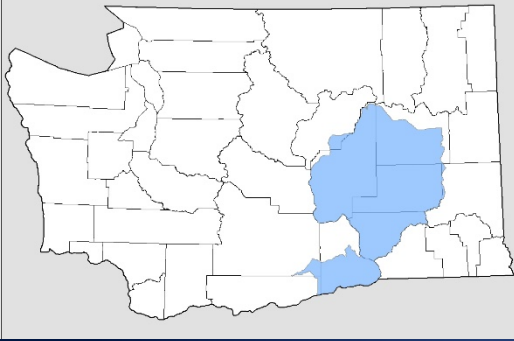
Blue Mountains

- Pre-hunt ground surveys
- Ratio estimates vary widely from year to year
 - Avg. F:D = 51:100
 - Avg. B:D = 42:100
 - 2019 estimates similar
- Removed opportunity to harvest antlerless white-tailed deer in GMU 166 during the early archery season

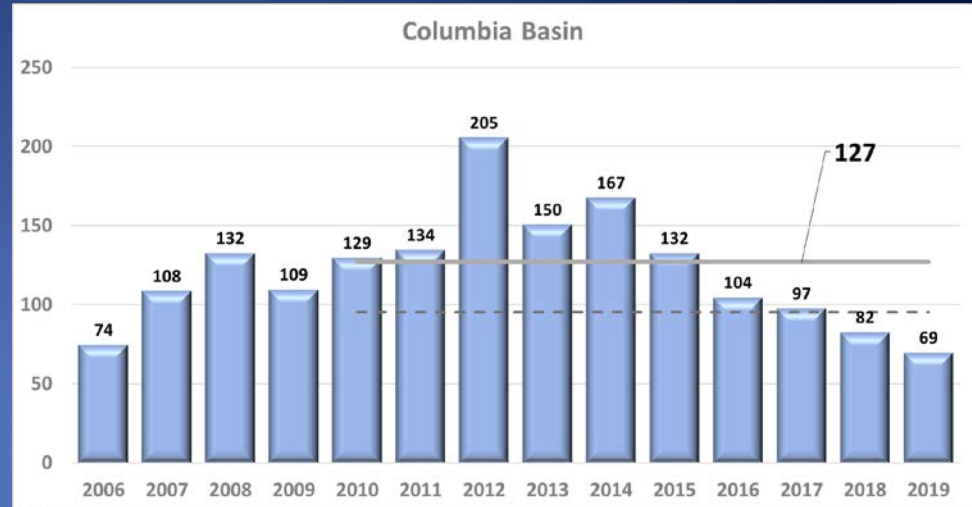


Quality Permits		2018	2019
DA 1040	Modern Firearm	2	1
Total		2	1
Antlerless Permits		2018	2019
DA 1040	Youth	5	2
GMU 186	Youth	0	3
Total		5	5

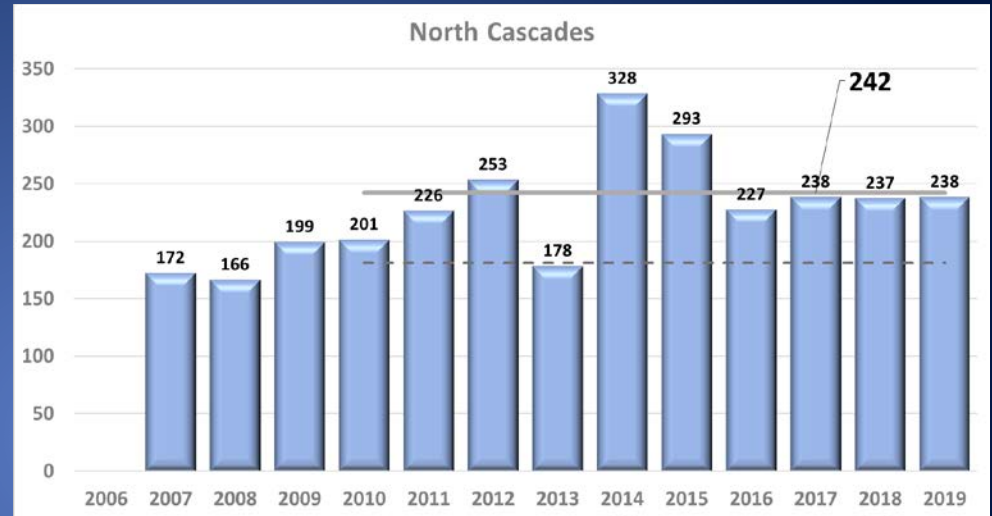
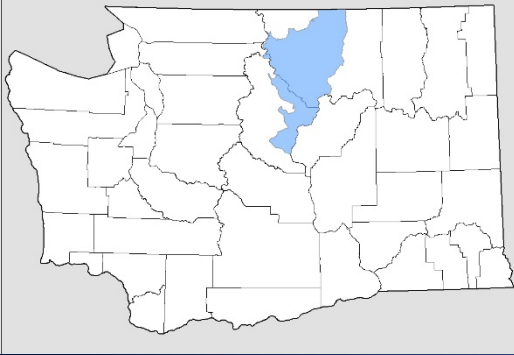
Columbia Basin



- White-Tailed deer occur in very low numbers
- Meets the criteria of an “At-Risk” ungulate population, but mule deer are the management priority in this zone
- No formal surveys
- No proposed changes for general or special permit seasons



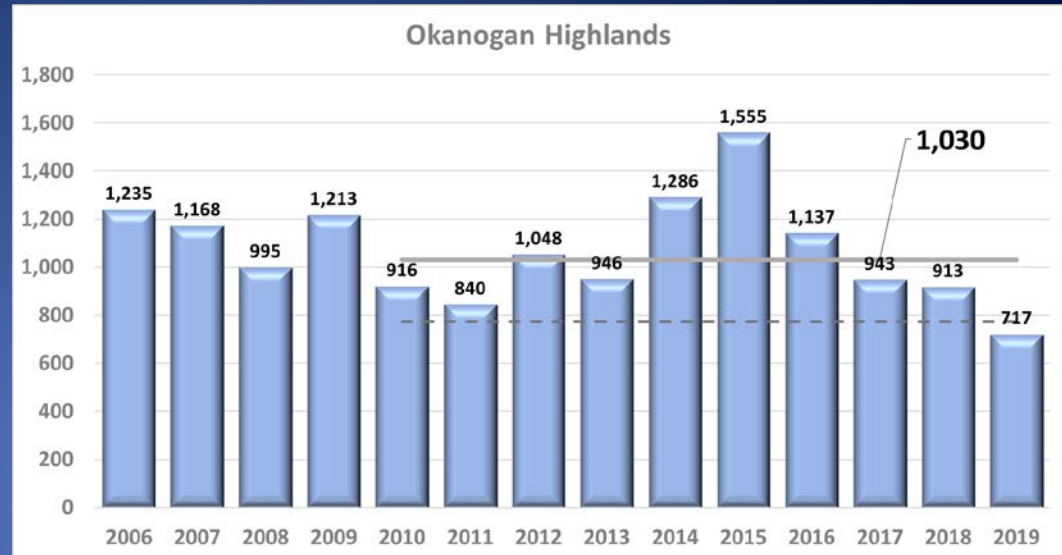
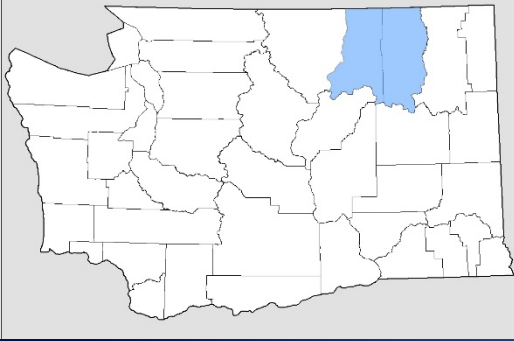
North Cascades



- White-Tailed deer occur in very low numbers
- Mule deer are the management priority in this zone
- No formal surveys
- No proposed changes for general or special permit seasons



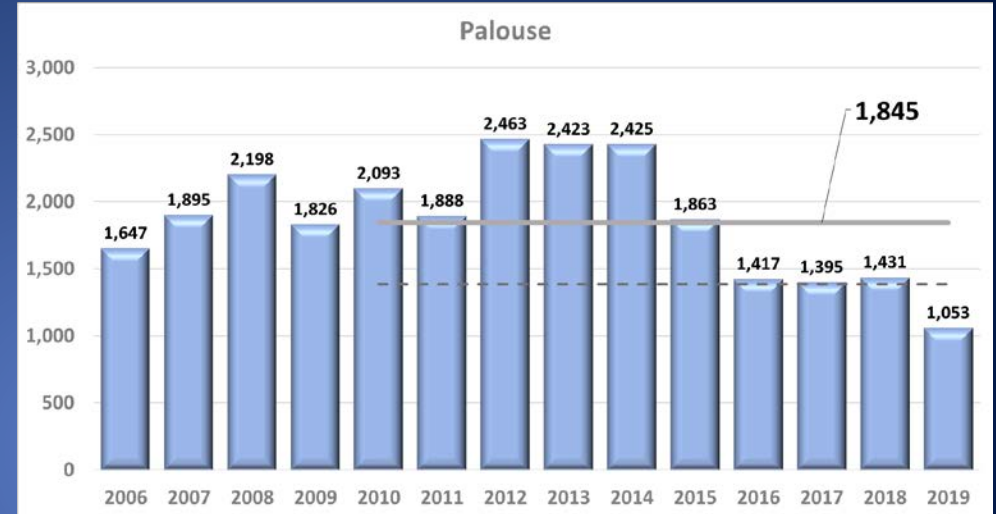
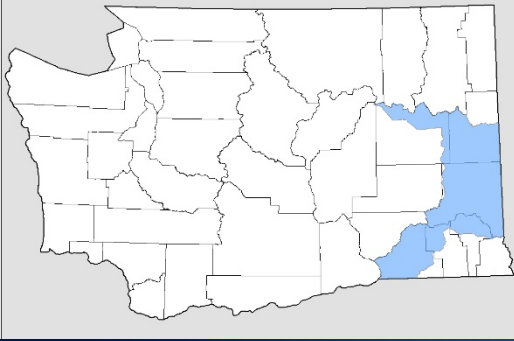
Okanogan Highlands



- White-Tailed deer occur throughout the zone, but are more common in the eastern portion
- Pre-hunt ground surveys conducted in the eastern portion to estimate buck:doe ratios, but sample sizes are usually very low (<100)
 - Avg. B:D = 32:100
- No proposed changes for general or special permit seasons

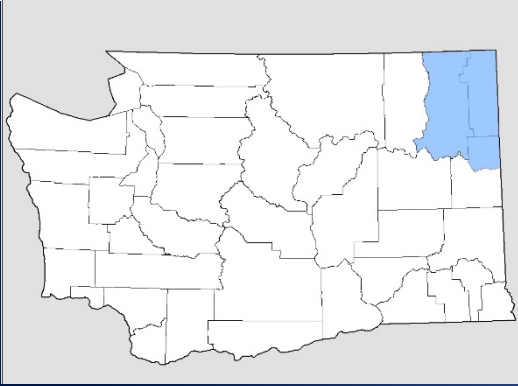


Palouse



- White-Tailed deer occur throughout the zone
- North of Snake River
 - Pre-hunt ground survey
 - Buck:Doe ratio fluctuates around the long-term average (~25-30:100)
 - Fawn:Doe ratios declined below the long-term average (~50:100), 2015-2017, but have since rebounded
- South of Snake River
 - Mule deer are the management priority
 - No formal survey
- No proposed changes for general or special permit seasons

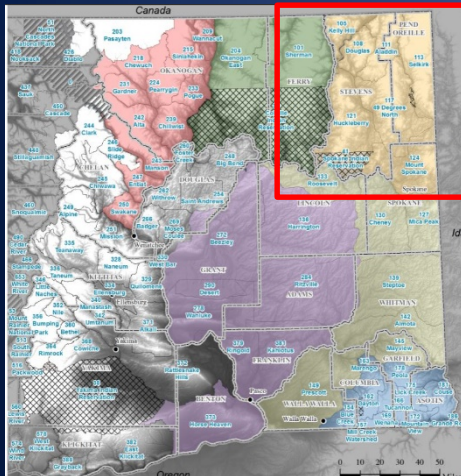
Selkirk



- No proposed changes to general or special permit seasons

District 1

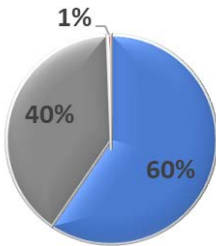
GMUs 101, 105, 108, 111, 113, 117, & 121



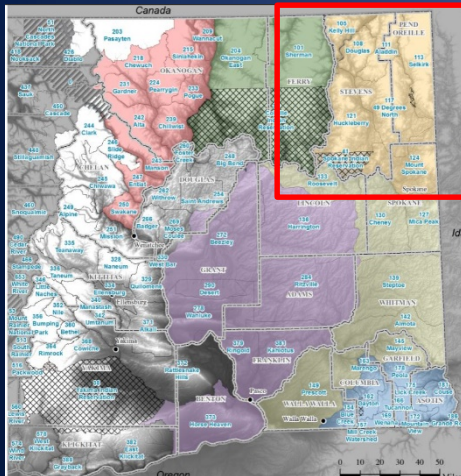
District 1

GMUs ~~101~~, 105, 108, 111, 113, 117, & 121

General Season Buck Harvest in GMU 101
by Species, 2006-2018



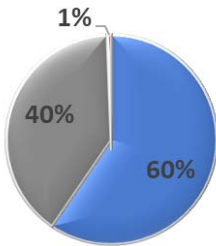
■ White-Tailed Deer ■ Mule Deer ■ Black-Tailed Deer



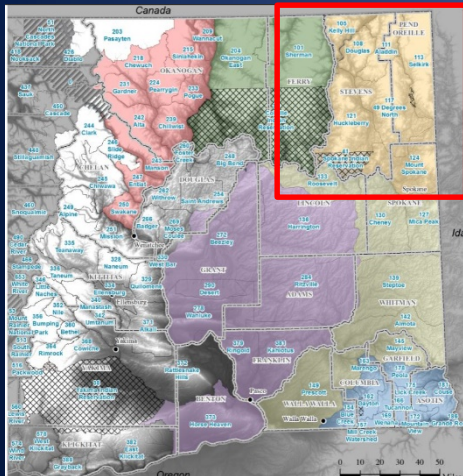
District 1

GMUs ~~101~~, 105, 108, 111, 113, 117, & 121

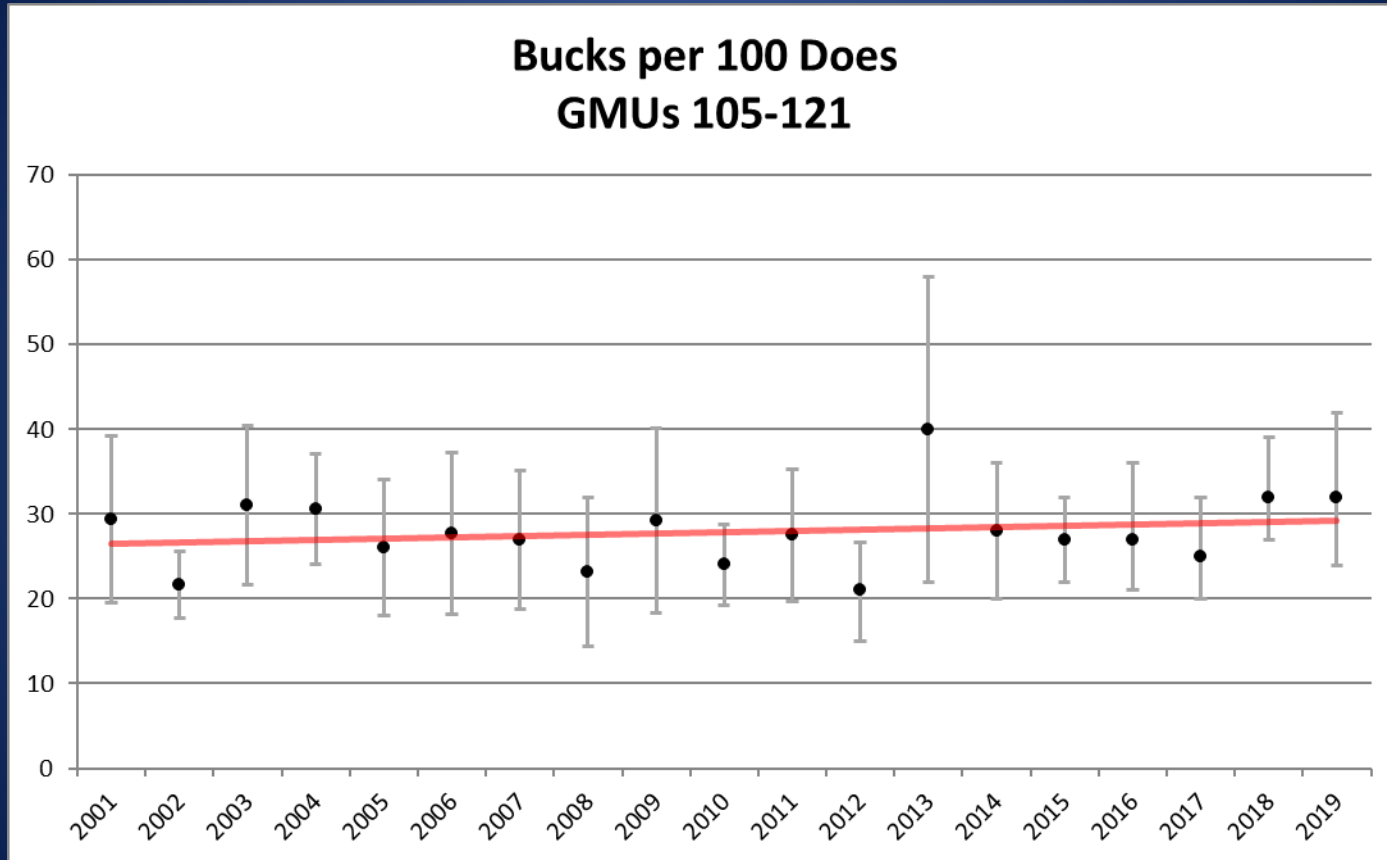
General Season Buck Harvest in GMU 101
by Species, 2006-2018



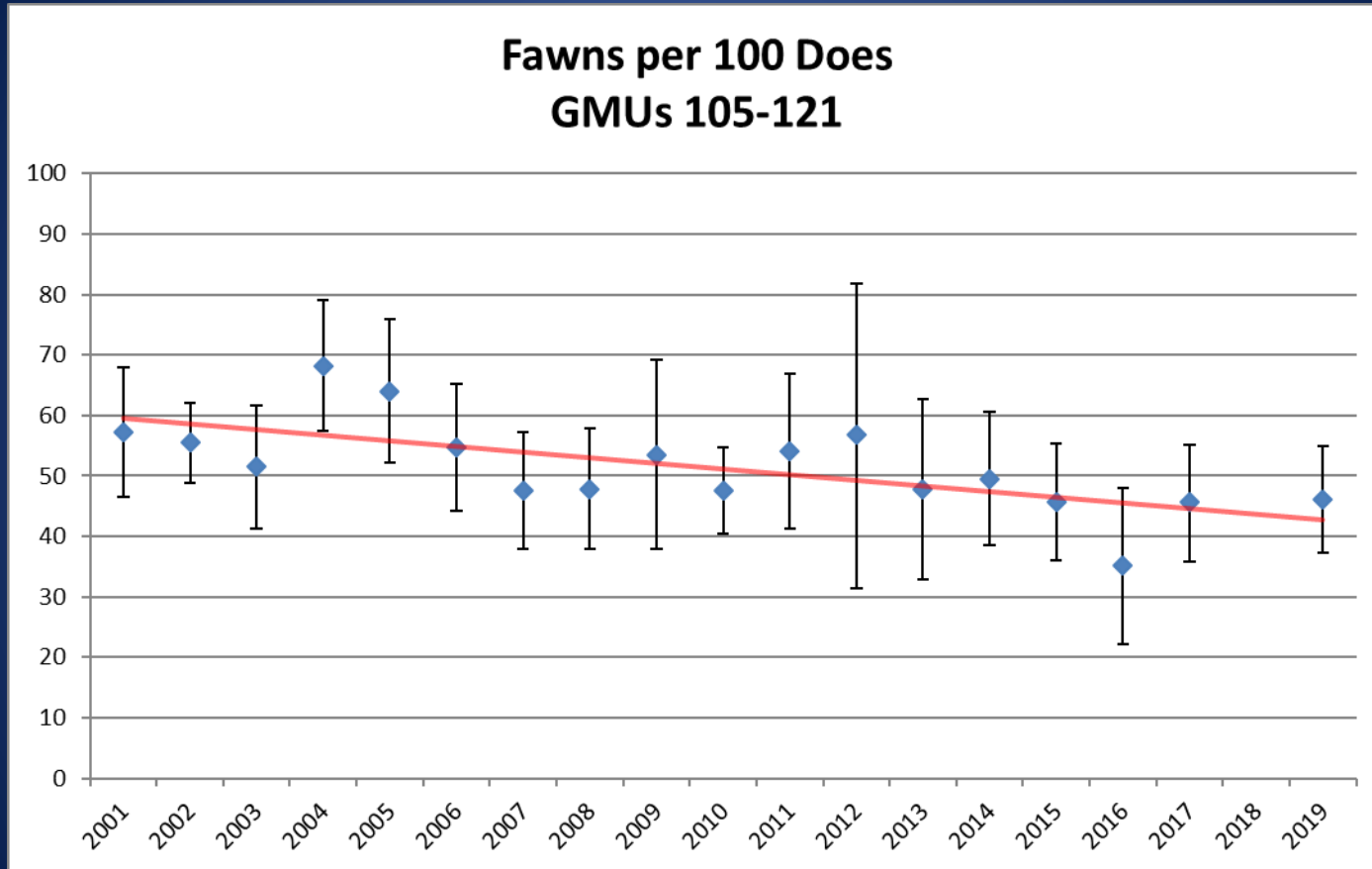
■ White-Tailed Deer ■ Mule Deer ■ Black-Tailed Deer



Buck:Doe Ratios

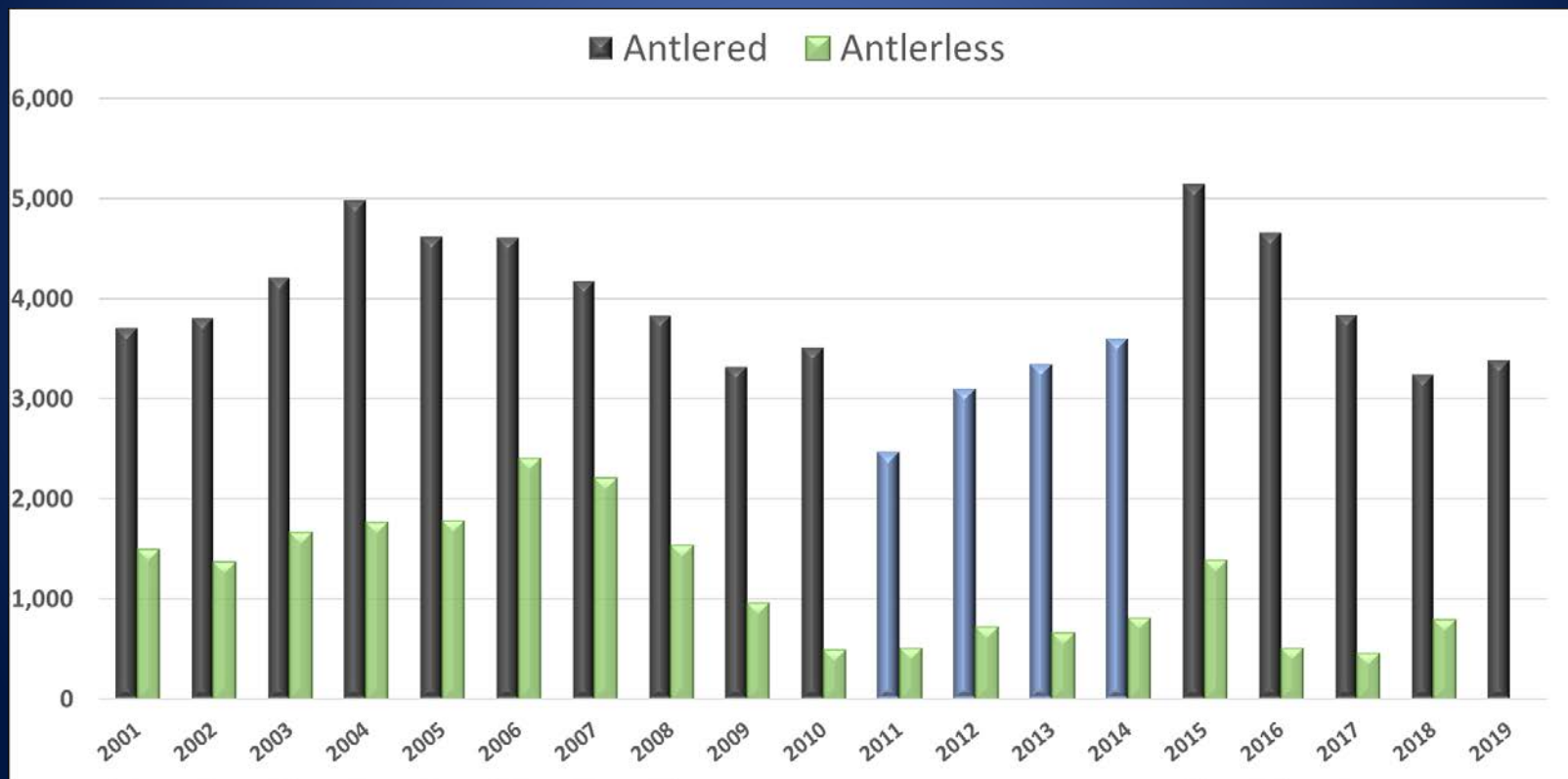


Fawn:Doe Ratios



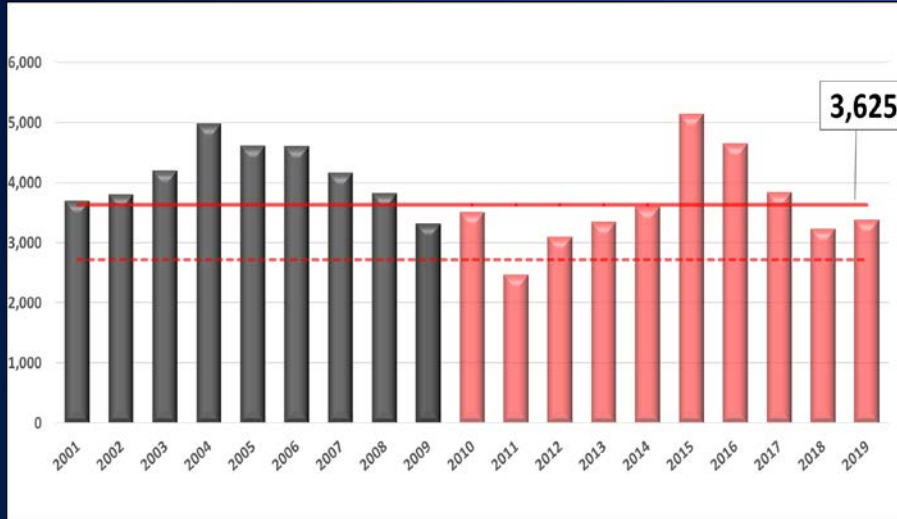
District 1—“At-Risk” Assessment

- Data limited to general season buck harvest during modern firearm, archery, and muzzleloader seasons

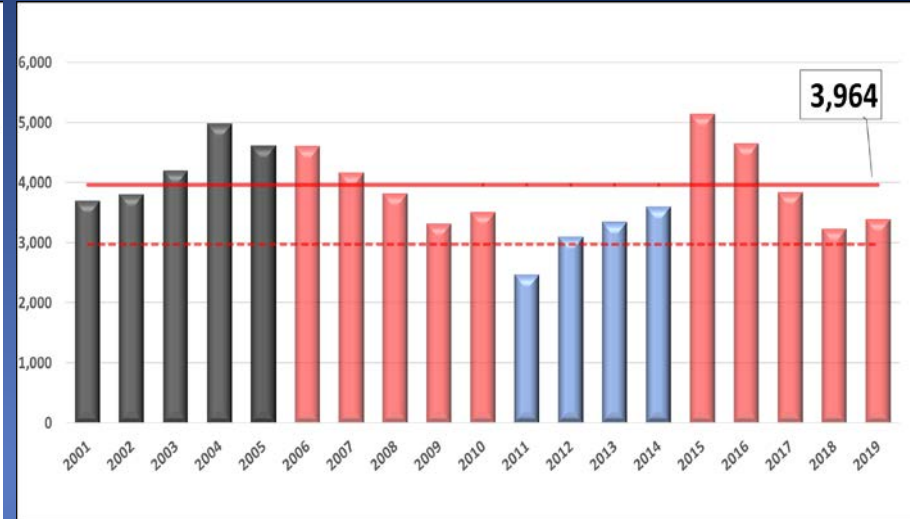


At-Risk Assessment

2010-2019



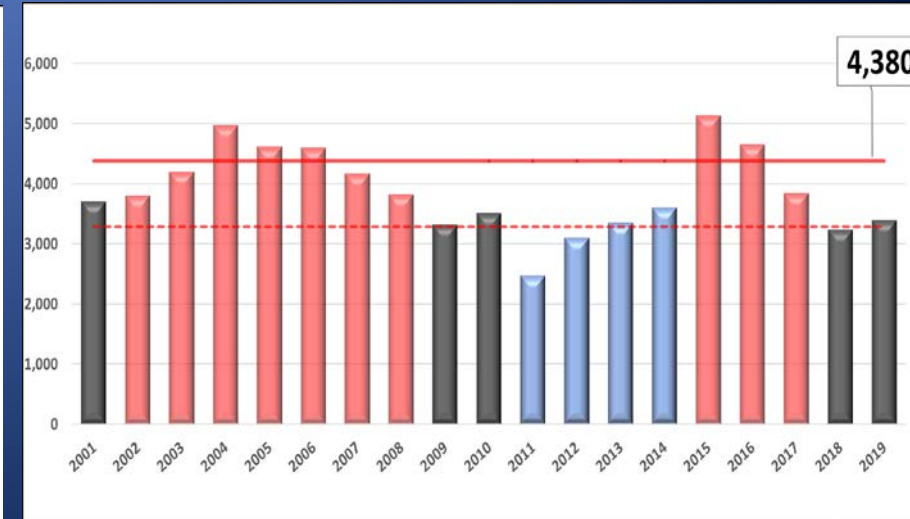
2006-2010 & 2015-2019

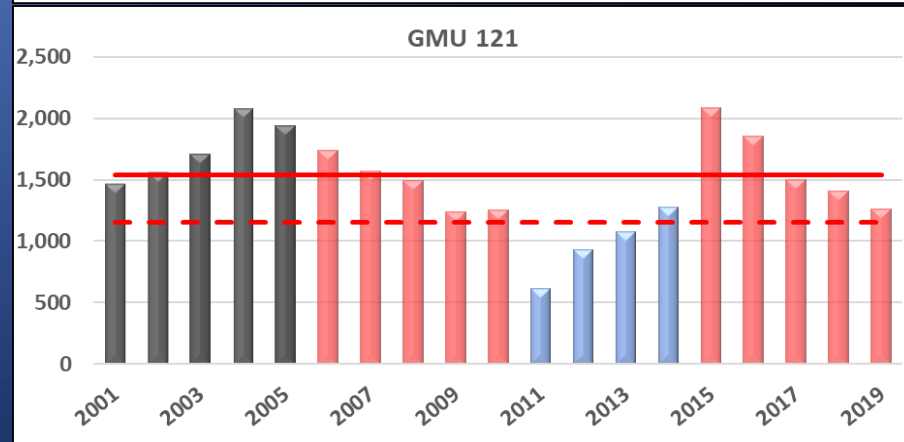
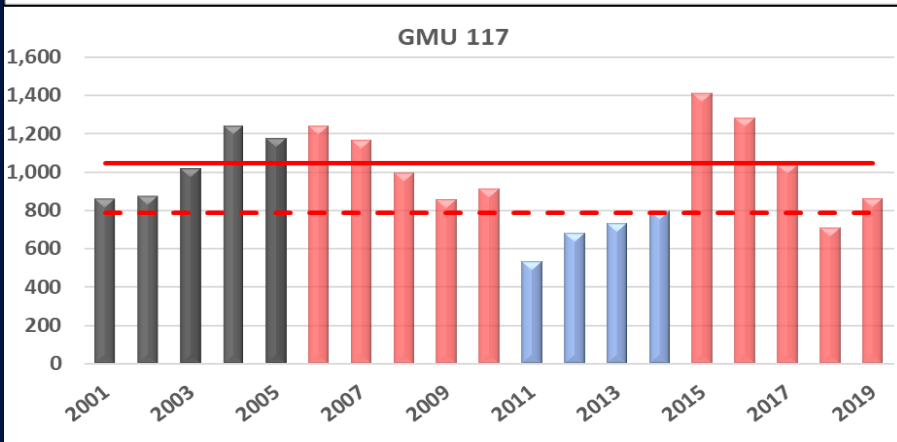
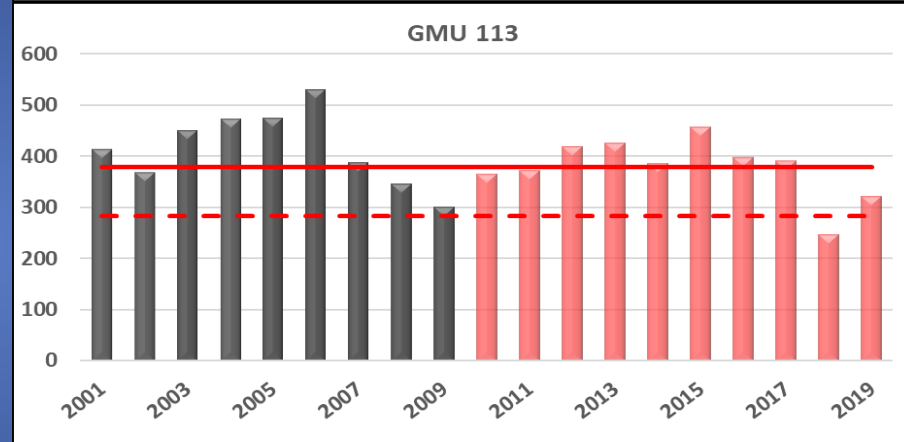
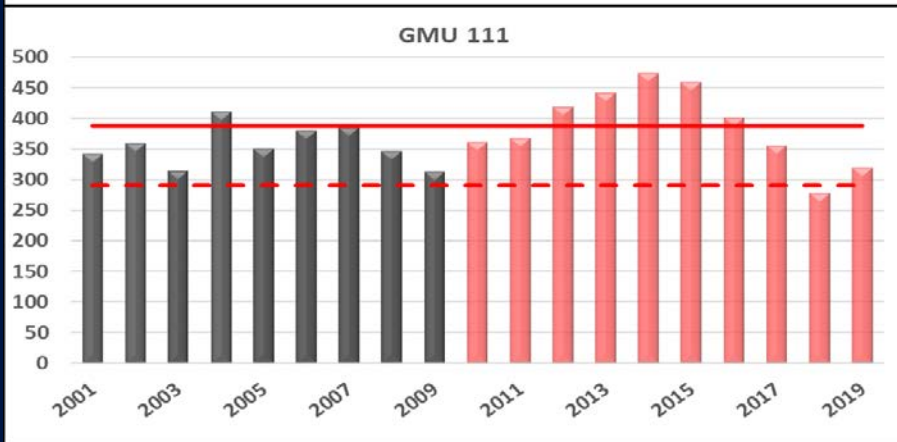
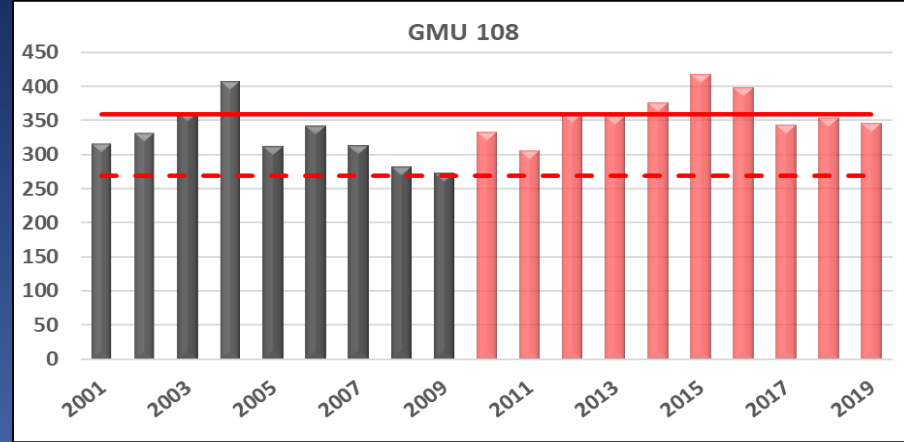
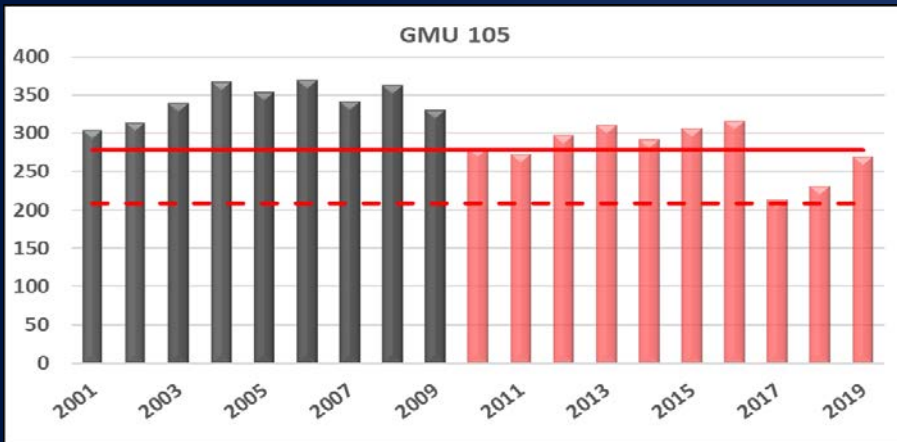


2001-2010

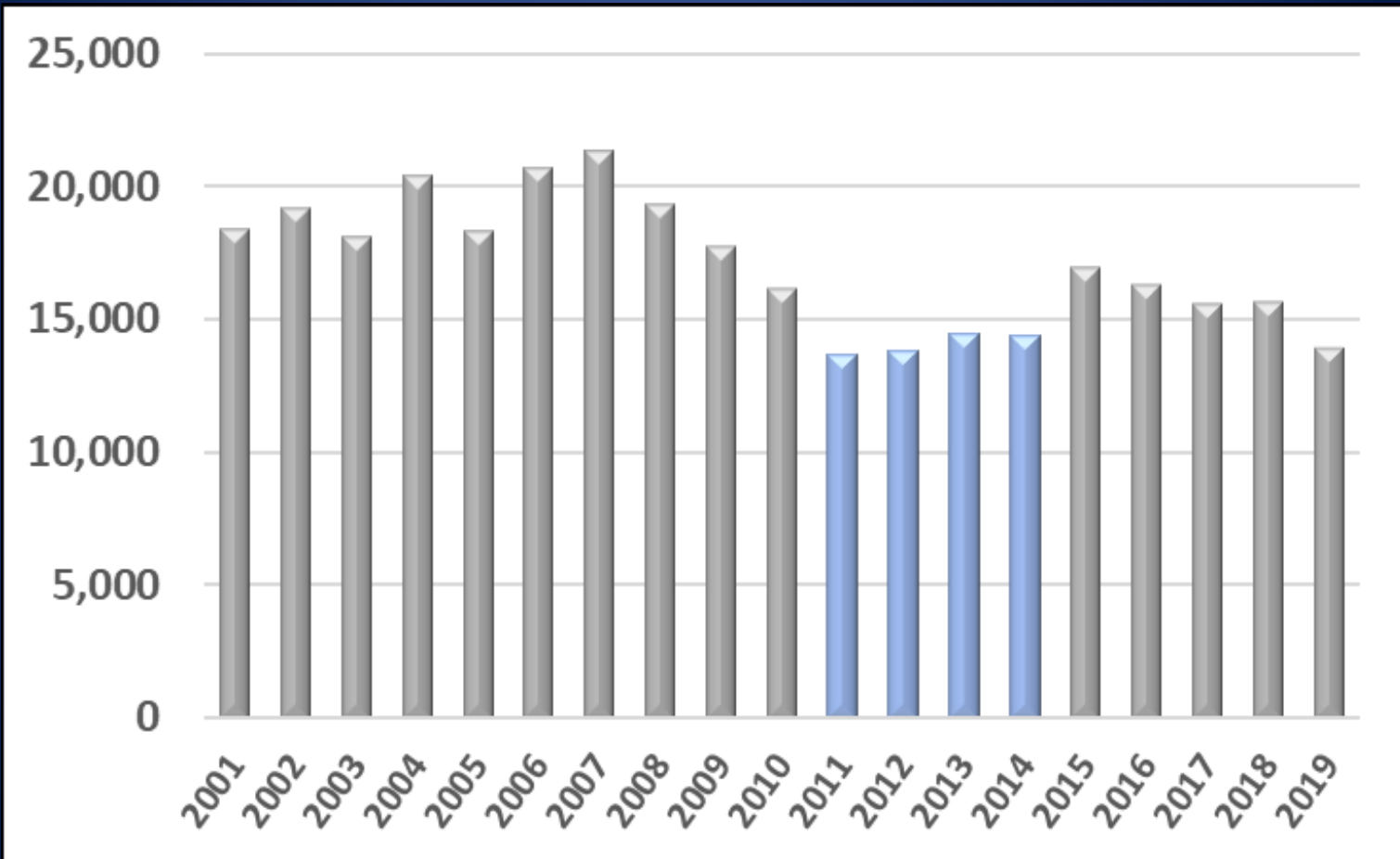


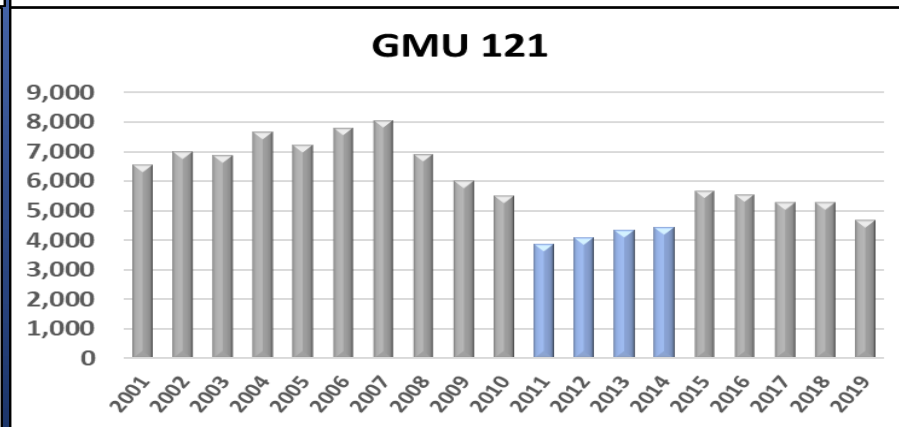
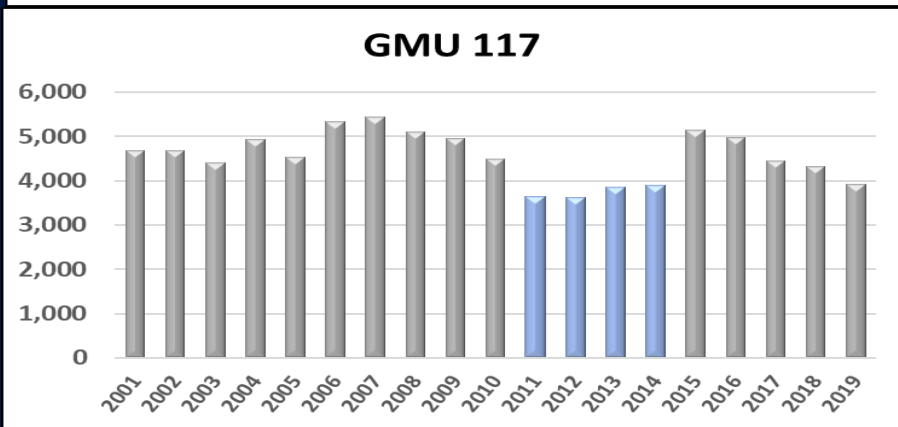
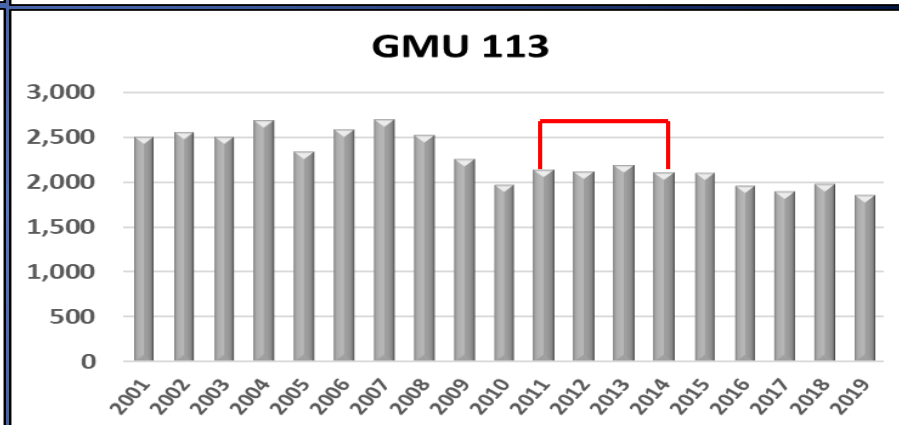
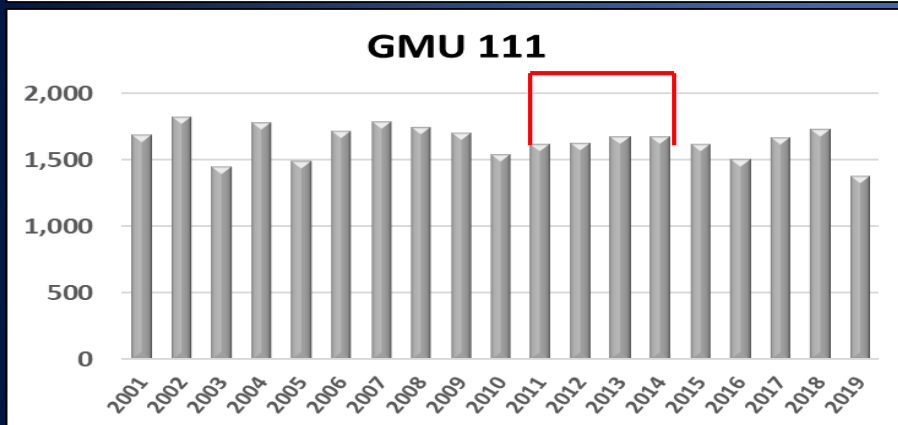
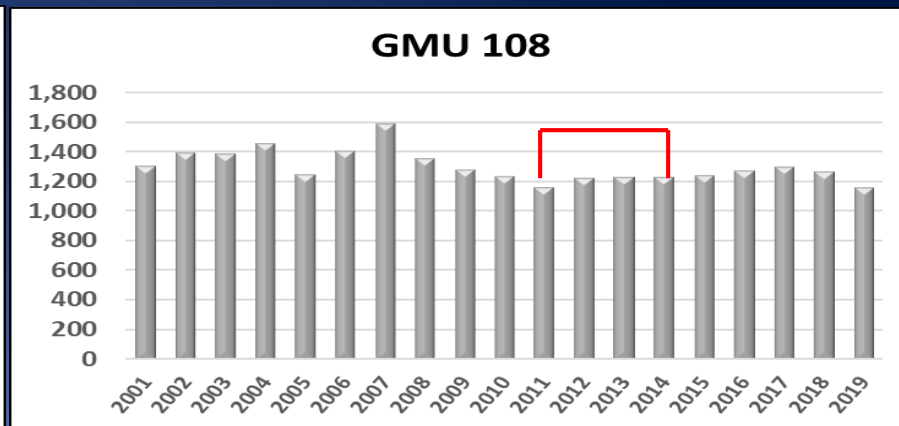
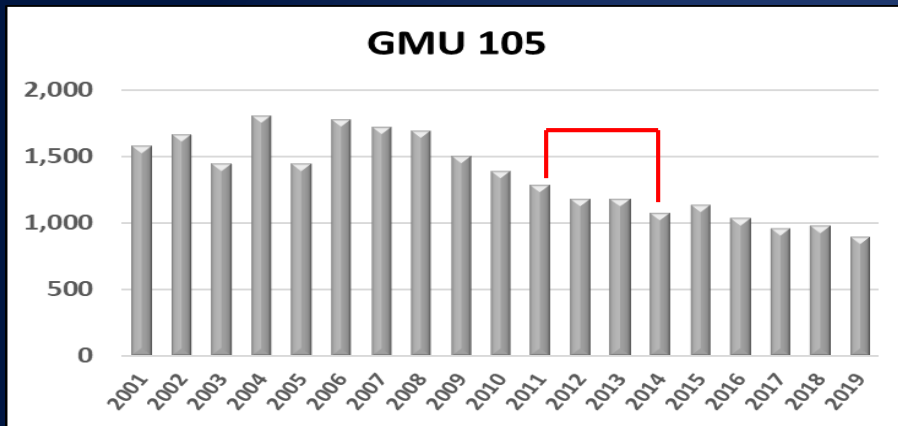
10 Highest Years



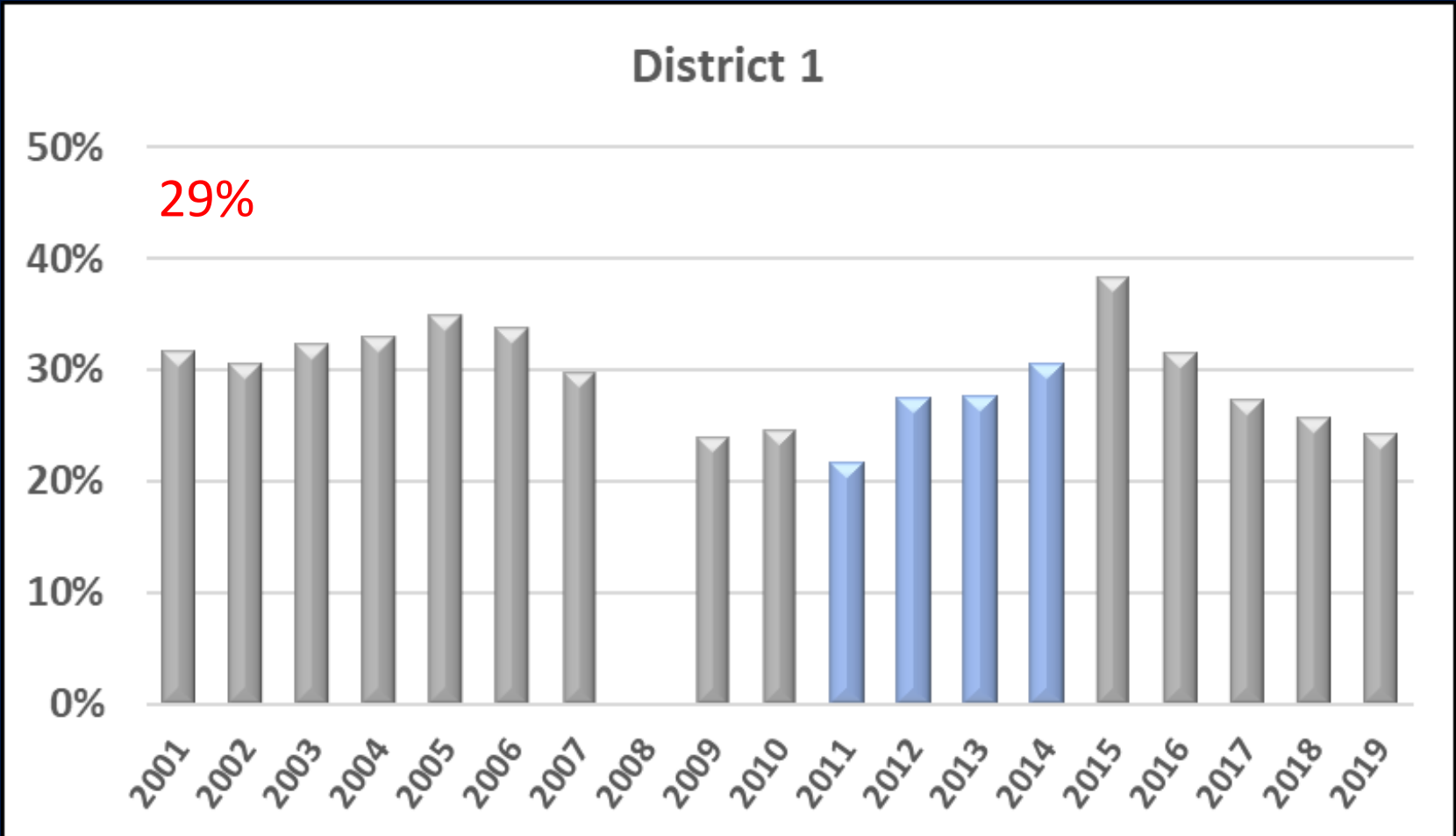


District 1—Hunter Numbers

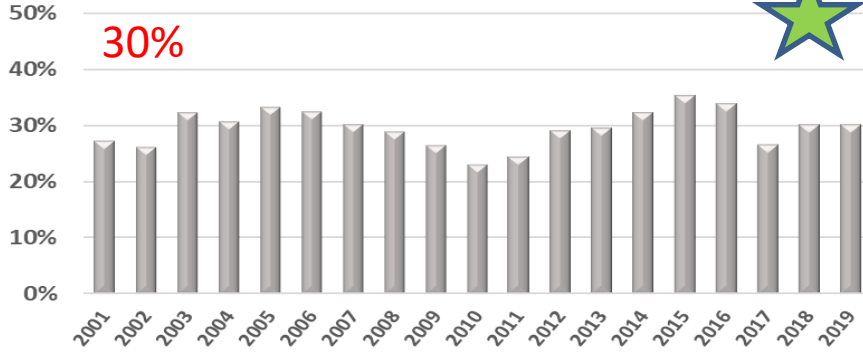




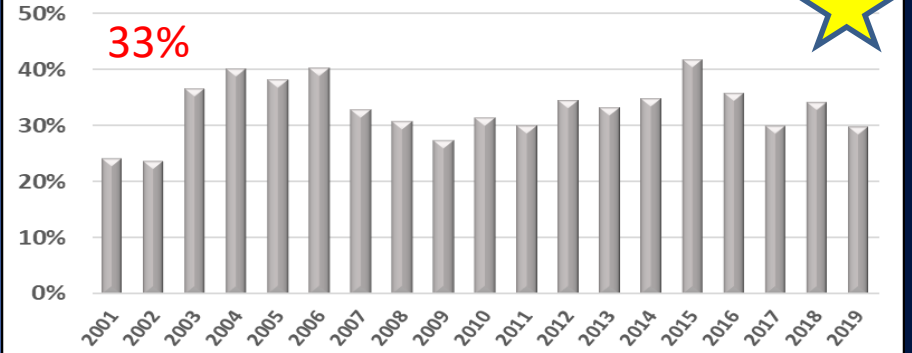
District 1—Hunter Success



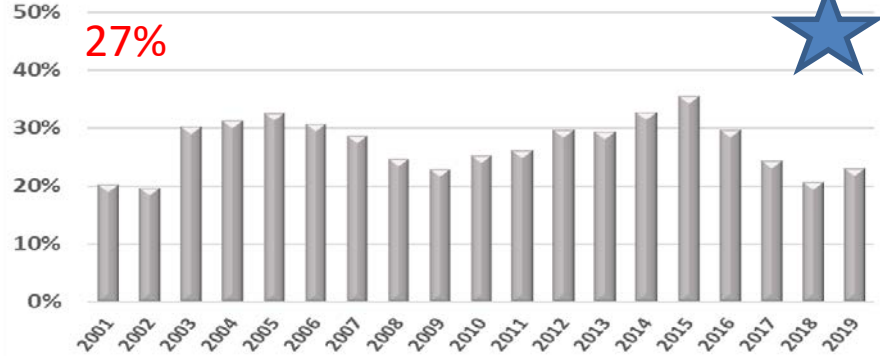
GMU 105



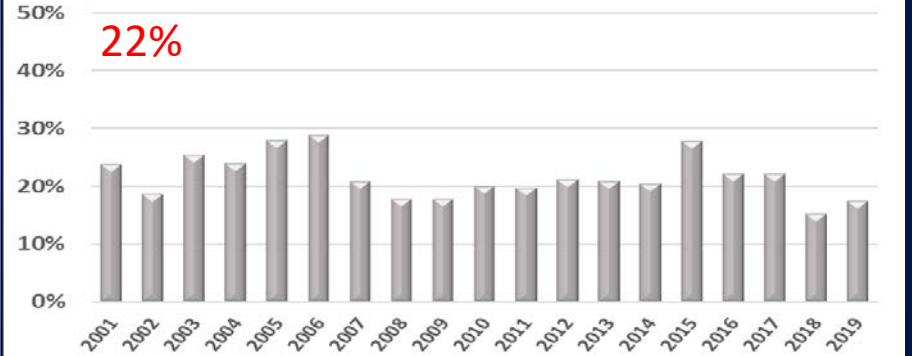
GMU 108



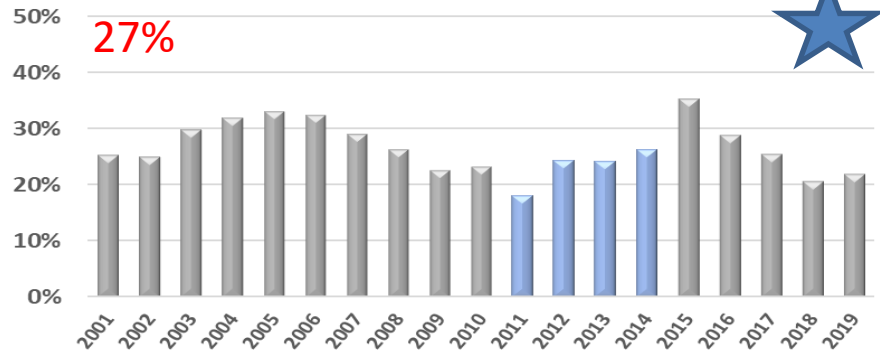
GMU 111



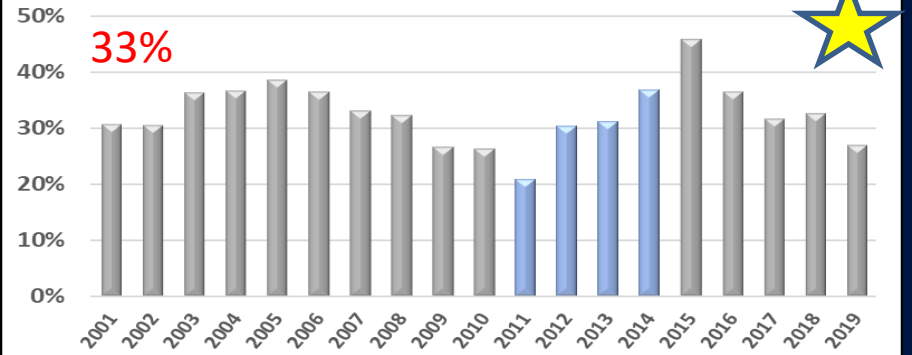
GMU 113



GMU 117

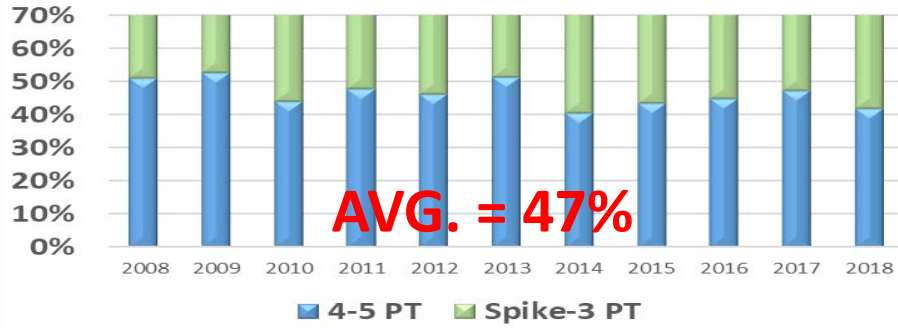


GMU 121

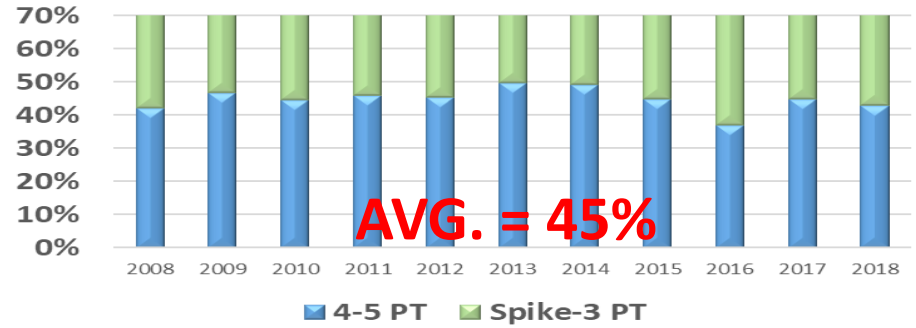


% 4-5 Pt. Bucks in Harvest

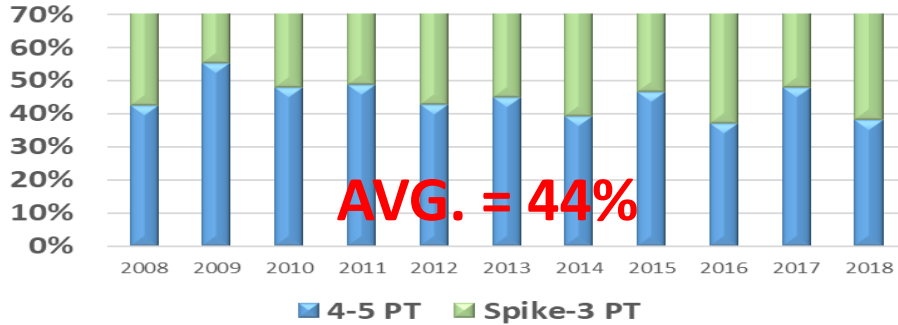
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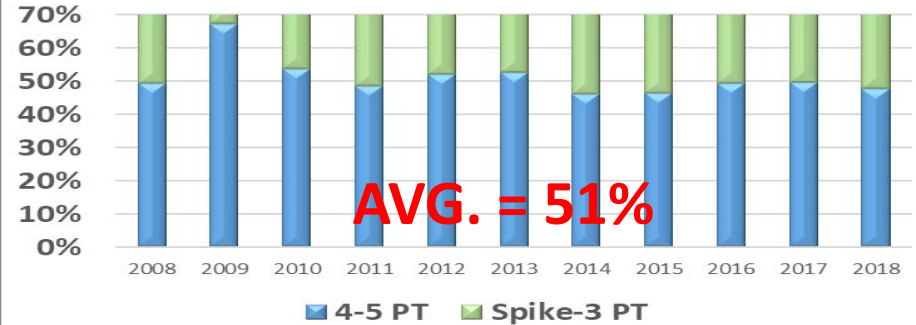
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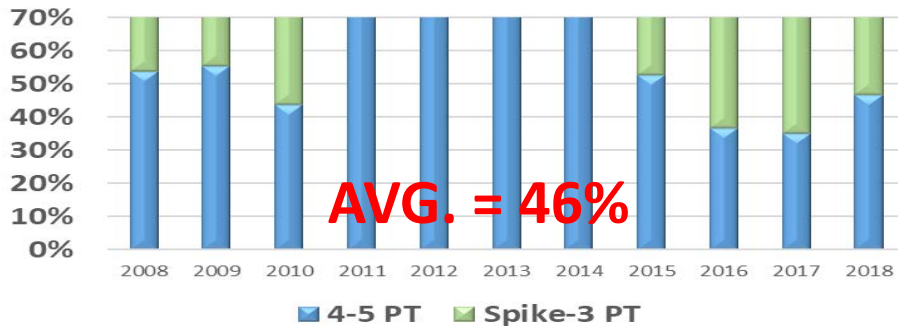
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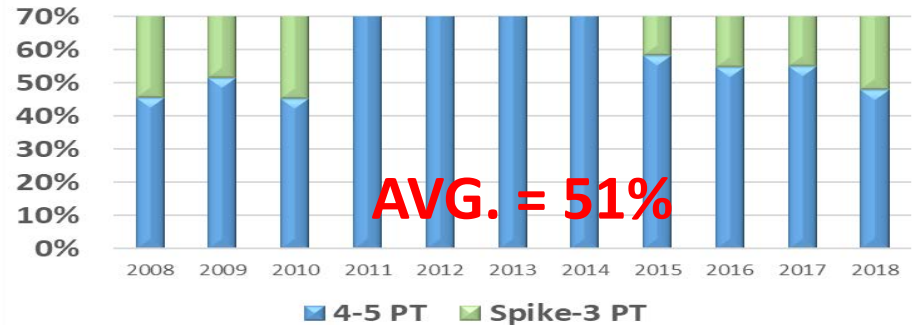
GMU 113



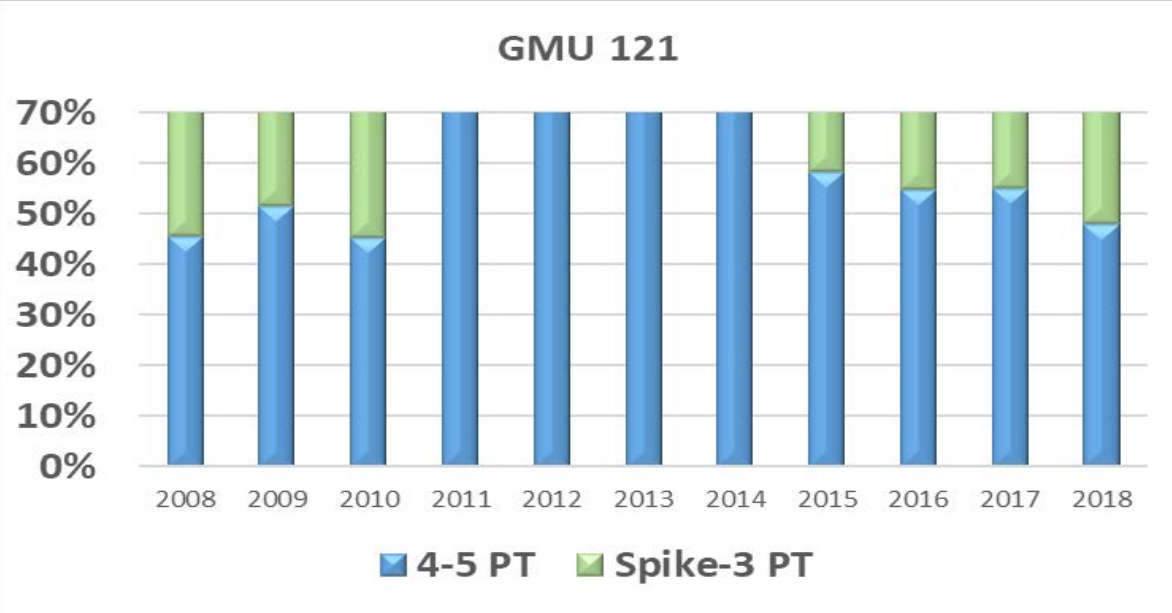
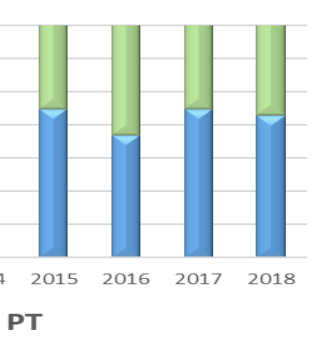
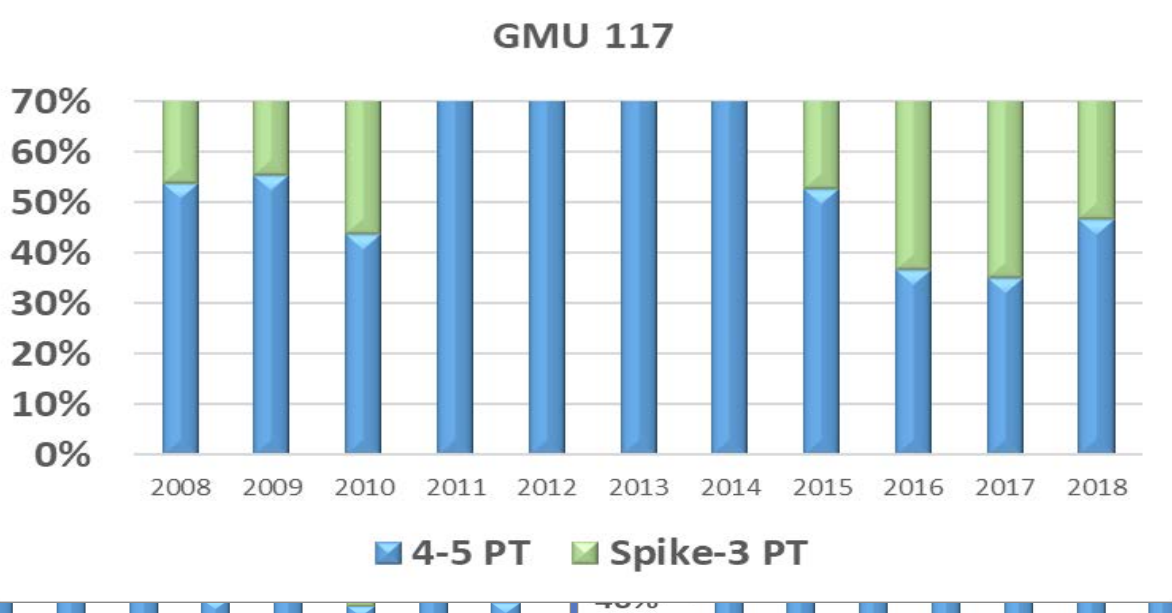
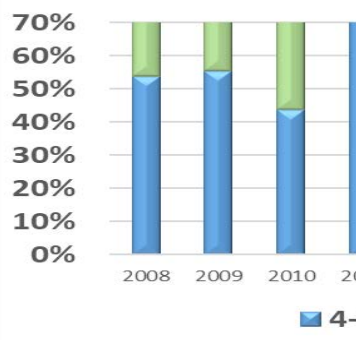
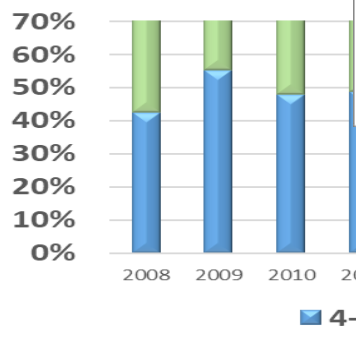
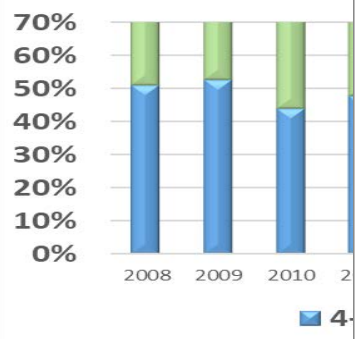
GMU 117



GMU 121



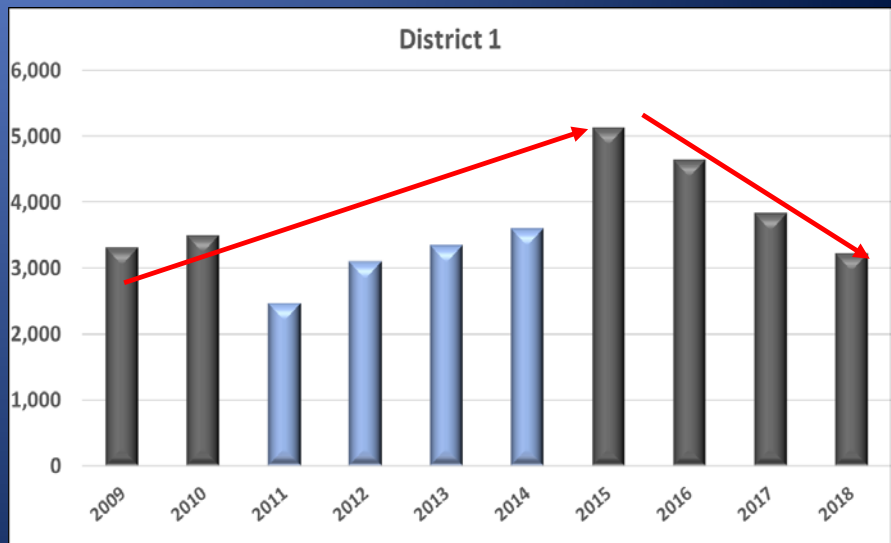
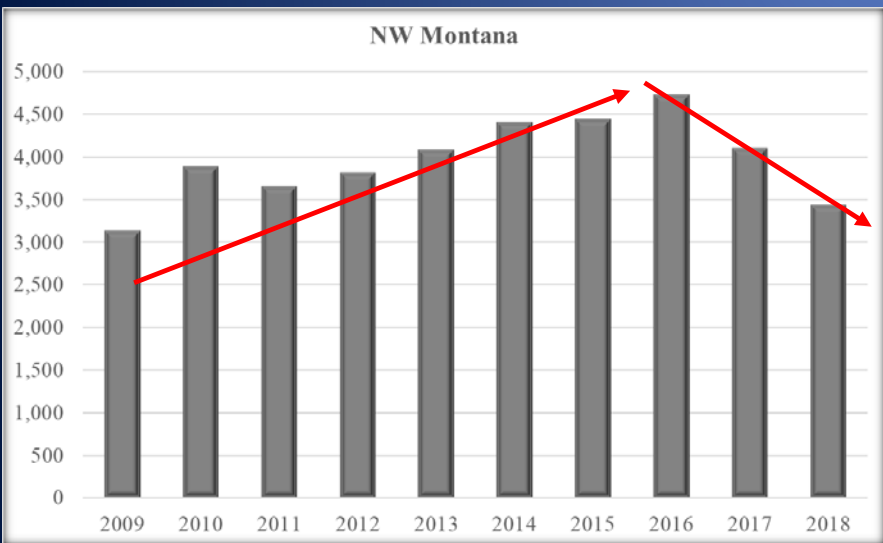
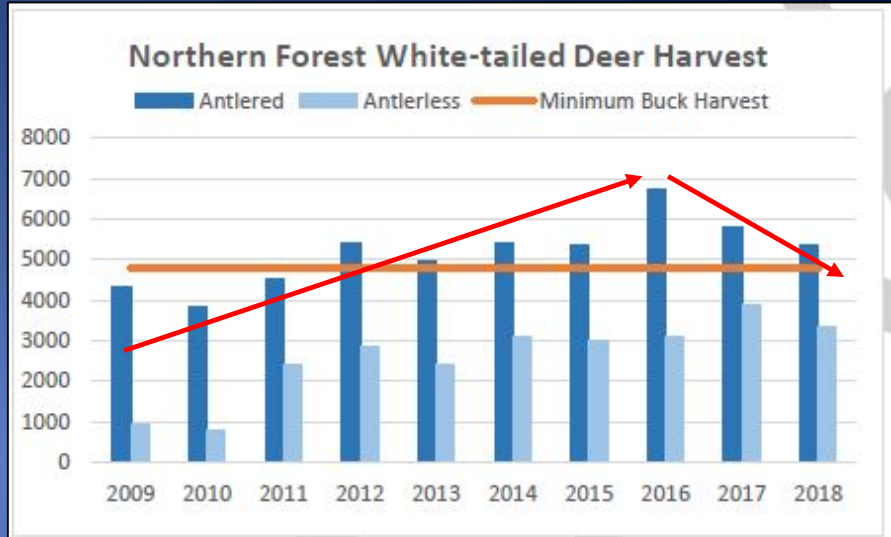
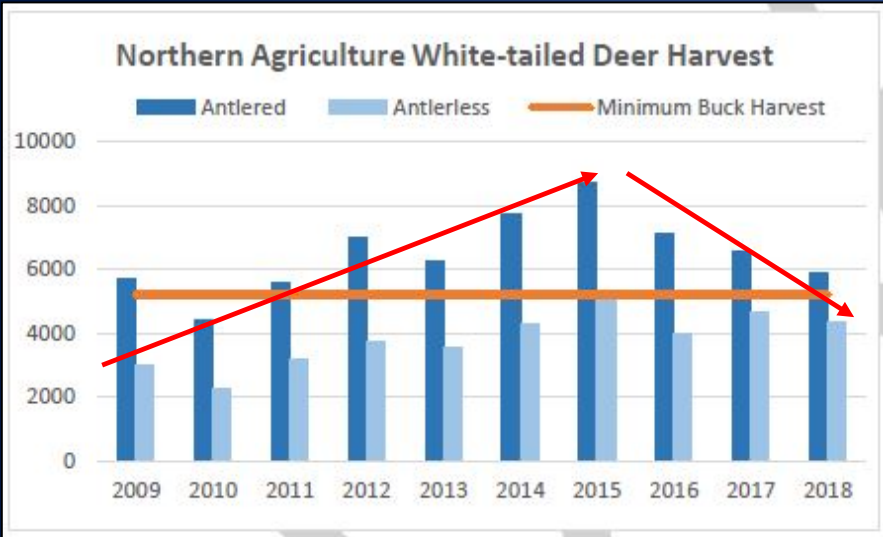
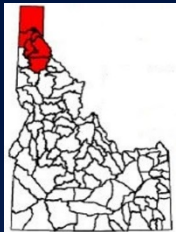
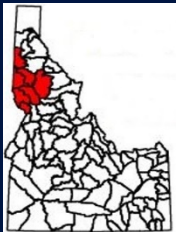
% 4-5 Pt. Bucks in Harvest



Regional Comparisons

- 2 Data Analysis Units from Idaho Panhandle
- 6 Hunt Districts from NW Montana
- General either-sex white-tailed deer seasons for all weapon types
- General seasons with late rut hunting opportunity
- No antler-point restrictions

Regional Comparisons Buck Harvest 2009-2018

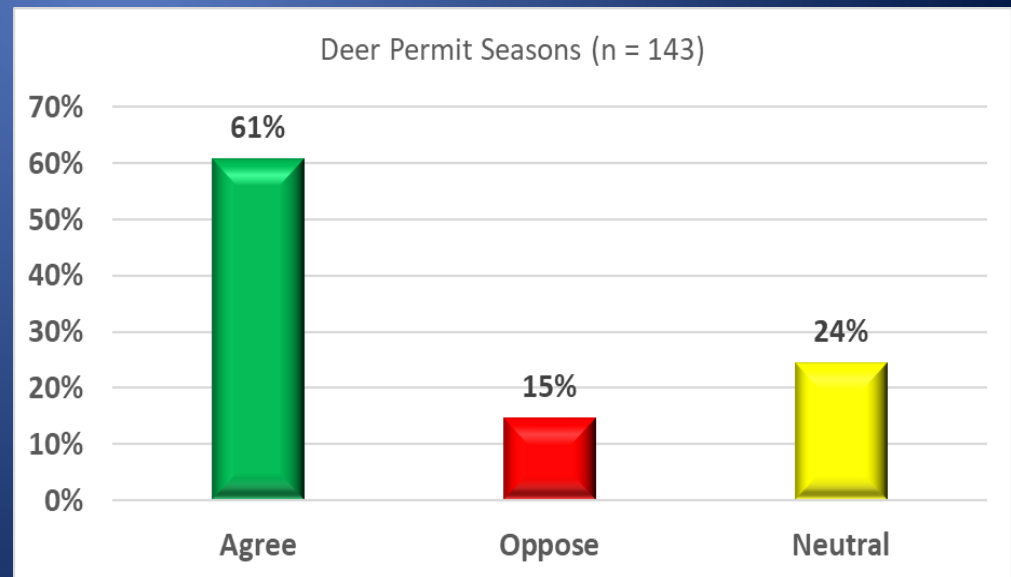
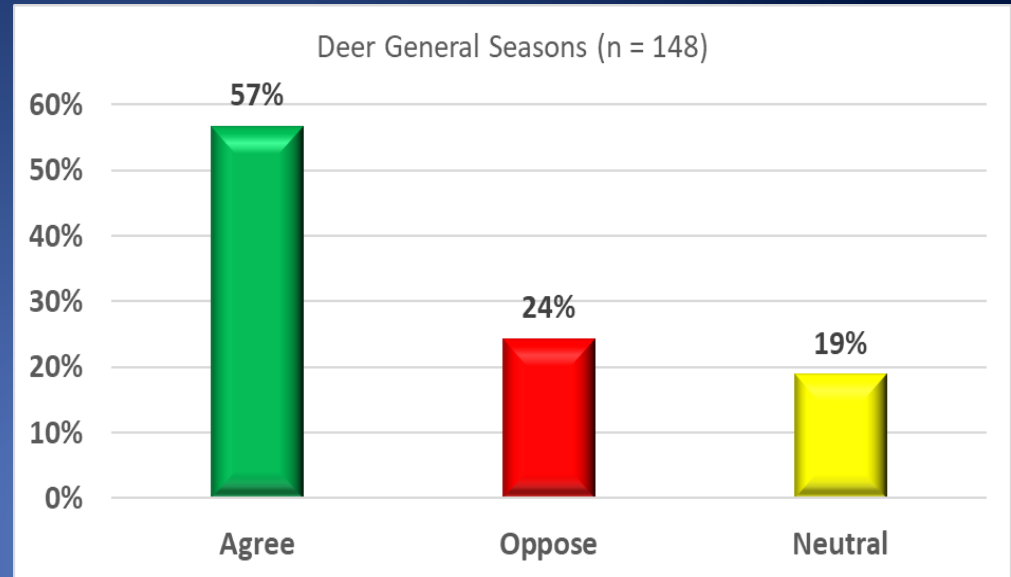


Antler-Point Restrictions (APRs)

- Although APRs have shown minimal biological benefits, they remain popular with many hunters
- Because of that popularity, they warrant consideration as a social issue
- The Department has committed to considering APRs during the 2021-2023 season setting process
- Public outreach and support is critical when APRs are being considered

Public Comment

- Common themes included:
 - Reducing antlerless harvest
 - Predator management
 - Antler-Point restrictions
- The Department has already eliminated or substantially reduced antlerless harvest in areas where it was warranted
- The Department has already liberalized bear seasons and has proposed changes to cougar seasons
- The Department has committed to considering APRs during the 2021-2023 season setting process

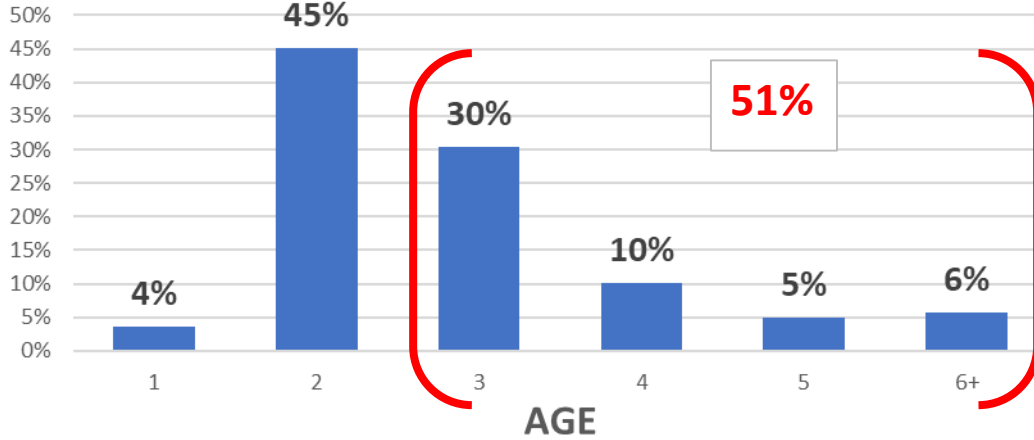


Questions?

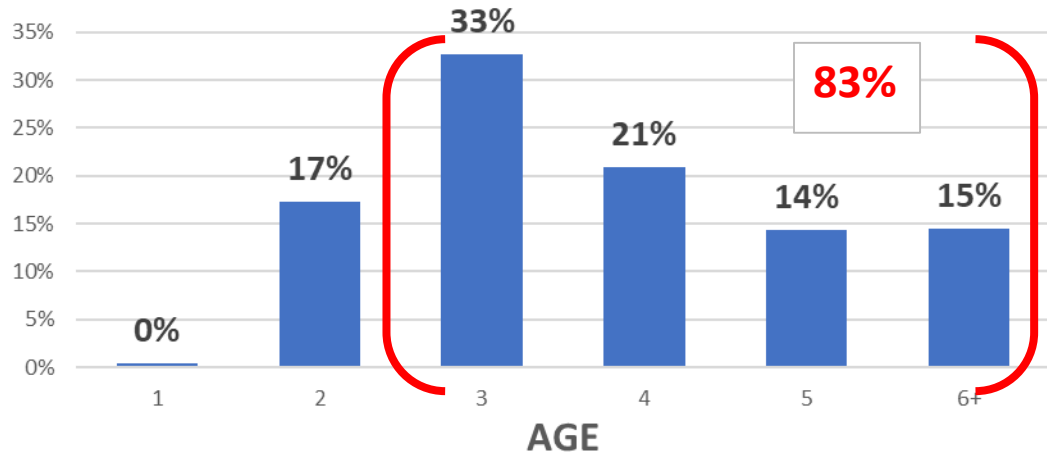


Antler Points

4 Points (n = 641)



5+ Points (n = 441)



Antler Points

- Idaho
- N = 1,045

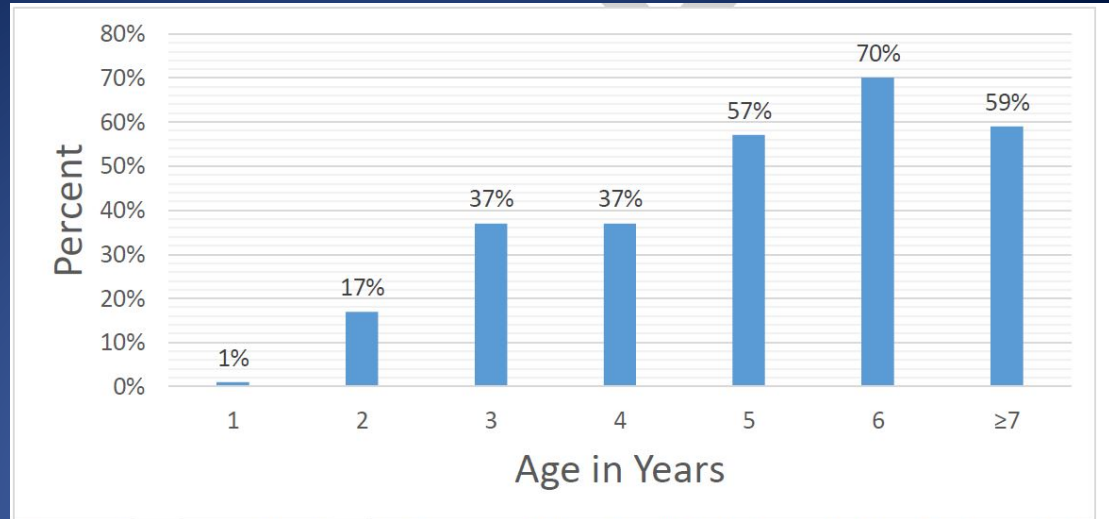
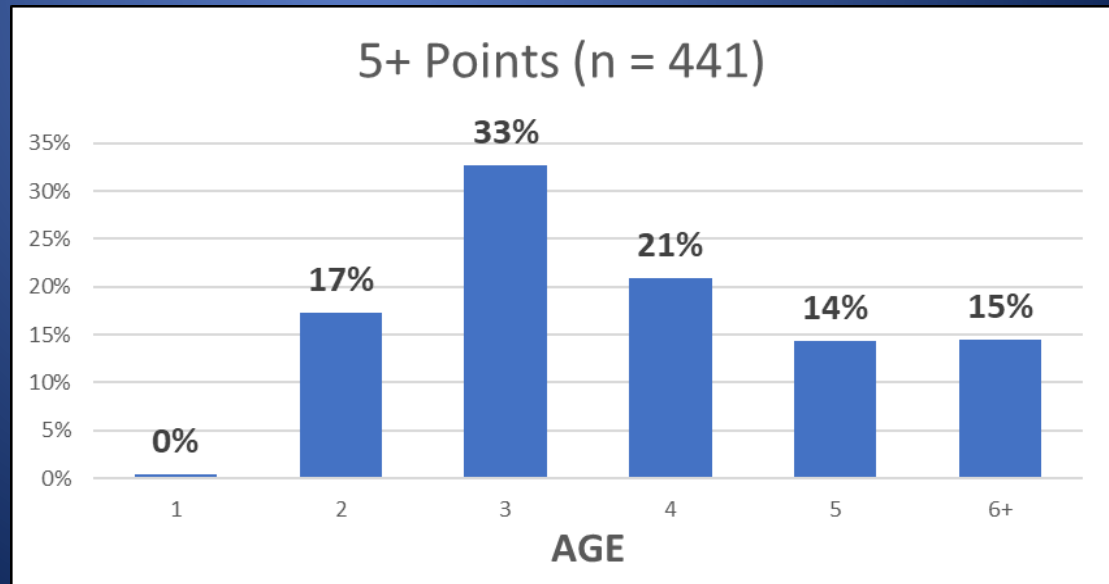


Figure 4. Percentage of bucks with ≥ 5 points on left antler of 1,045 white-tailed deer bucks checked at Panhandle Region Check Stations (1980-2012)

- Washington

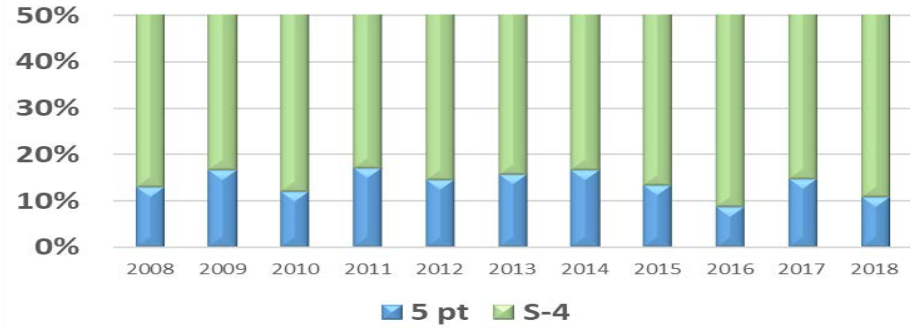


Antler Points

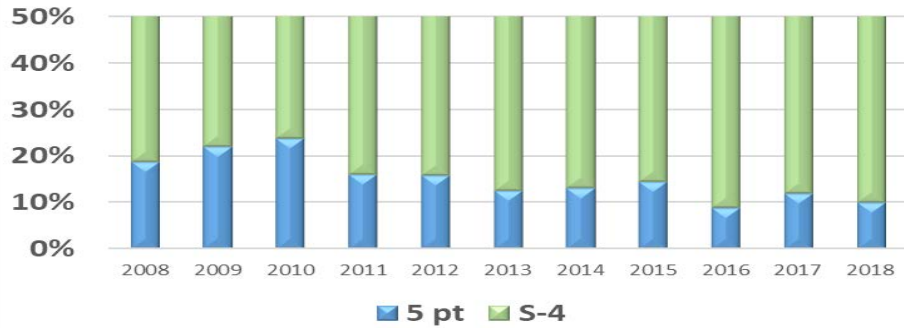
GMU 105



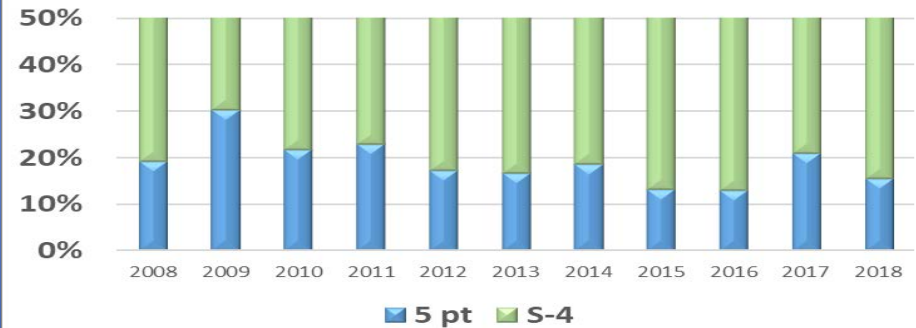
GMU 108



GMU 111



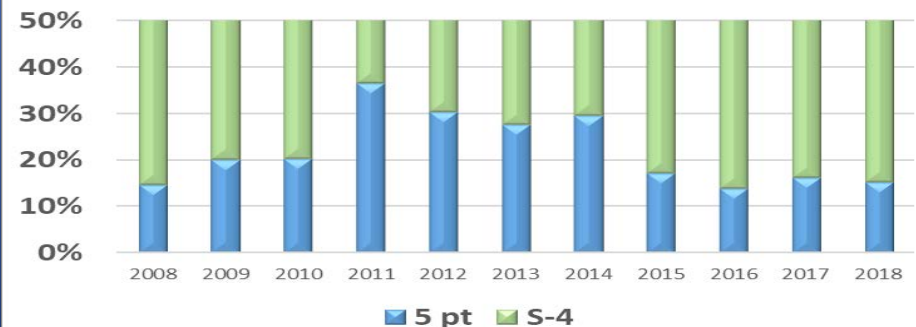
GMU 113



GMU 117

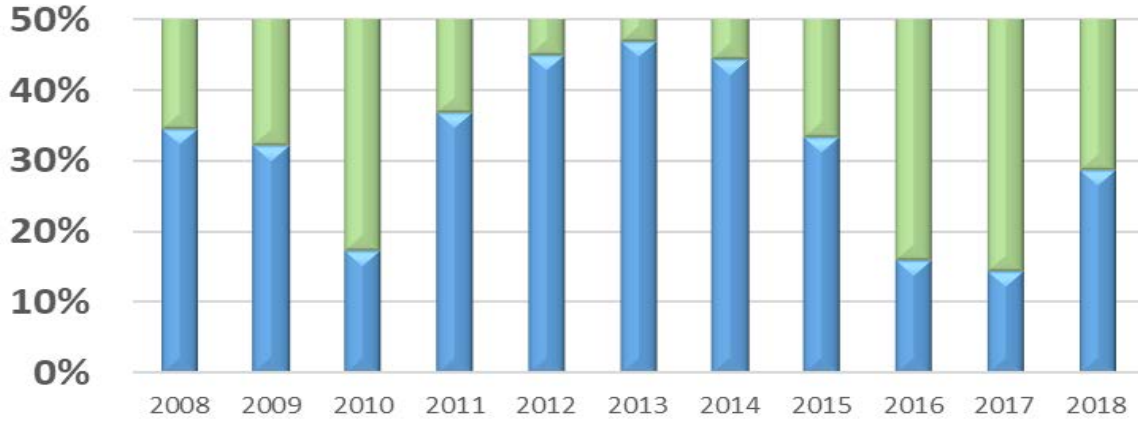
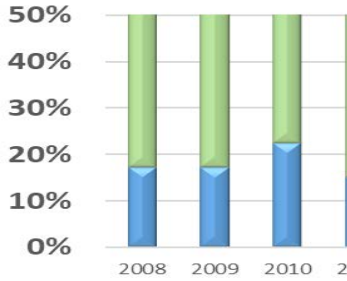


GMU 121

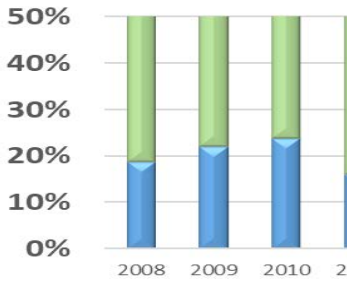
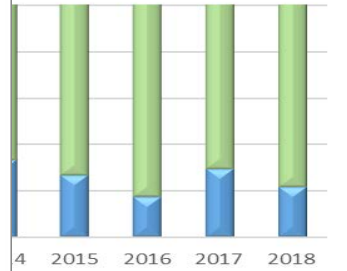


Antler Points

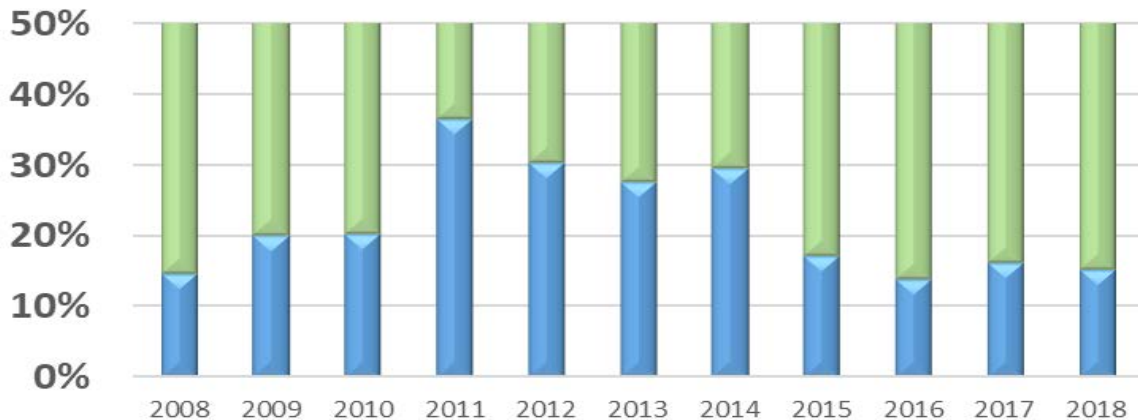
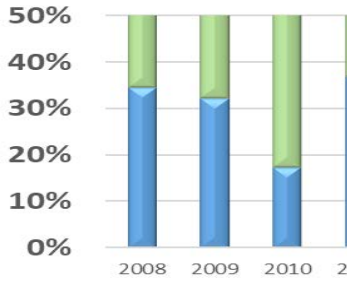
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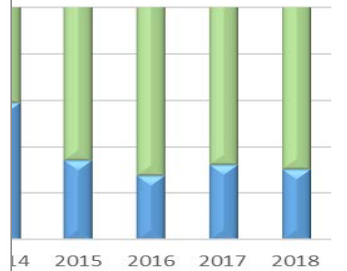
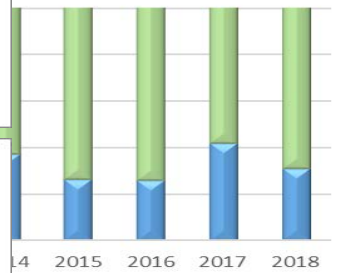
5 pt S-4



GMU 121

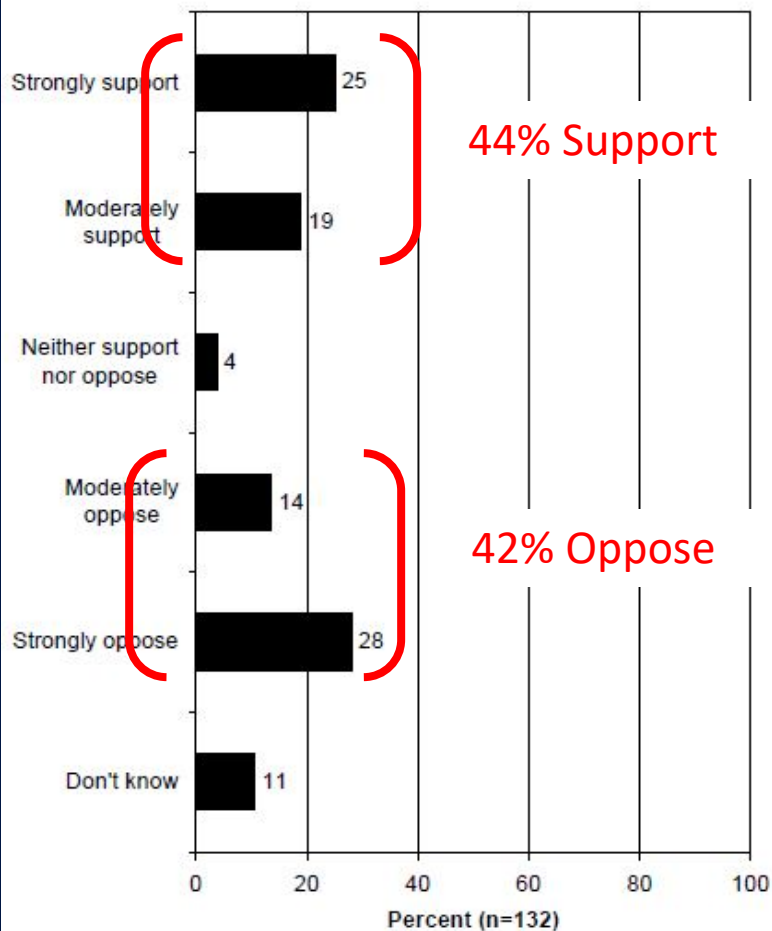


5 pt S-4

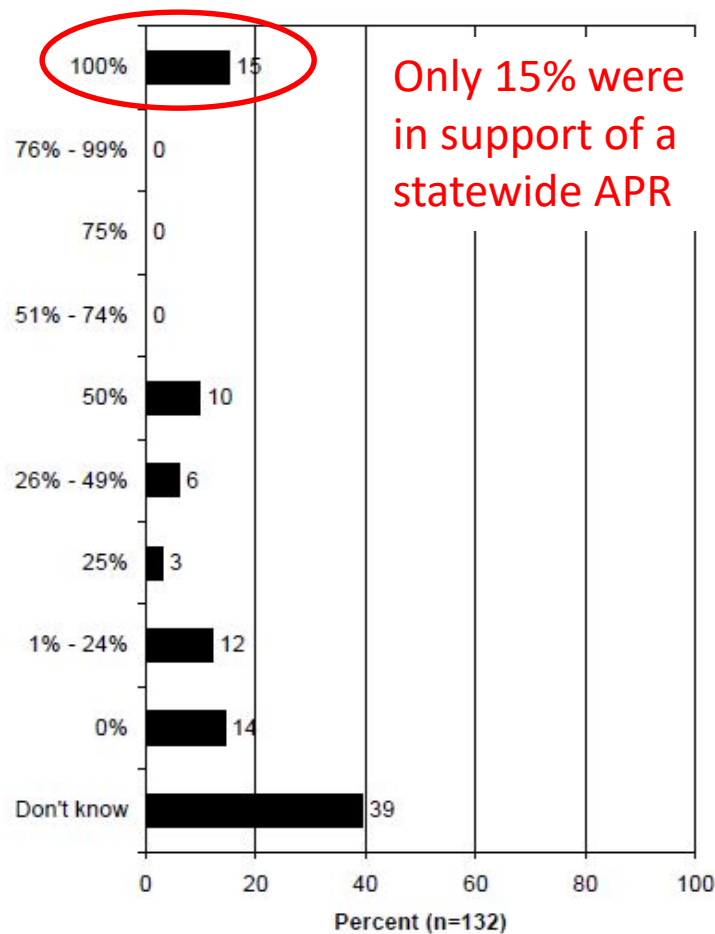


Antler Point Restrictions

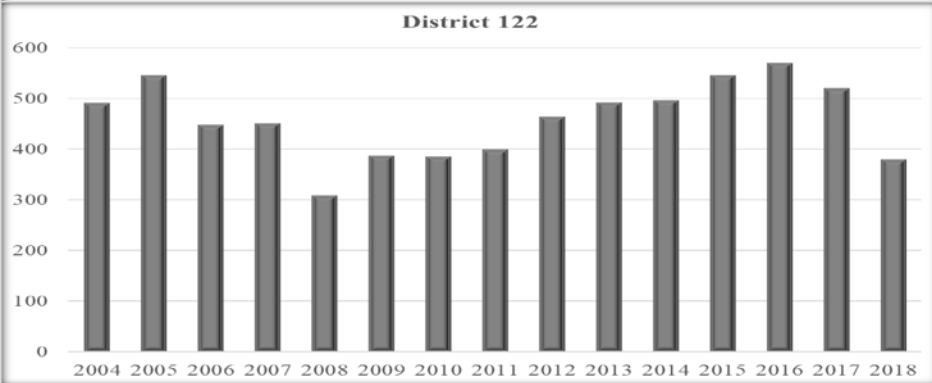
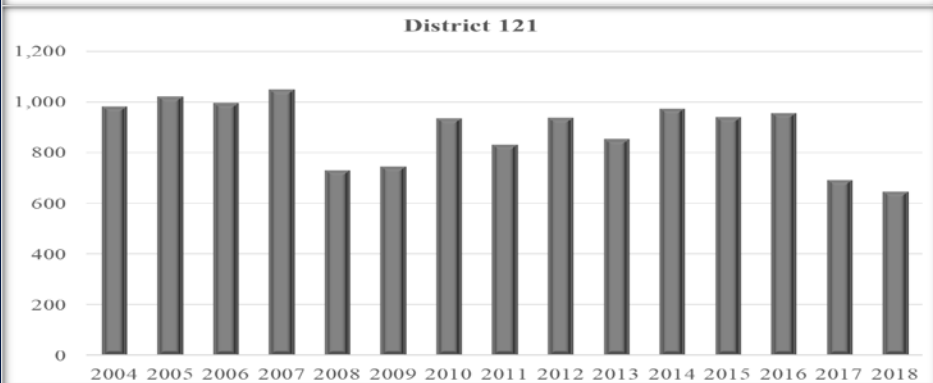
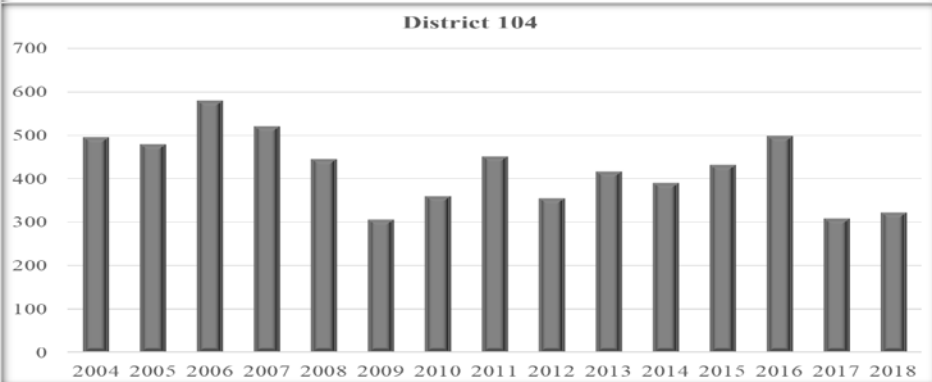
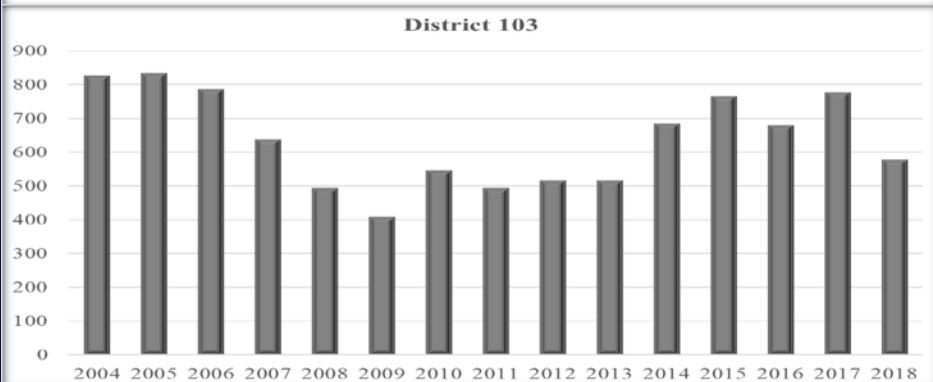
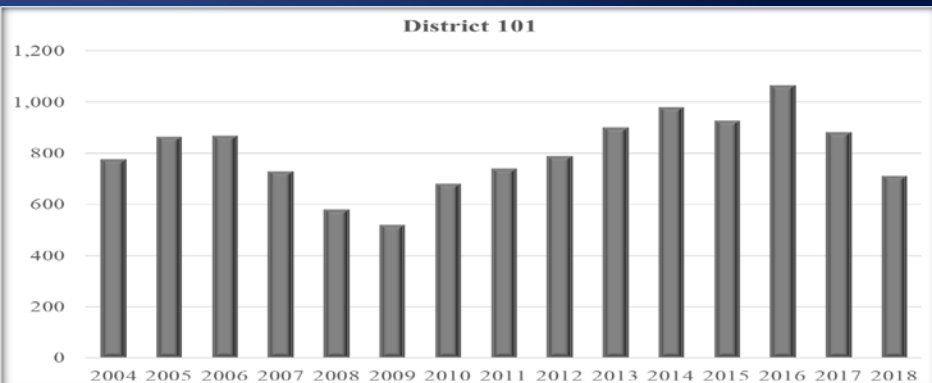
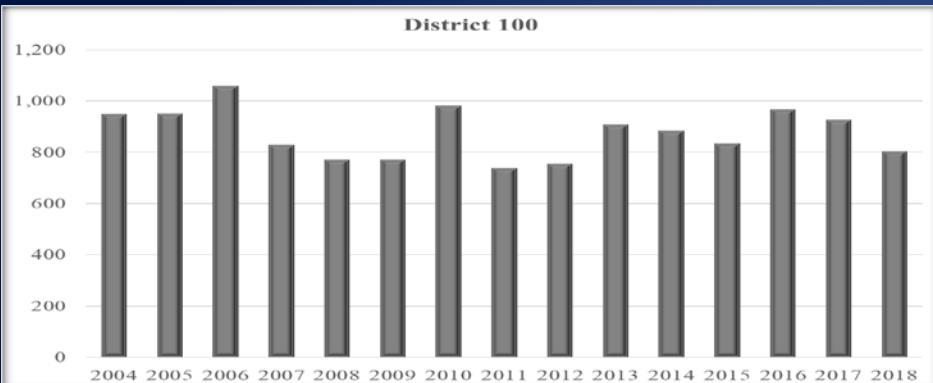
Q113. Do you support or oppose a 3-point antler restriction general season for white-tailed deer in all of eastern Washington? (Asked of deer hunters.)



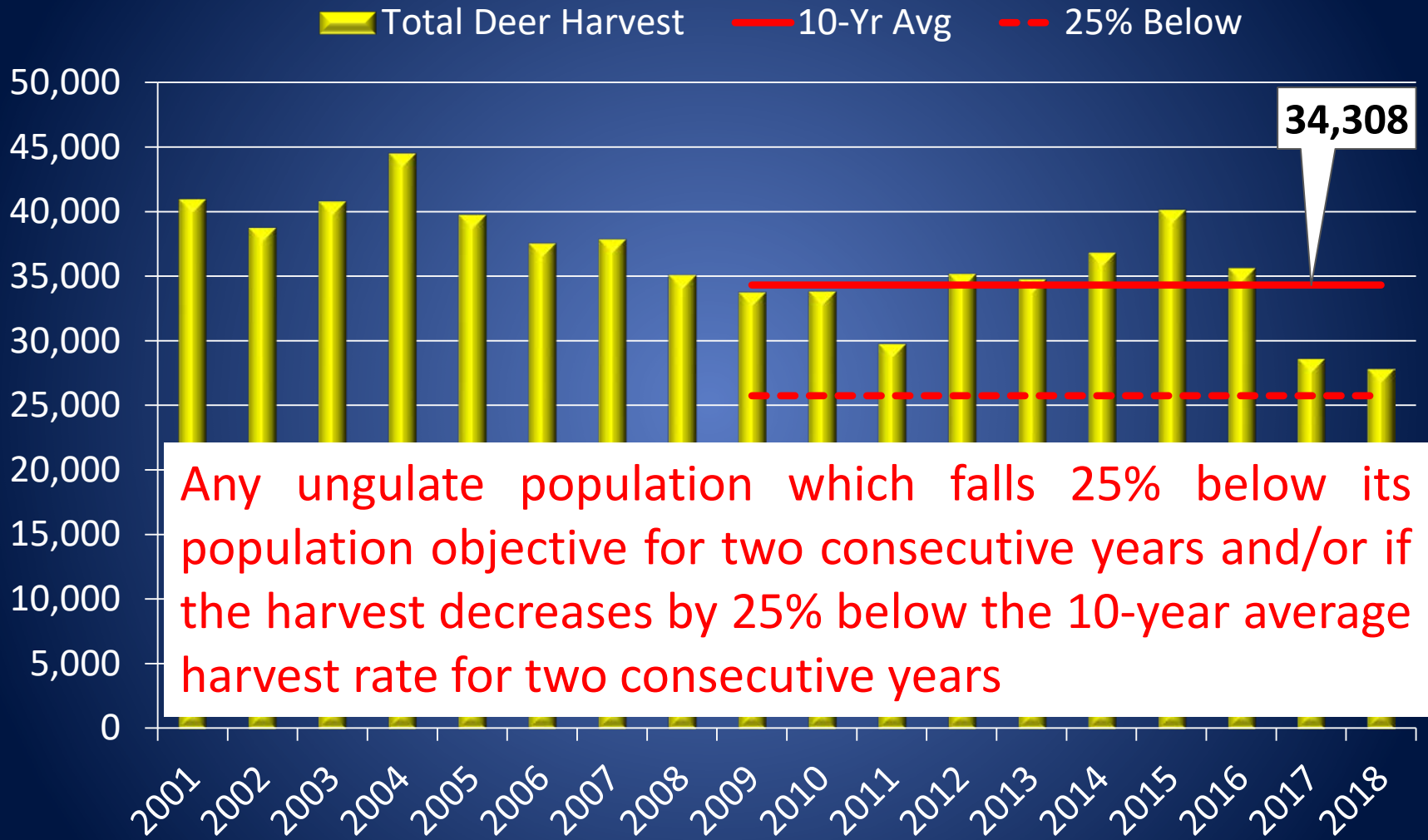
Q114. What percentage of the state's Game Management Units would you prefer to be under a 3-point antler restriction general season for white-tailed deer? (Asked of deer hunters.)



NW Montana-Buck Harvest



Statewide Deer Harvest 2001-2018



34,308

Any ungulate population which falls 25% below its population objective for two consecutive years and/or if the harvest decreases by 25% below the 10-year average harvest rate for two consecutive years

Antler-Point Restrictions (APRs)

- Very little information in the literature that has evaluated the biological benefits of APRs

Evaluation of Antler-based Selective Harvest Criteria on Harvest and Antler Size of Male White-tailed Deer in Florida

Bradley S. Cohen, Warnell School of Forestry and Natural Resources, University of Georgia, Athens, GA 30602

Erin H. Leone, Fish and Wildlife Research Institute, Florida Fish and Wildlife Conservation Commission, 1105 SW Williston Gainesville FL 32601



NEW JERSEY DIVISION OF
Fish and Wildlife

AN ASSESSMENT OF NEW JERSEY DEER HUNTER OPINION ON EXPANDING ANTLER POINT RESTRICTION (APR) REGULATIONS IN DEER MANAGEMENT ZONES 28, 30, 31, 34 AND 47

Peer-Reviewed Articles

What Predicts Support for Antler Point Restrictions?

SUSAN A. SCHROEDER¹ LOUIS CORNICELLI

The Pennsylvania State University

The Graduate School

School of Forest Resources

WHITE-TAILED DEER ANTLER POINT RESTRICTIONS
SURVIVAL RATES, AND DEER HUNTER SUPPORT: IS IT

REALITY

Original Article

Hunter Perceptions and Acceptance of Alternative Deer Management Regulations



Wildlife Technical Articles

Effects of Various Approaches to Quality Deer Management on White-tailed Deer Harvest

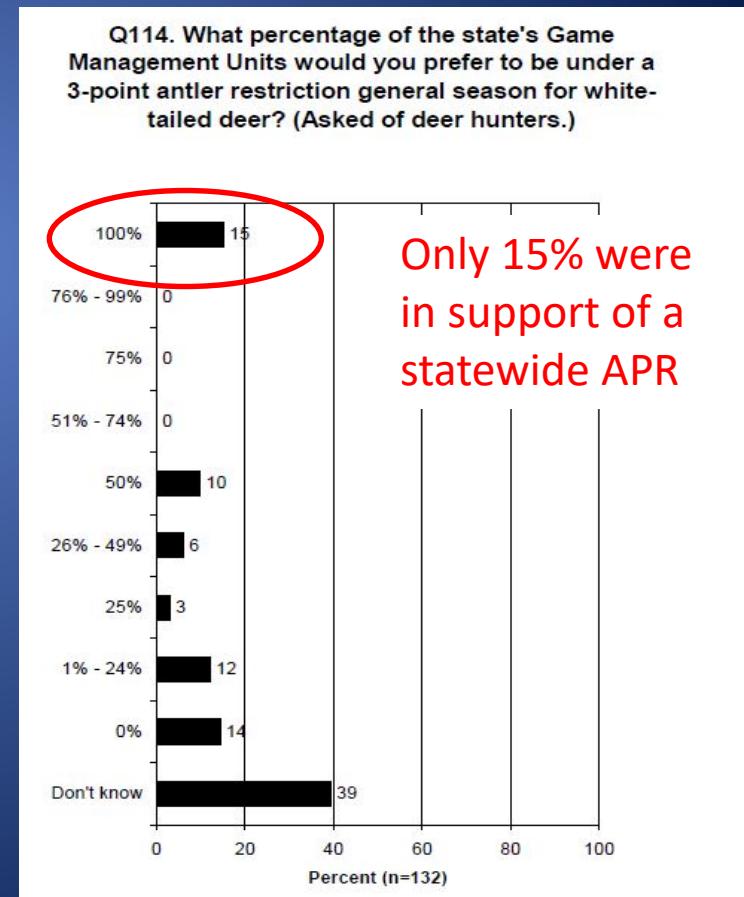
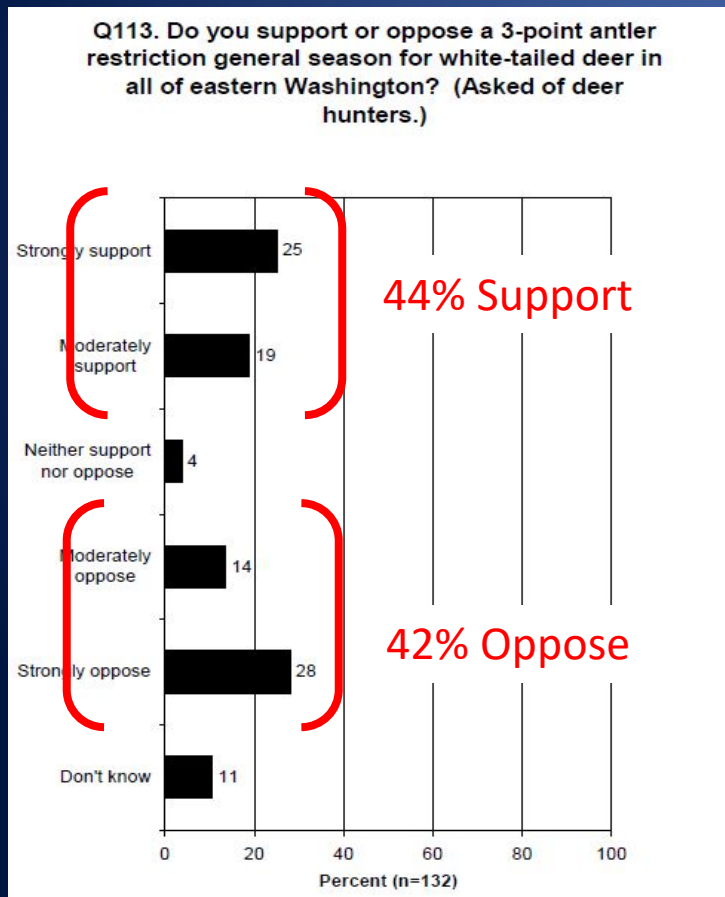
Christopher E. Shaw, Department of Forestry, Wildlife, and Fisheries, University of Tennessee, 2431 Joe Johnson Drive, Knoxville, TN 37996

Craig A. Harper, Department of Forestry, Wildlife, and Fisheries, University of Tennessee, 2431 Joe Johnson Drive, Knoxville, TN 37996

Abstract: Quality deer management (ODM) is increasingly promoted and practiced throughout the range of white-tailed deer *Odocoileus virginianus*.

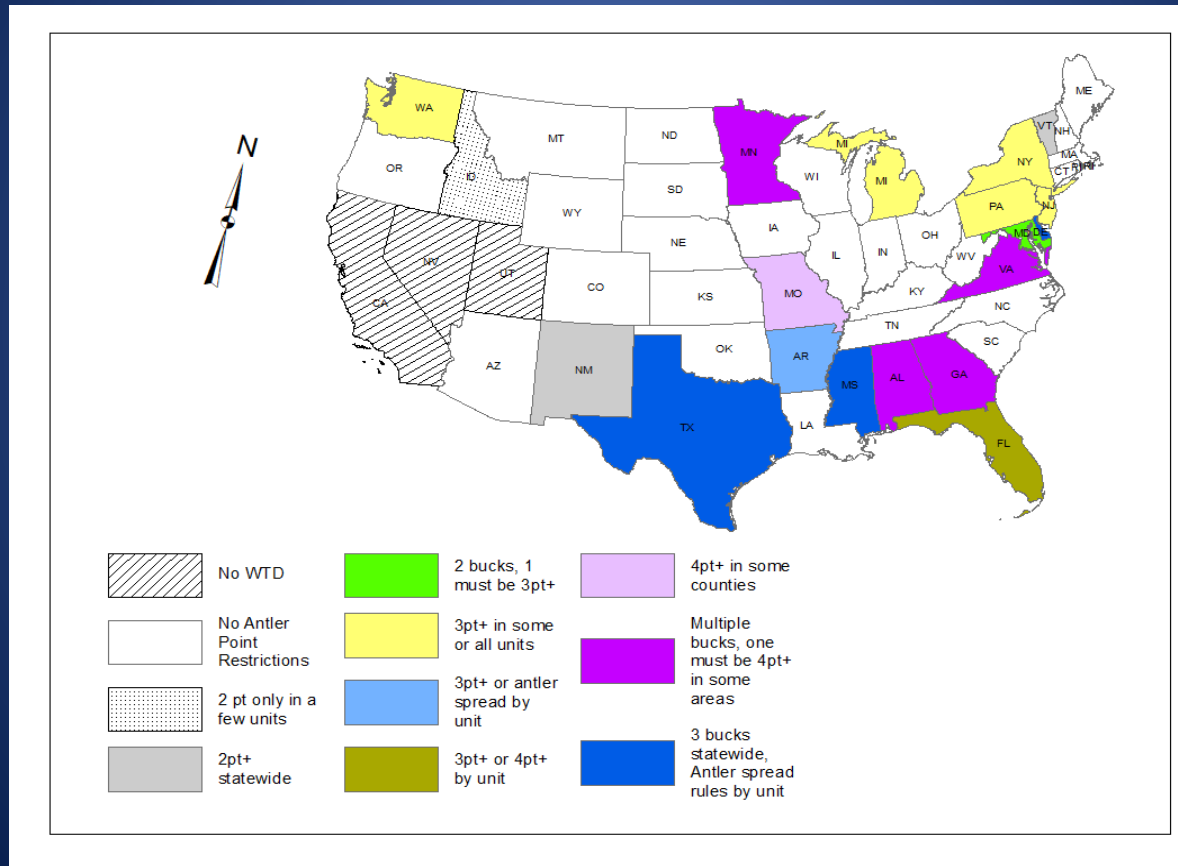
Antler-Point Restrictions (APRs)

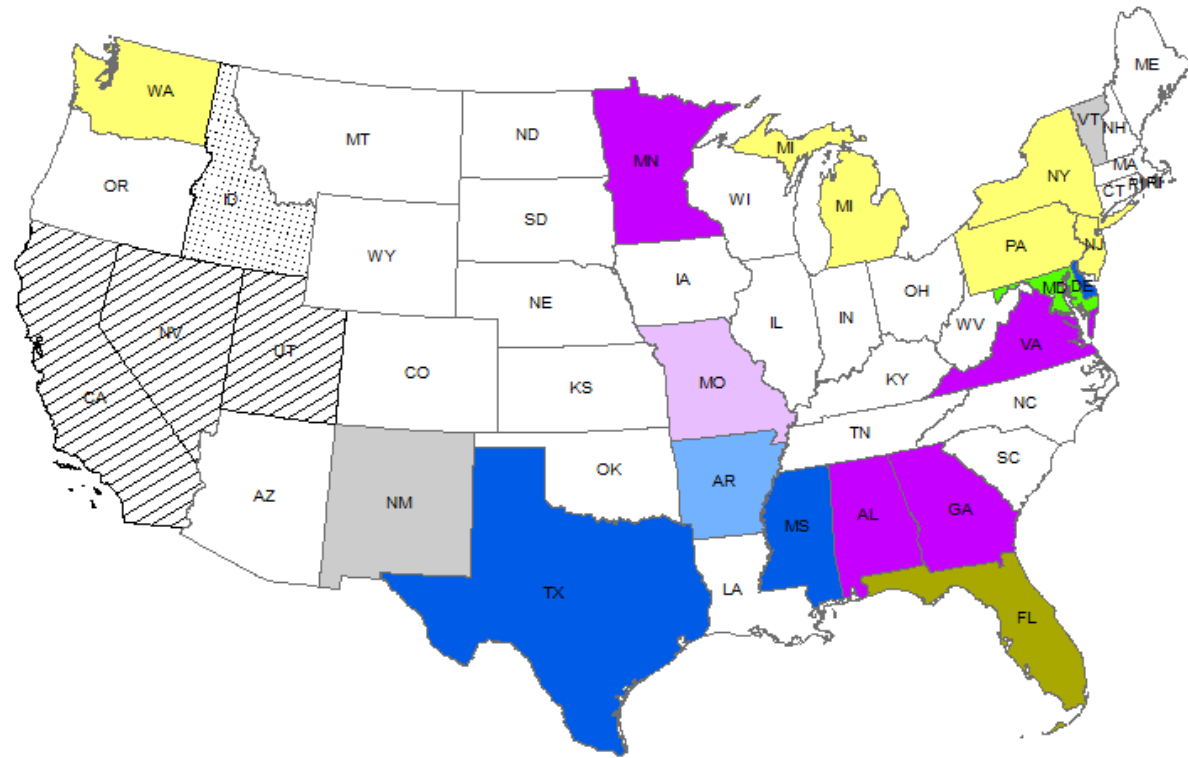
- Not always supported by the majority and never universally supported
 - Public outreach and support is critical







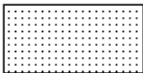
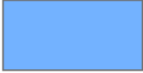





Antler-Point Restrictions (APRs)

- Rare for states to implement APRs at a statewide level





	No WTD		2 bucks, 1 must be 3pt+		4pt+ in some counties
	No Antler Point Restrictions		3pt+ in some or all units		Multiple bucks, one must be 4pt+ in some areas
	2 pt only in a few units		3pt+ or antler spread by unit		3 bucks statewide, Antler spread rules by unit
	2pt+ statewide		3pt+ or 4pt+ by unit		

Effects of APRs on Reproduction

- Study Period 1999-2006
- APRs implemented 2002
- Documented increase in the number of mature bucks
- Found no effect of APRs on reproductive parameters monitored
 - Date of conception
 - Productivity (embryos/doe)
 - Sex ratio of embryos

The Journal of Wildlife Management 1-9; 2019; DOI: 10.1002/jwmg.21712

Research Article

Effect of Male Age Structure on Reproduction in White-Tailed Deer

DUANE R. DIEFENBACH,¹ U.S. Geological Survey, Pennsylvania Cooperative Fish and Wildlife Research Unit, Pennsylvania State University, 404 Forest Resources Building, University Park, PA 16802, USA
GARY L. ALT,² Pennsylvania Game Commission, Bureau of Wildlife Management, Harrisburg, PA 17110, USA
BRET D. WALLINGFORD, Pennsylvania Game Commission, Bureau of Wildlife Management, Harrisburg, PA 17110, USA
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ABSTRACT Selective harvest regimes that create female-biased sex ratios can potentially lead to delayed breeding, reduced breeding synchrony, reduced productivity, and a female-biased sex ratio of offspring. These resulting changes in breeding behavior and population dynamics have potential to adversely affect population growth. In 2002, Pennsylvania implemented harvest regulation changes that reduced deer density (increased harvest of antlerless deer) and increased the number and age of antlered deer (implemented antler point restriction regulations) that resulted in a less female-biased sex ratio. We monitored date of conception, productivity (embryos/female), and sex ratio of embryos during 1999–2006 to test if timing of breeding occurred earlier and with greater synchrony, if productivity of females increased, and if the sex ratio of offspring would shift towards more males. Deer density decreased 23% and the adult (≥ 1.5 yr old) sex ratio declined from 2.30 to 1.95 females/male. The ratio of ≥ 2.5 -year-old to 1.5-year-old males shifted towards more older males (1:3.7 in 2002 to 1:1.59 in 2006) and the ≥ 2.5 -year-old male population increased from 41,853 during 1999–2001 to 54,064 by 2006. We found no evidence of any change in the timing or variability of date of conception, productivity, or offspring sex ratio. We conclude that harvest regulation changes implemented in Pennsylvania, USA, were insufficient to affect timing of breeding or population dynamics and that efforts by managers to identify a desired sex ratio or manipulate sex ratios to achieve management goals on a statewide scale will be challenging. © 2019 The Wildlife Society.

KEY WORDS age ratio, antler point restrictions, breeding, *Odocoileus virginianus*, productivity, selective harvest, sex ratio, white-tailed deer.

In ungulate species, selective harvesting that results in a female-biased sex ratio and younger age structure can reduce fecundity, alter breeding dates, reduce birth synchrony, result in fewer male offspring, and reduce offspring body mass (Milner et al. 2007). Furthermore, male-biased harvest management strategies have raised concerns about selective effects on life-history evolution (Festa-Bianchet 2003, Myrnerud 2011) and loss of genetic variability (Ryman et al. 1981). Myrnerud et al. (2002) argued that the effects of males on population dynamics may be non-trivial and they identified several potential mechanisms that could affect timing of breeding that, in turn, could affect neonate survival and fertility of females.

White-tailed deer (*Odocoileus virginianus*) populations throughout North America have endured harvest rates as high as 80% of antlered males (Adams and Hamilton 2011). In Pennsylvania, USA, throughout the twentieth century, hunting regulations for white-tailed deer resulted in a female-biased sex ratio but with no adverse effect on overall abundance (Diefenbach et al. 1997). During 1981–2001, the annual harvest rate of antlered deer was 0.77–0.84 and few male deer survived >3.5 years of age (Wallingford et al. 2017). In 2002, Pennsylvania implemented harvest regulations that increased the survival rate of males and reduced the survival rate of females by implementing antler point restriction (APR) regulations for males and increased allocation of antlerless licenses to harvest females (Wallingford et al. 2017). Pennsylvania's deer population has adversely affected forest plant communities and agricultural crops and the Pennsylvania Game Commission (PGC) was unable to balance deer densities with habitat conditions (Diefenbach et al. 1997). The implementation of APRs was designed to maintain hunter satisfaction with more older deer harvested despite lower deer densities from

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