

Appendices

APPENDIX A. FIRE RISK CLASSIFICATION

High, moderate, and low fire risk was estimated for each CVS plot in the simulation dataset based on the Severe Crowning Index assessment from the Potential Fire Report produced by FFE. The Crowning Index indicates the estimated wind speed in miles per hour (mph) at 20 feet off the ground that would initiate an active crown fire assuming ignition of a surface fire. Assumptions required by the model include a temperature of 70 degrees Fahrenheit and 'very dry' moisture conditions (Crookston et al. 2002). Results from the crowning index estimates for each stand were sorted into one of three risk classes. Lower wind speeds indicate greater risk. If the crowning index was less than or equal to 25 mph, then the plot was considered to be in the high fire risk category. Moderate risk stands were those with a Severe Crowning Index of 25 through 50 mph. Low fire risk stands were those with a crowning index greater than 50 mph. Very young or clearcut stands function outside of the range of the model and subsequently record Severe Crowning Indices less than zero. To accommodate this model behavior, stands with a crowning index below zero are classed as low risk.

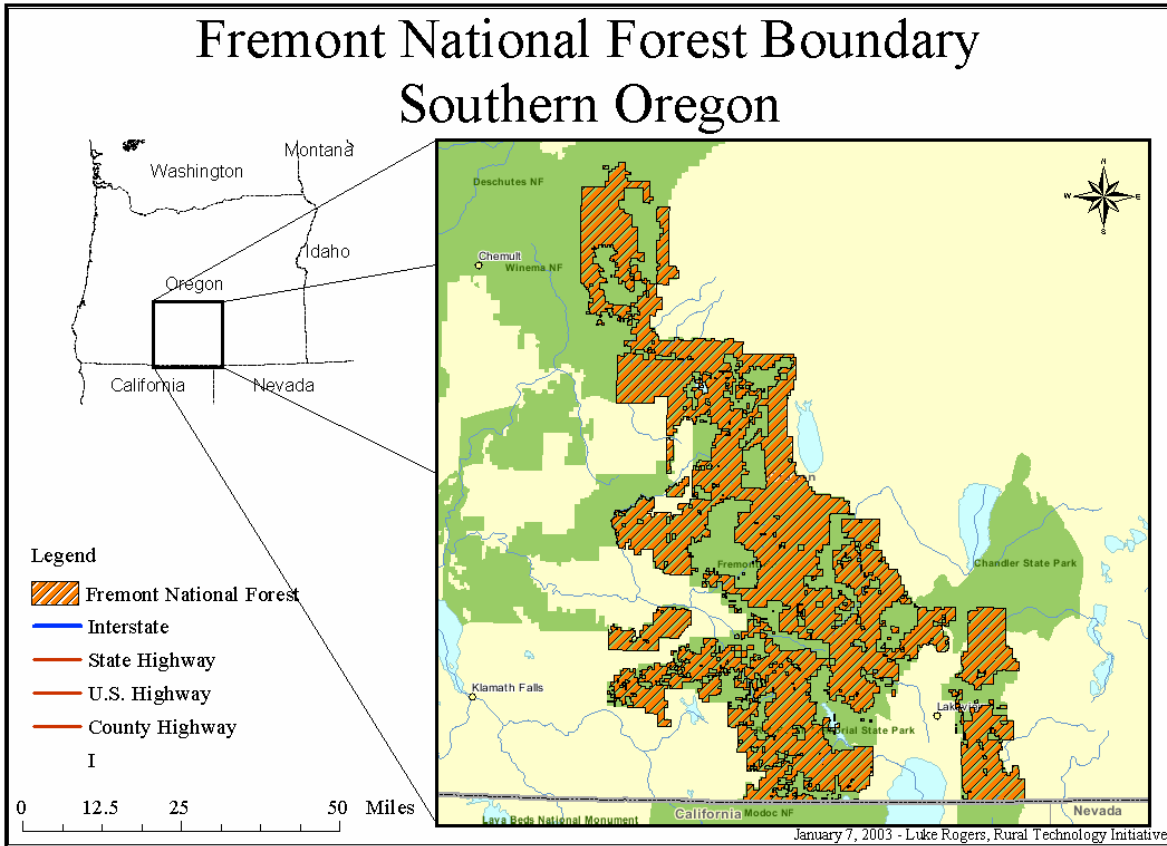
Fire Risk Classifications

Fire Risk Classification	Severe Crowning Index
Low	> 50 MPH & < 0 MPH
Moderate	> 25 ≤ 50 MPH
High	≤ 25 MPH

It should be noted that risk classifications are arbitrary thresholds useful and necessary for comparative analysis but that they may very well understate the risk at the margins. The word moderate properly segments a risk difference between high and low although the risk of a fire from wind speeds only slightly higher than 25 MPH might not be considered a moderate risk by many publics. It is in part for this reason that performance comparisons for treatment alternatives were reported in this investigation for high and moderate as separate risk classes and then combined as the total area to be considered for risk reduction treatments.

The initial 1995 fire risk distribution for the Fremont and Okanogan National Forests was reported as the percentage of CVS plots in each of the fire risk categories prior to any treatment or growth simulation. Fire risk distribution was similarly reported for projected and treated plot inventories at each growth cycle. For purposes of simulations to demonstrate comparisons between treatment alternatives only the plots with high and moderate initial classification were treated. Low risk areas did not receive treatment simulations since treatments of low risk areas would logically be considered unnecessary or of low priority. While some low risk areas may experience increases in risk over time most low risk areas appear to be either very young small diameter forests or rangeland/forest interface with sparse distributions of forest inventories that are unlikely to require fuels reductions at the time of this study.

APPENDIX B. FREMONT NATIONAL FOREST



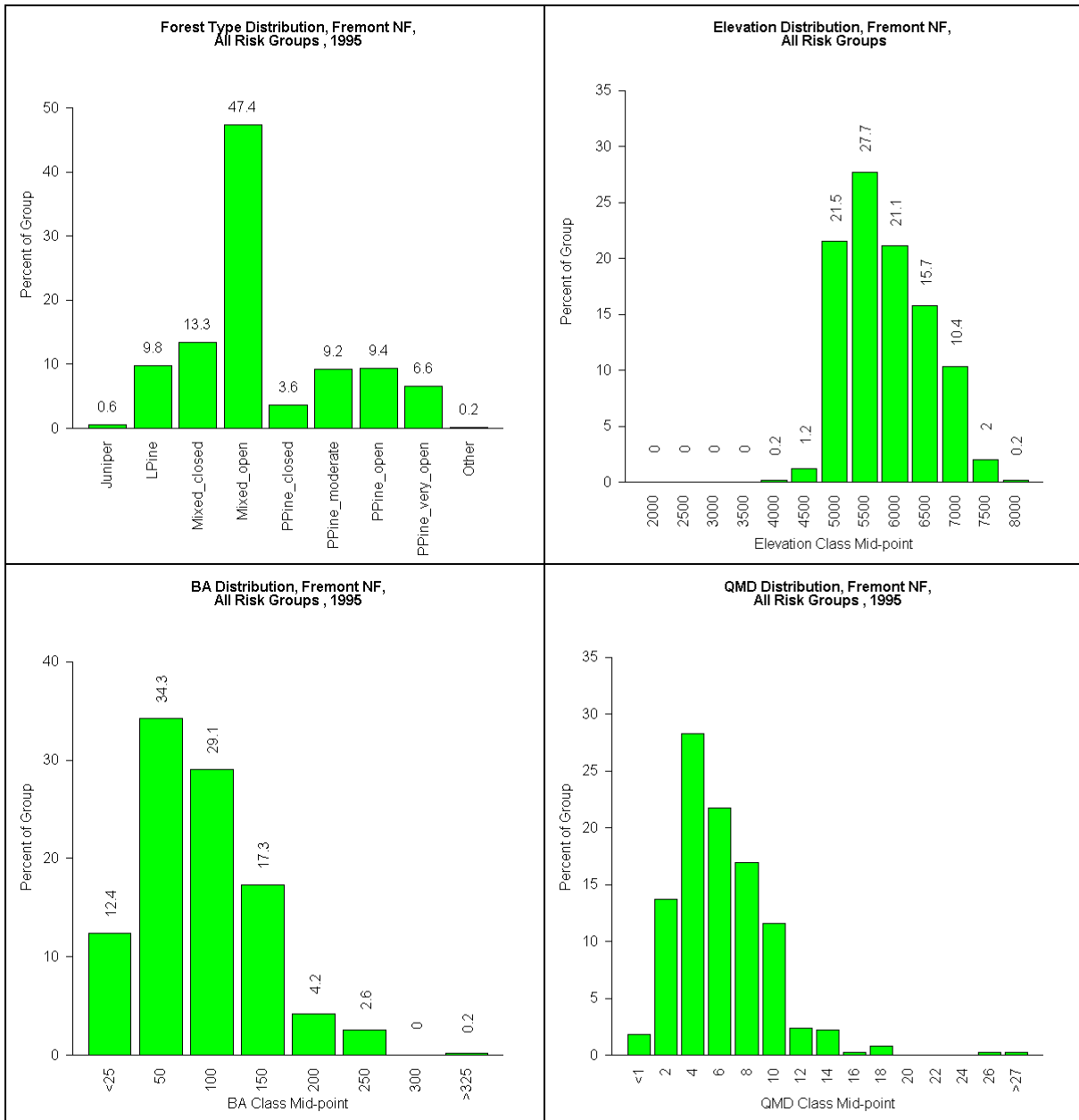
Fremont National Forest Risk Classes

Risk Class	Stands	Percent
High Risk	154	30.68
Moderate Risk	236	47.01
Low Risk	112	22.31
Total	502	

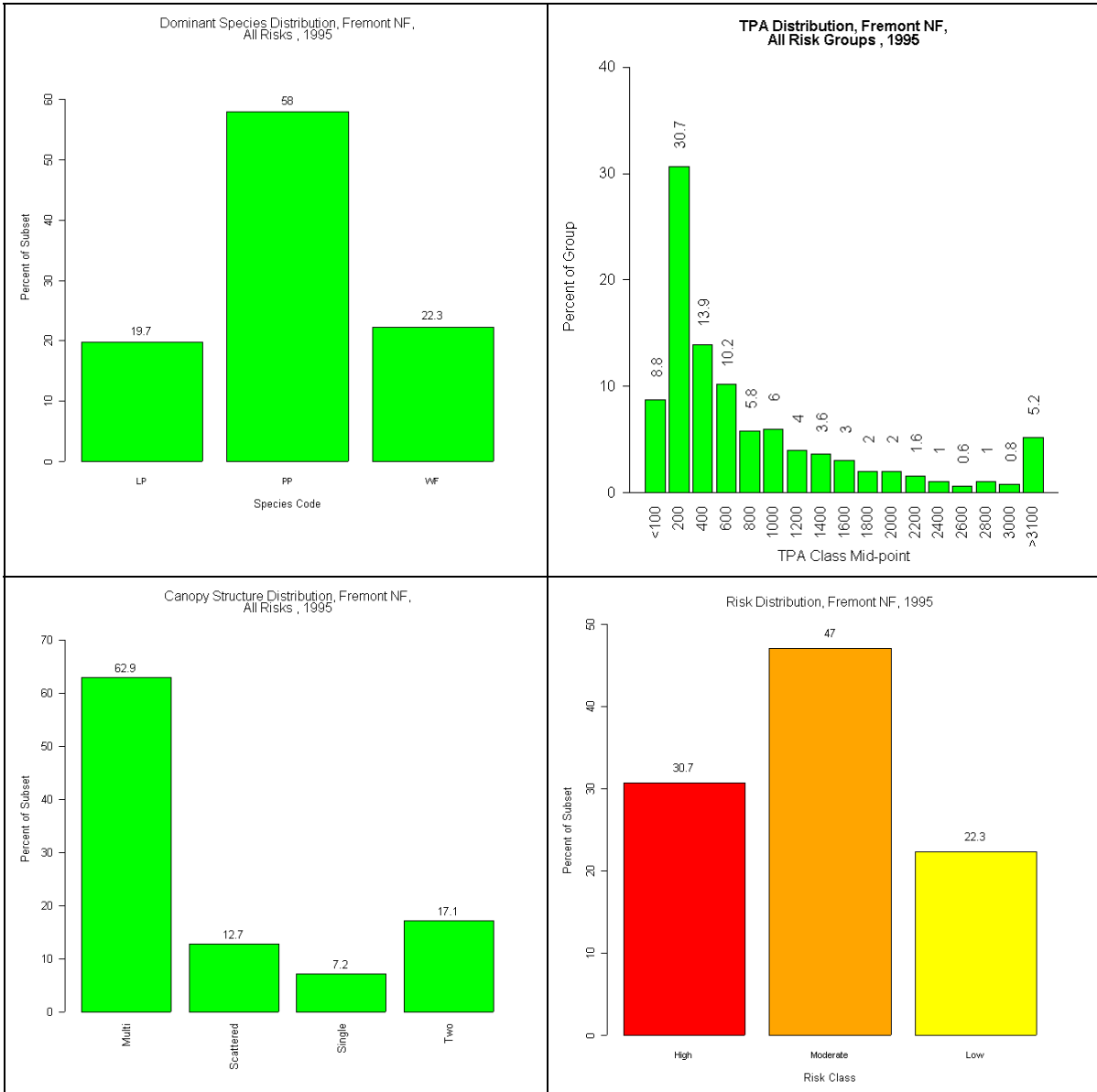
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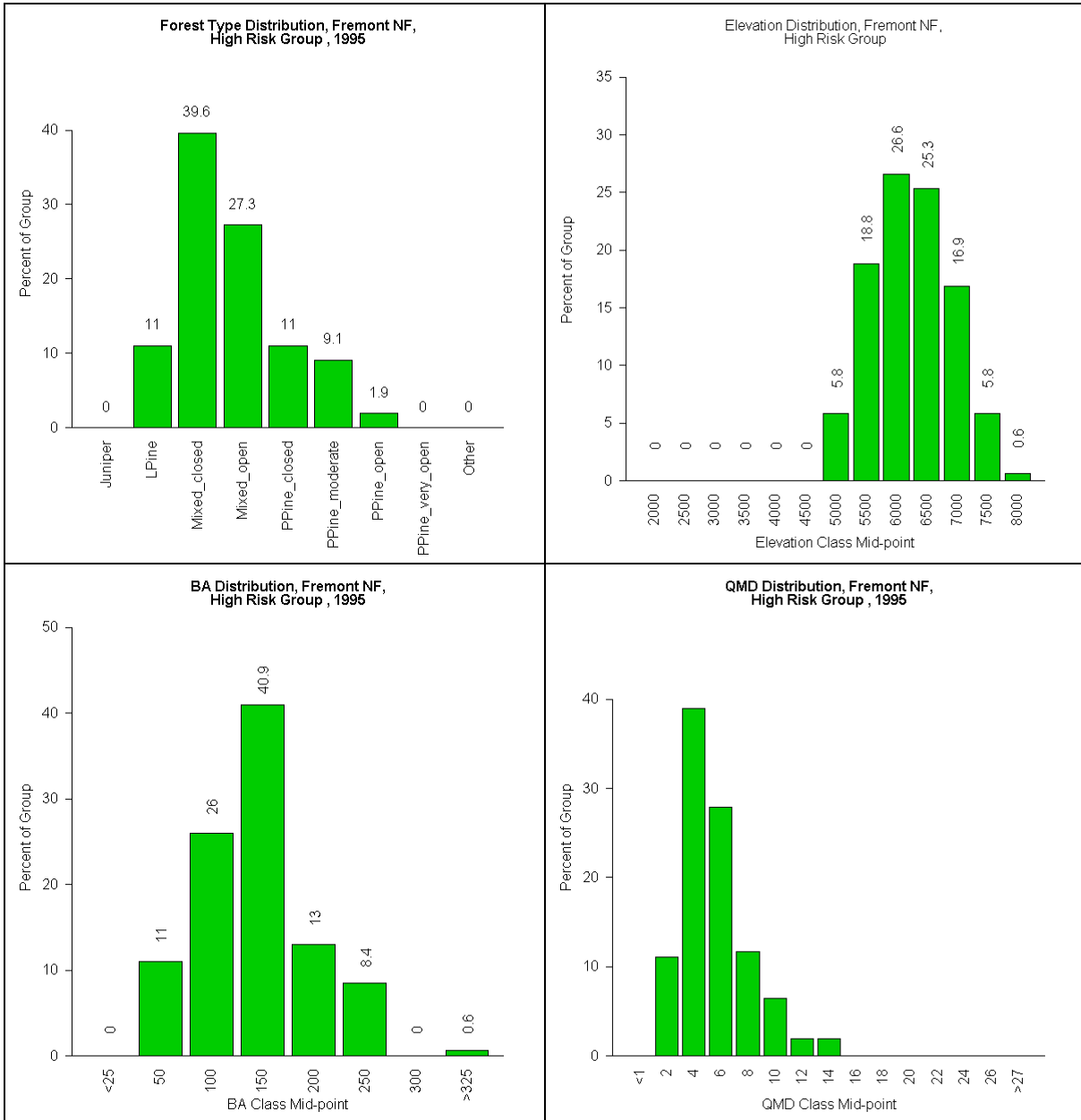
Fremont: Forest type, Elevation, Basal area, QMD



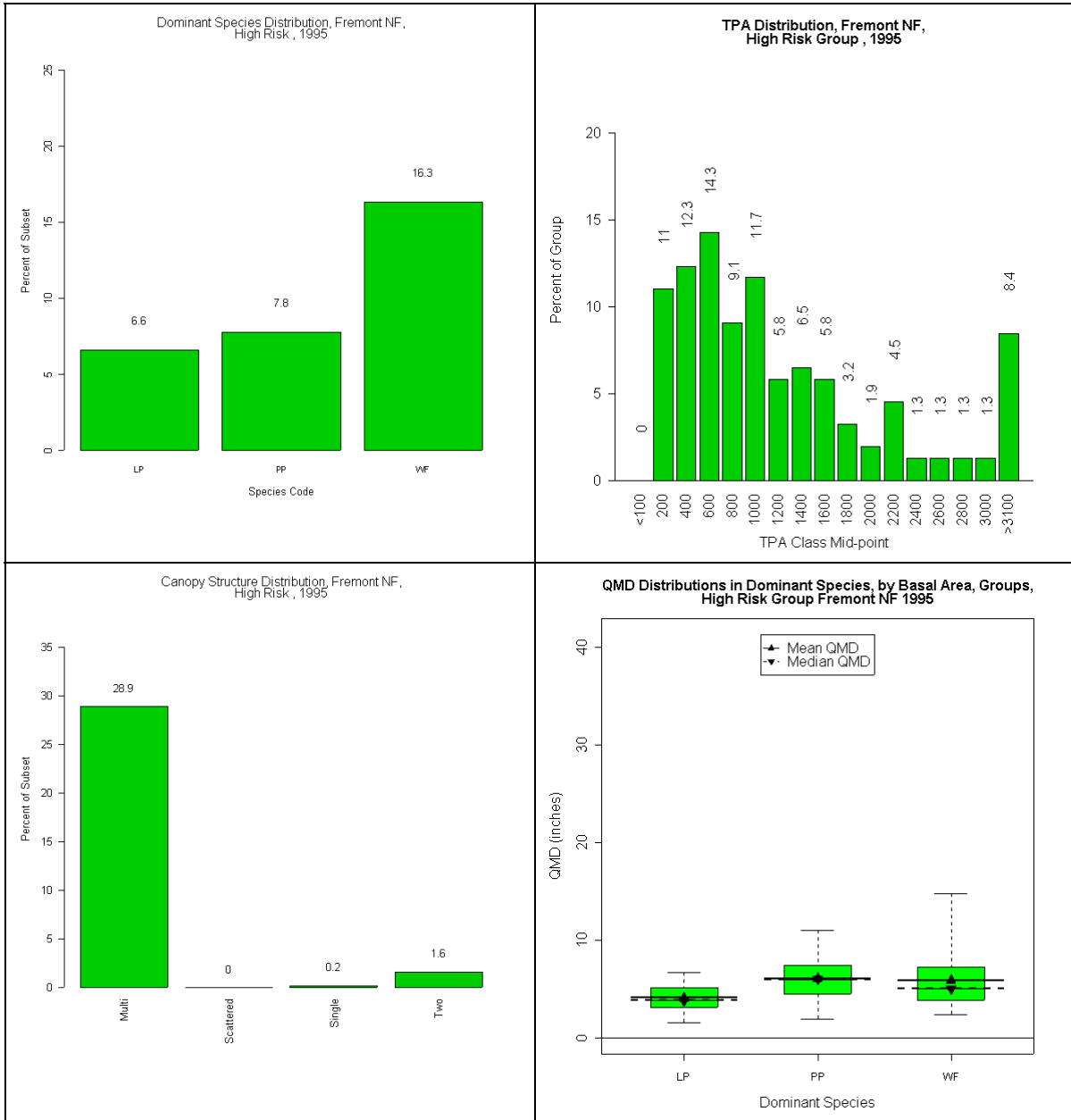
Fremont: Species, TPA, Canopy structure, Fire risk



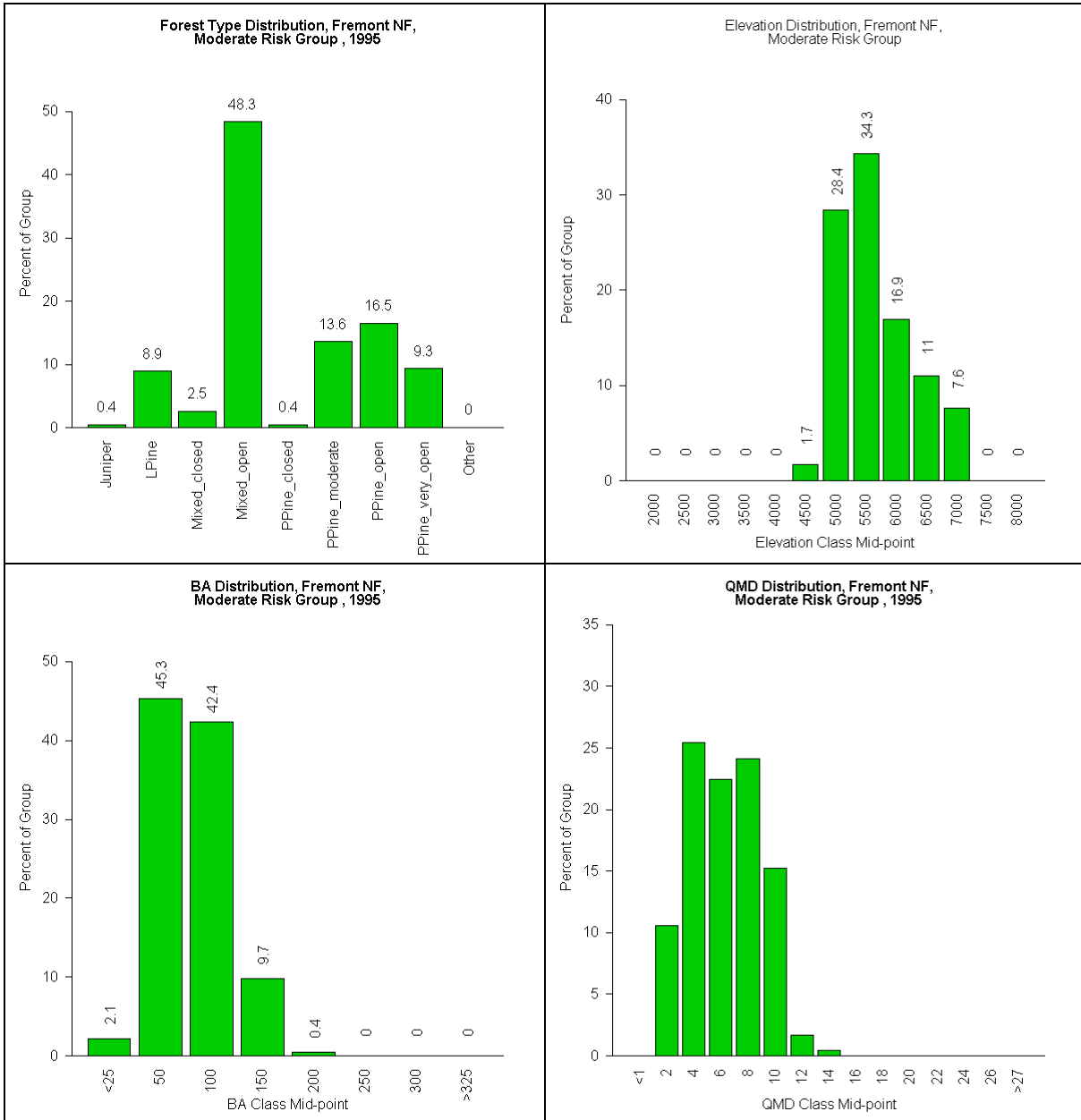
Fremont - High Risk Stands: Forest type, Elevation, Basal area, QMD



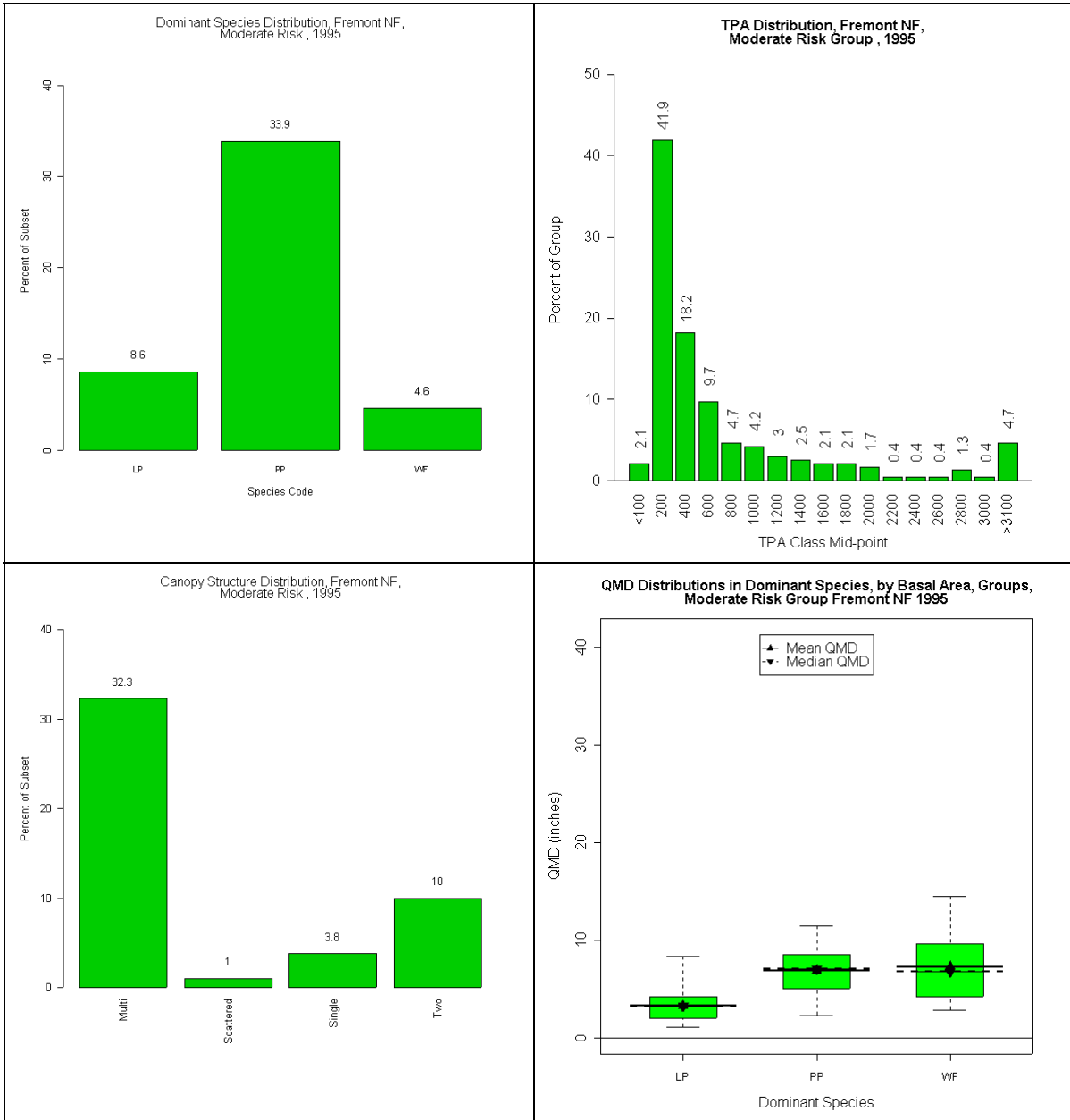
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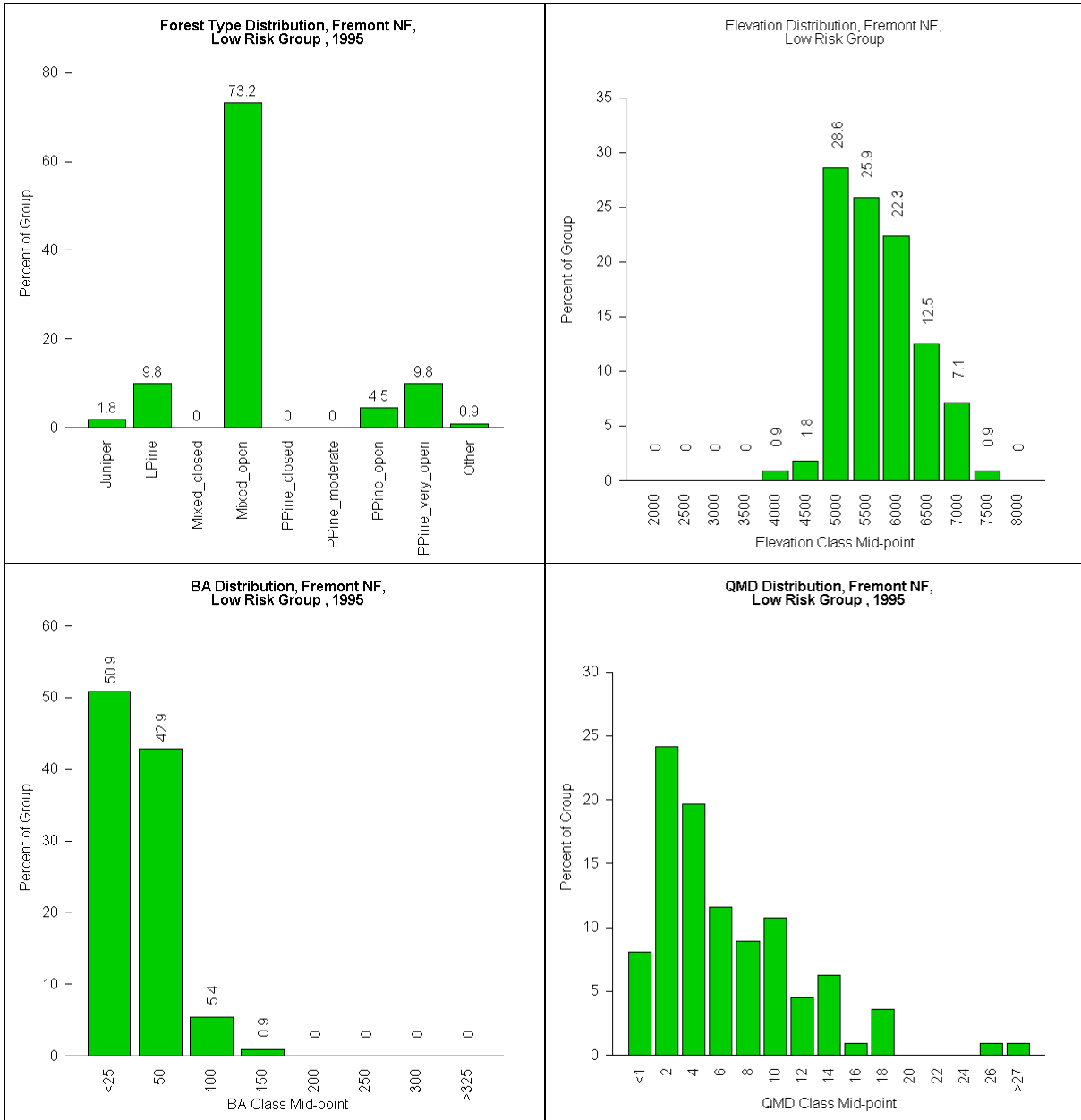
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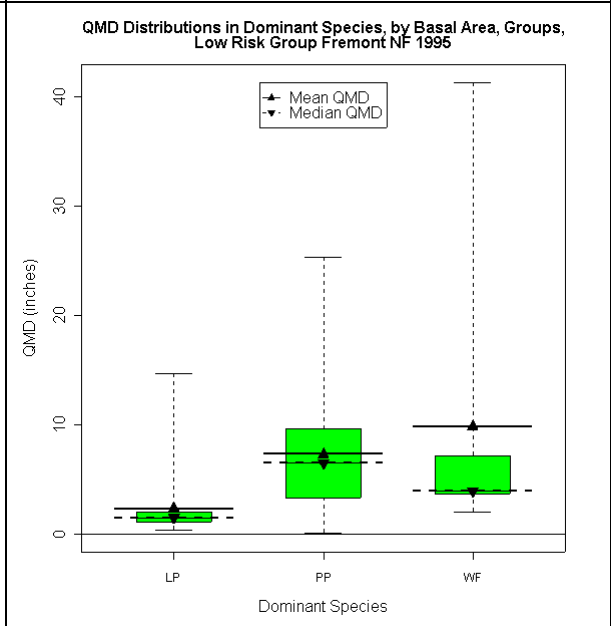
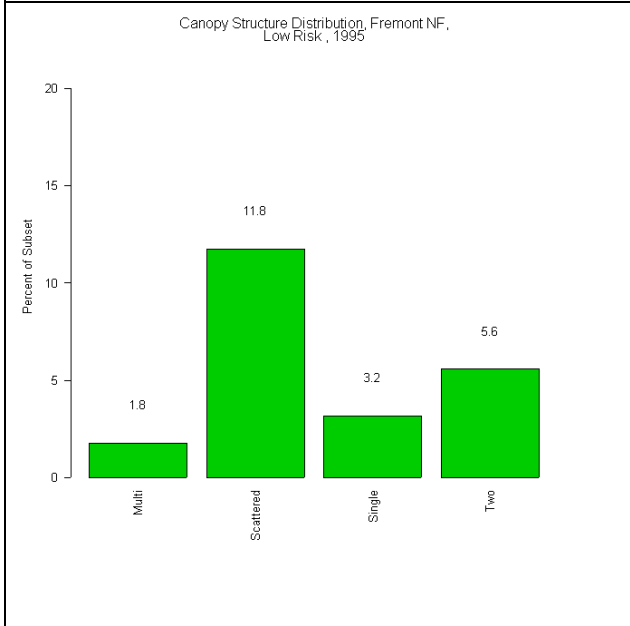
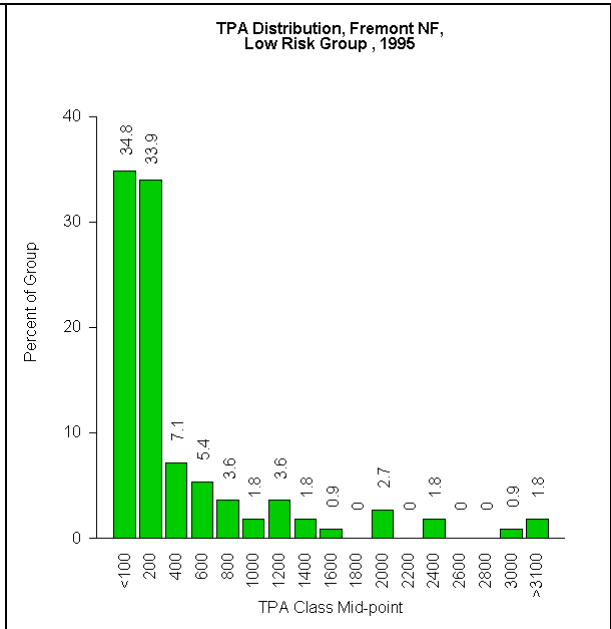
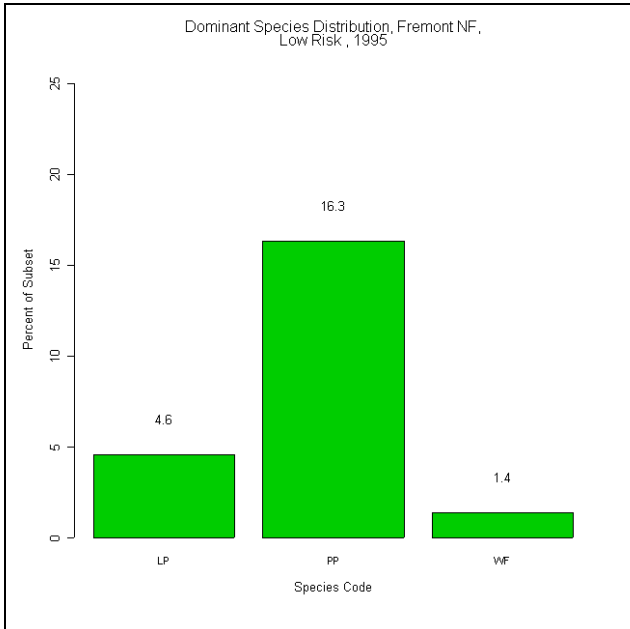
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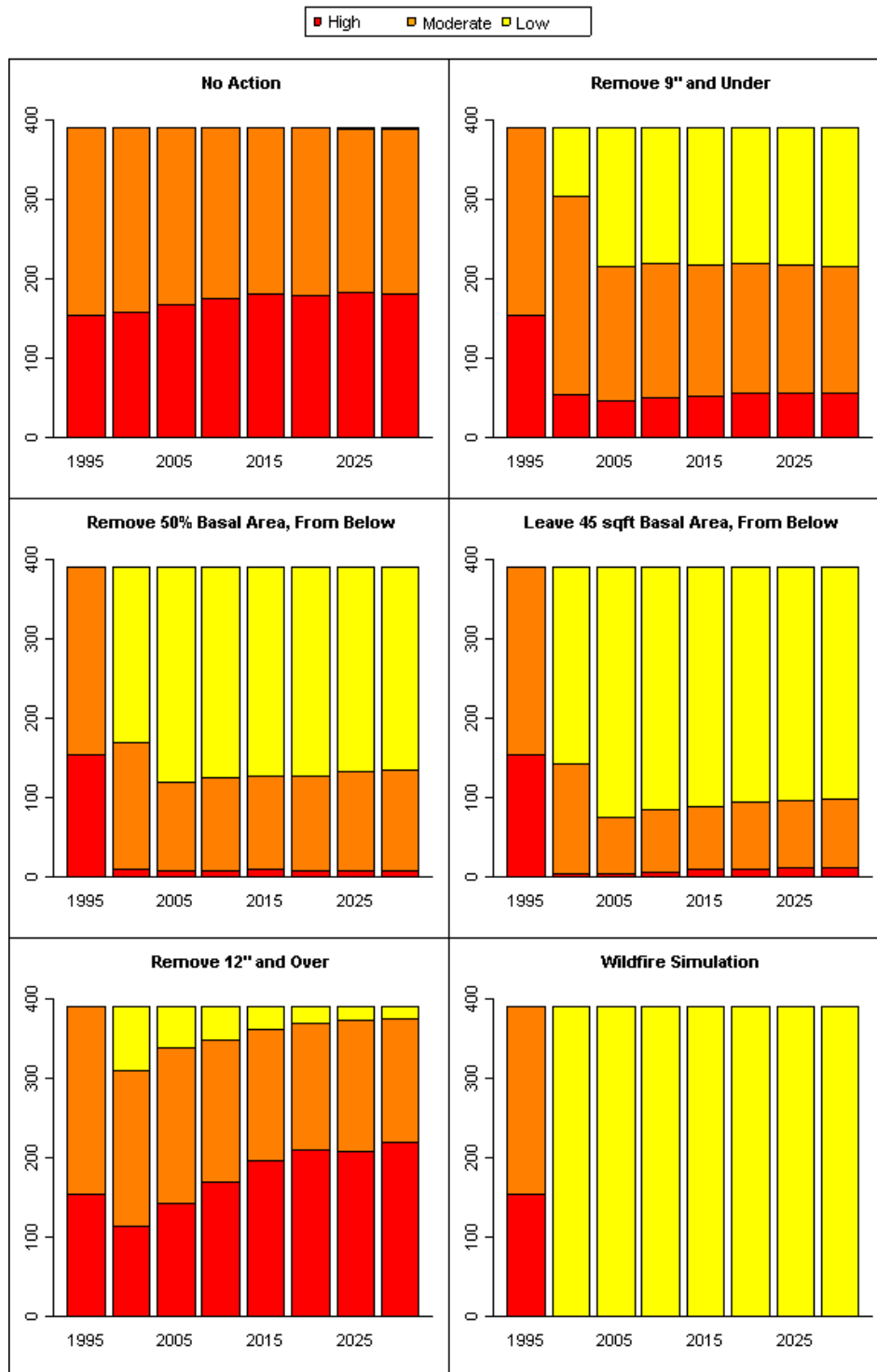
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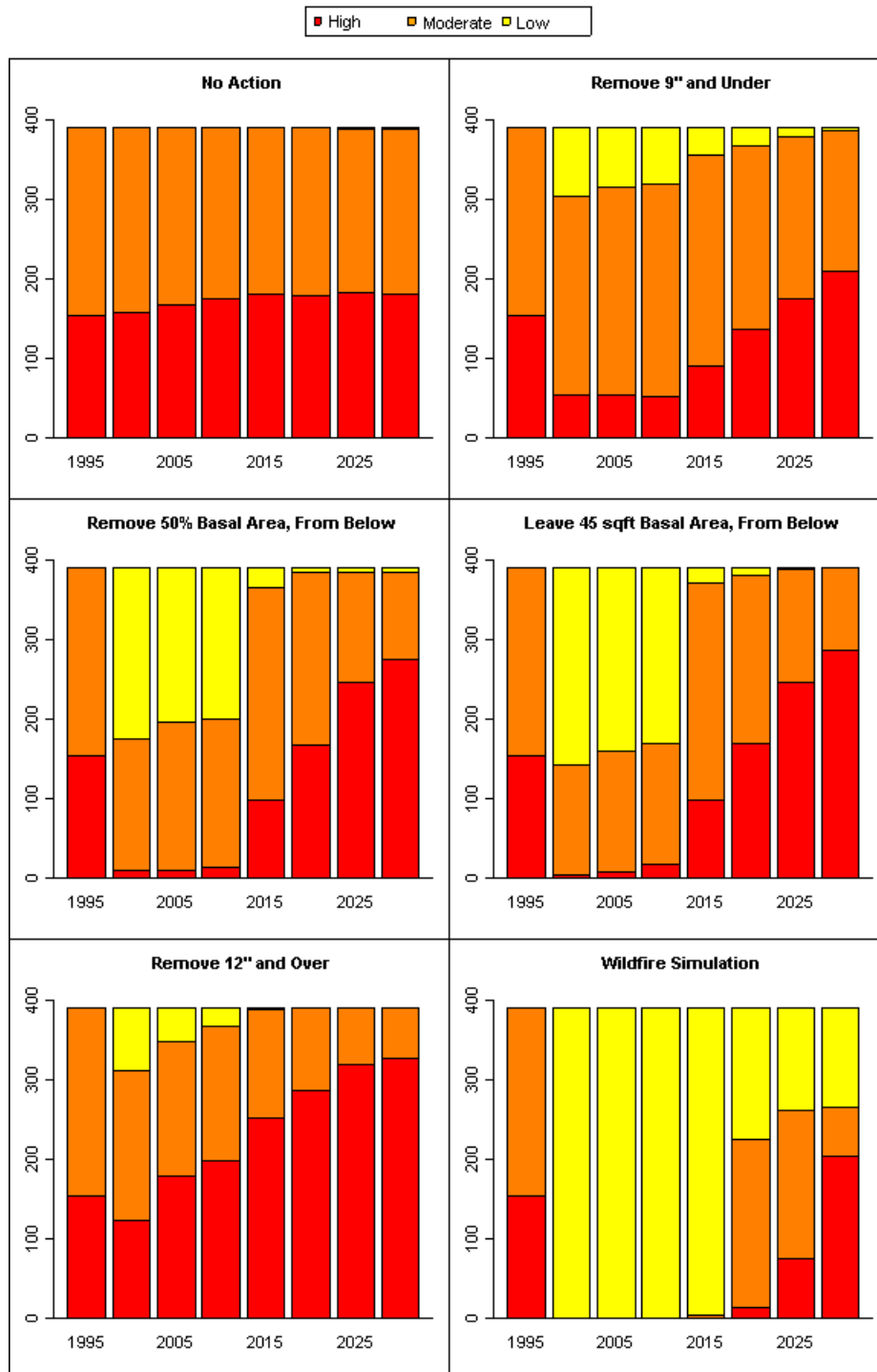
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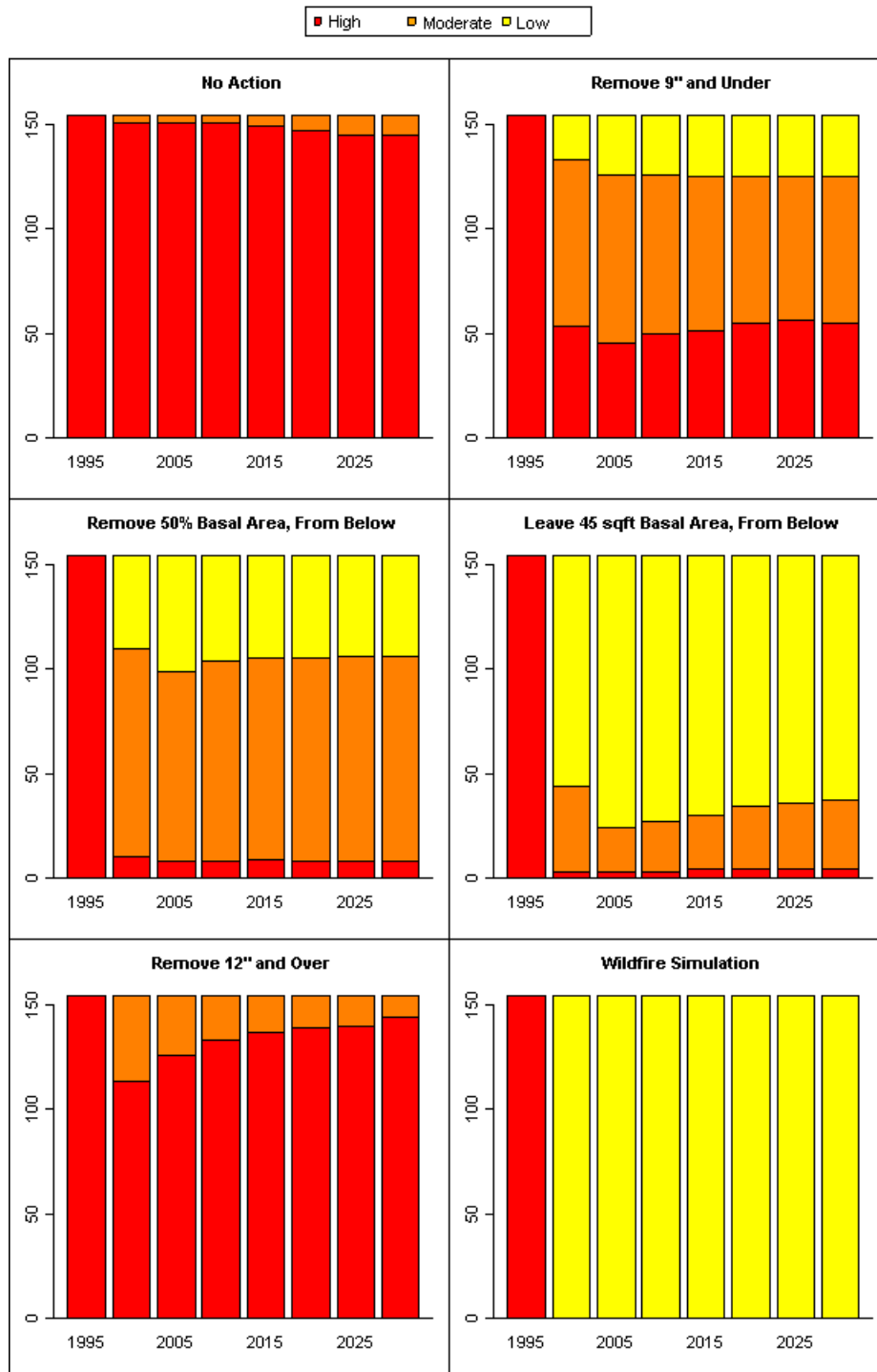
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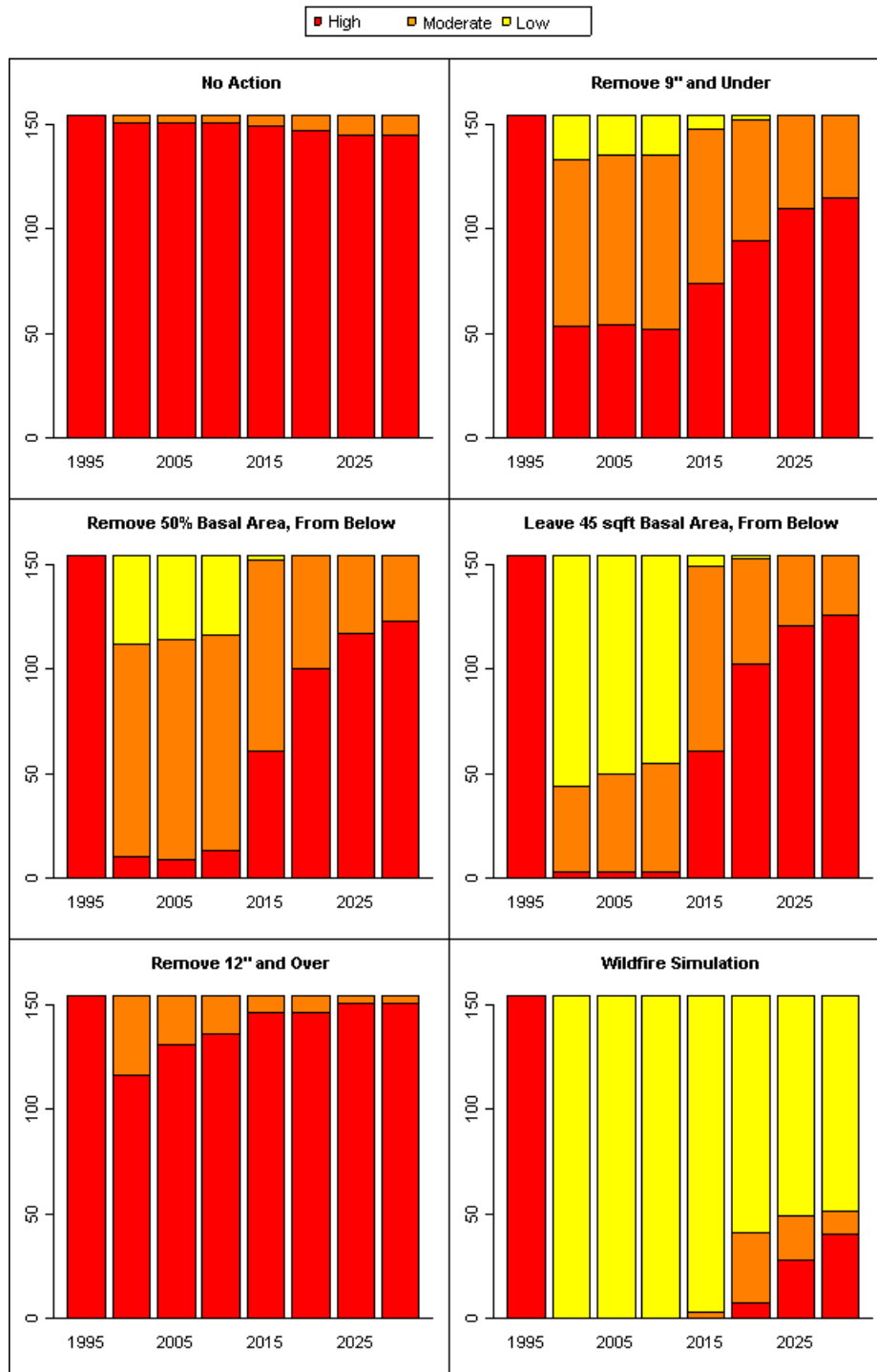
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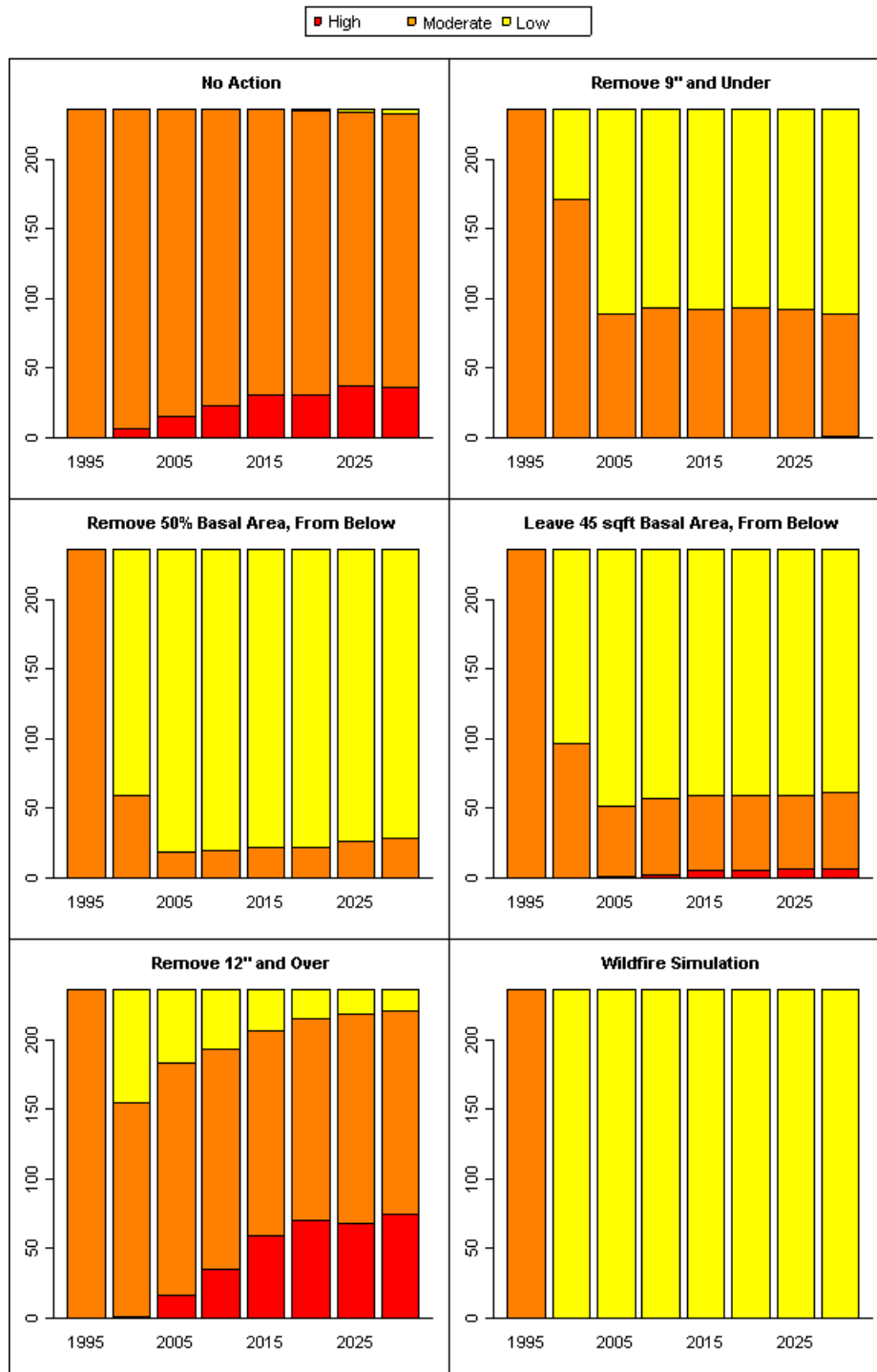
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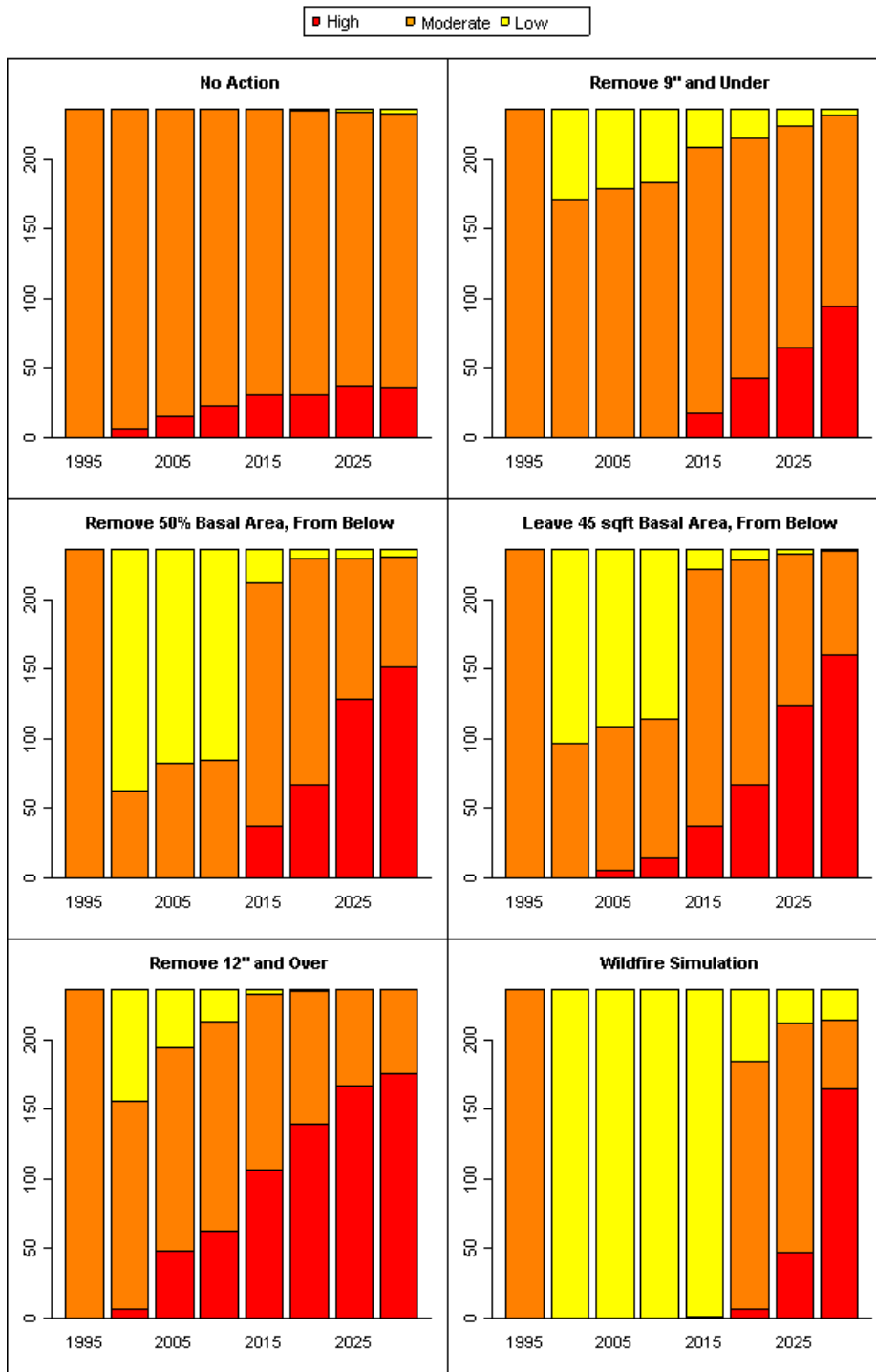
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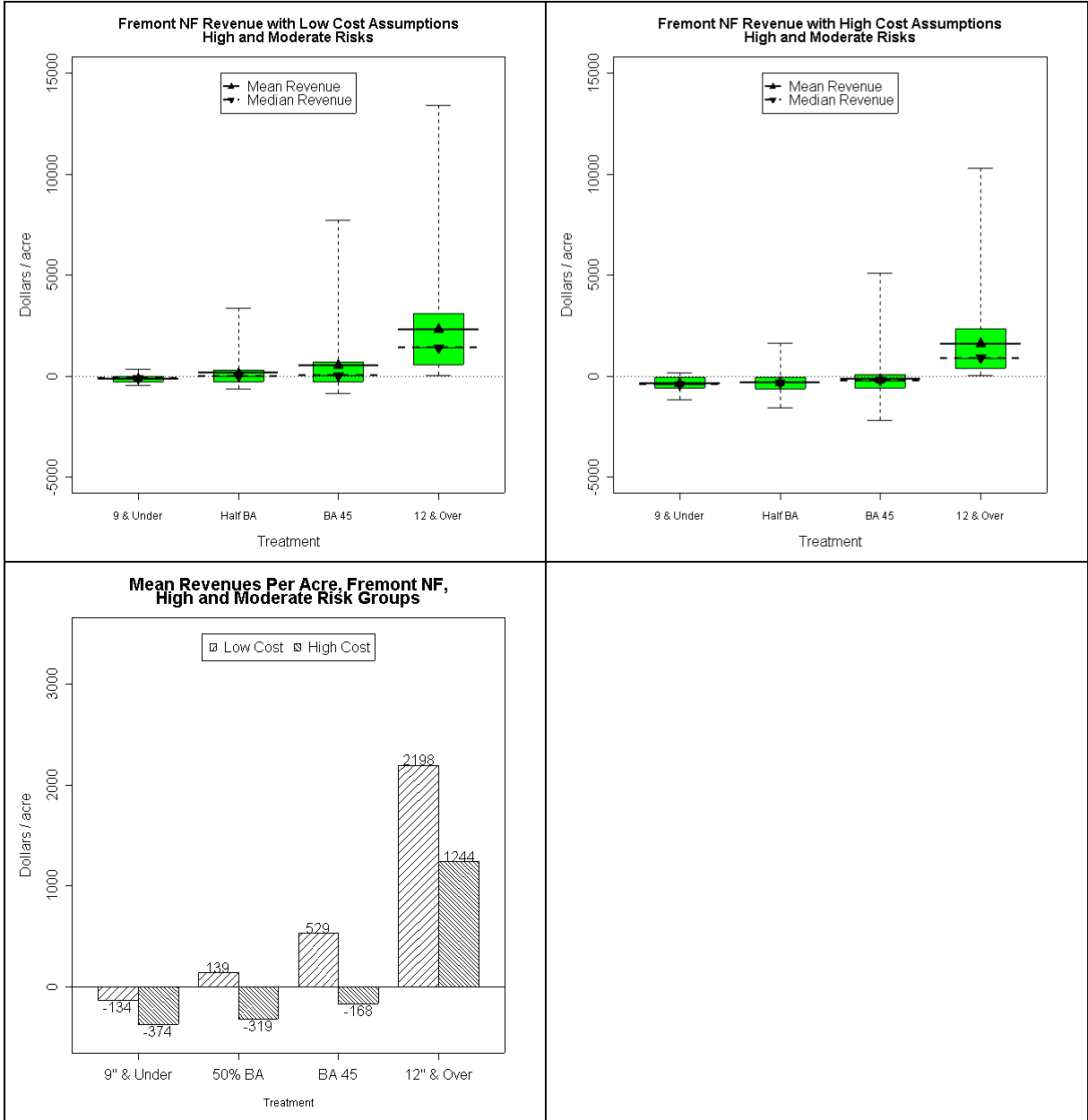
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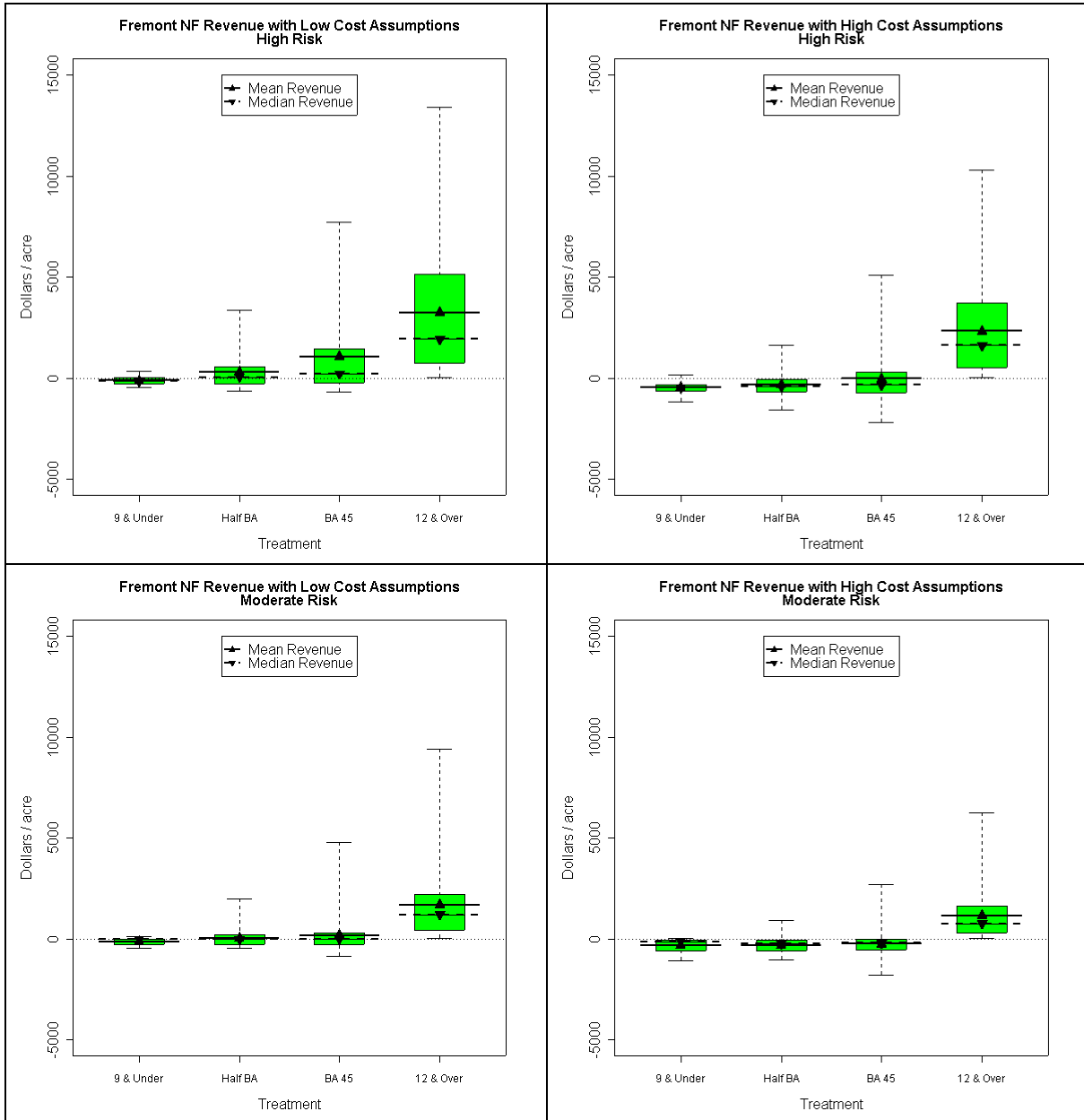
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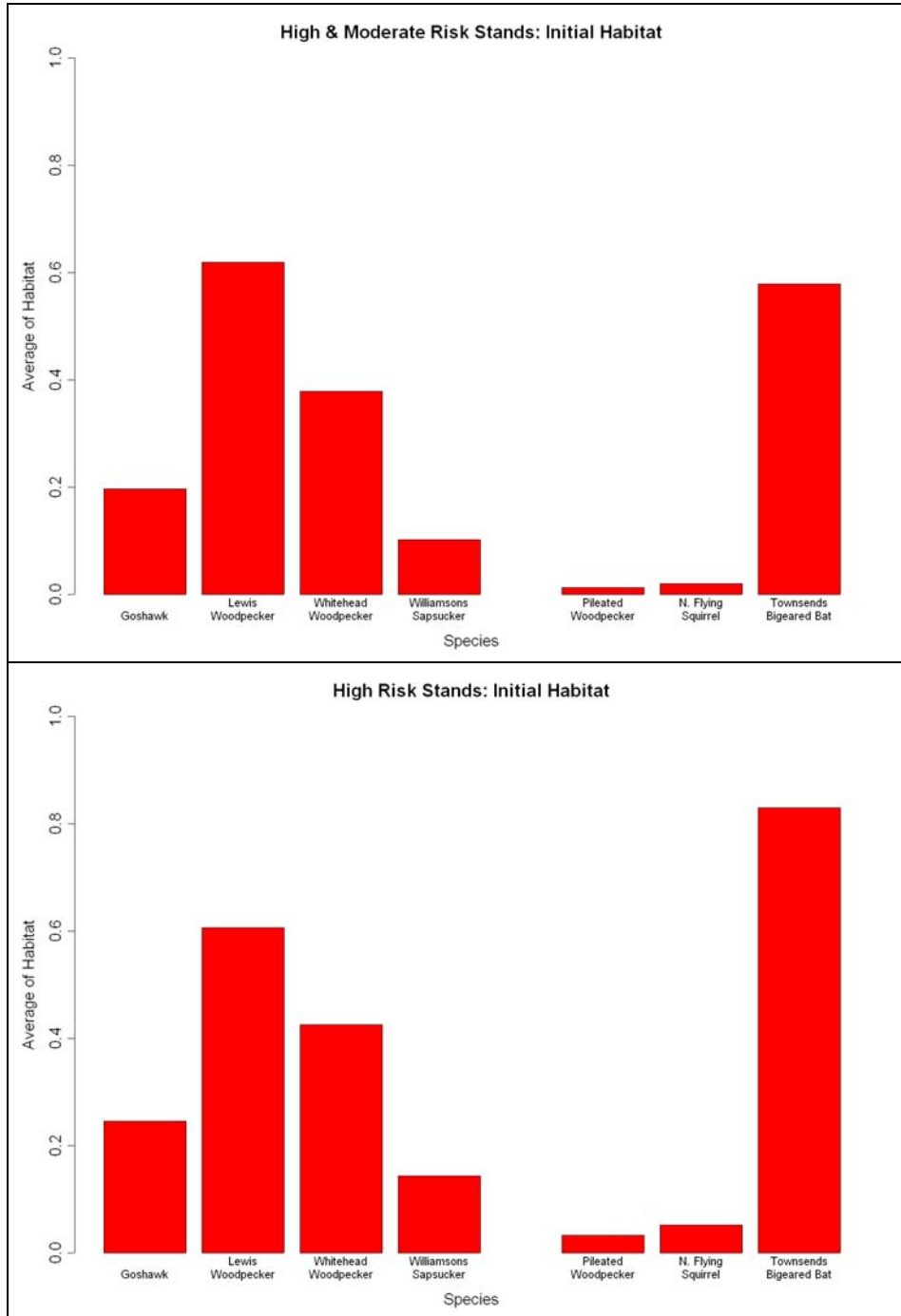
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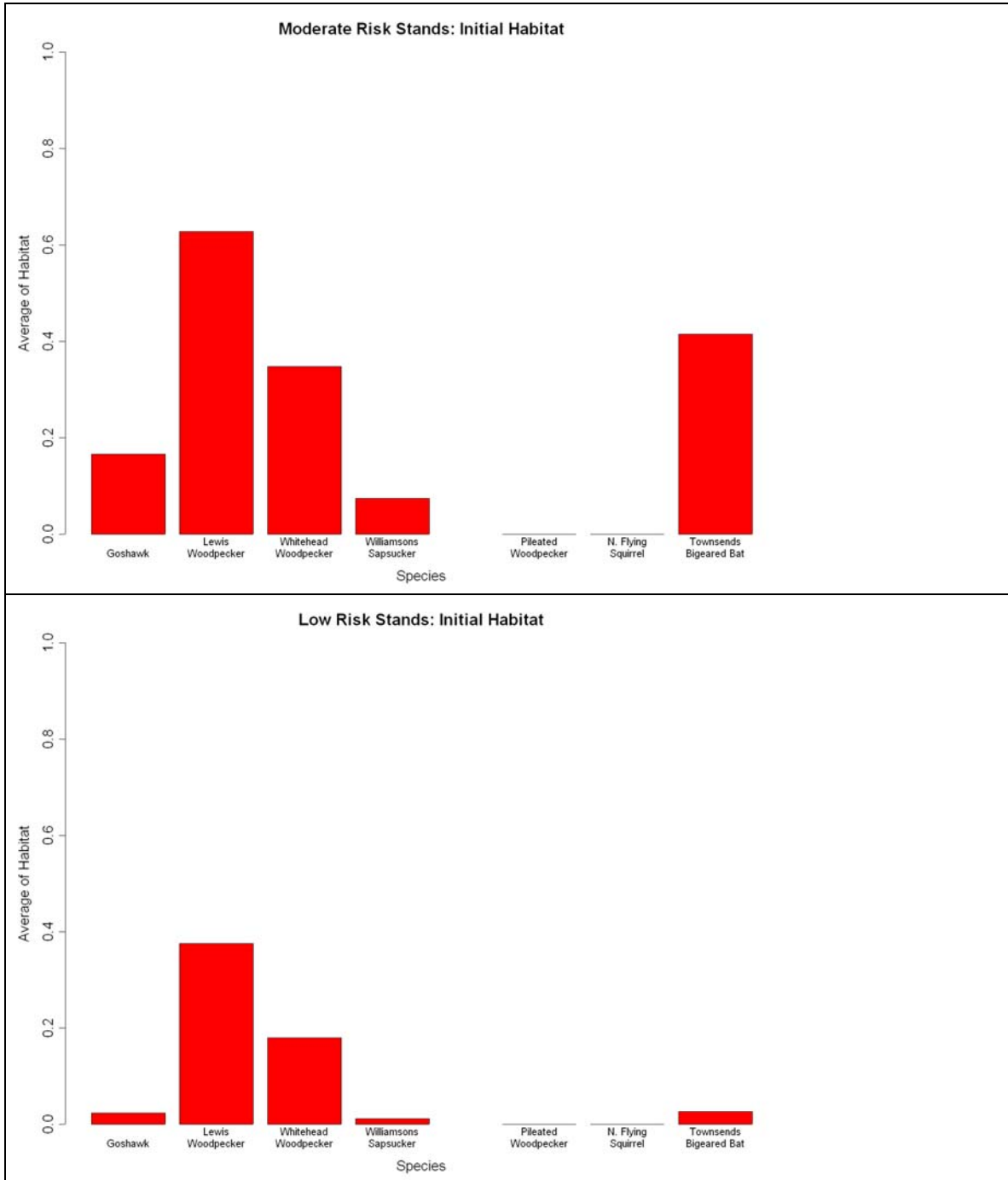
Fremont – High Risk & Moderate Risk Stands: Economics, Low & High Cost



Fremont – High & Moderate Risk Stands: Initial Habitat

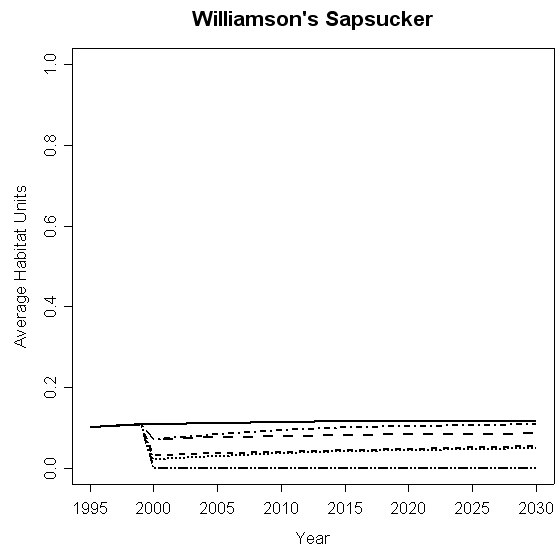
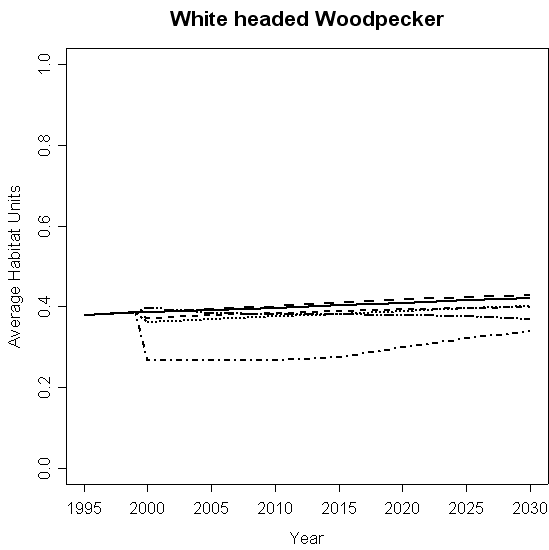
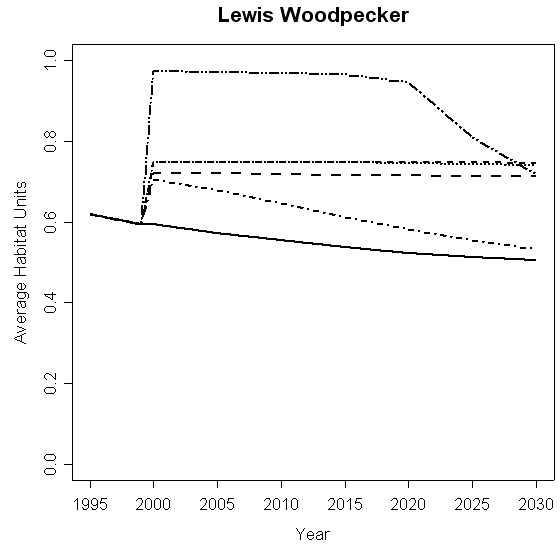
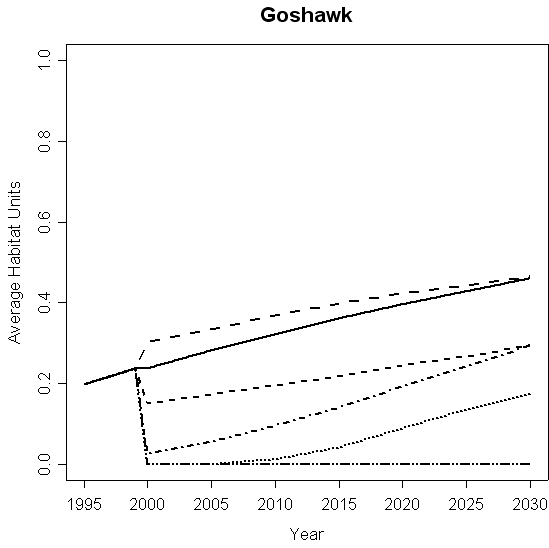


Fremont – High Risk & Moderate Risk: Initial Habitat



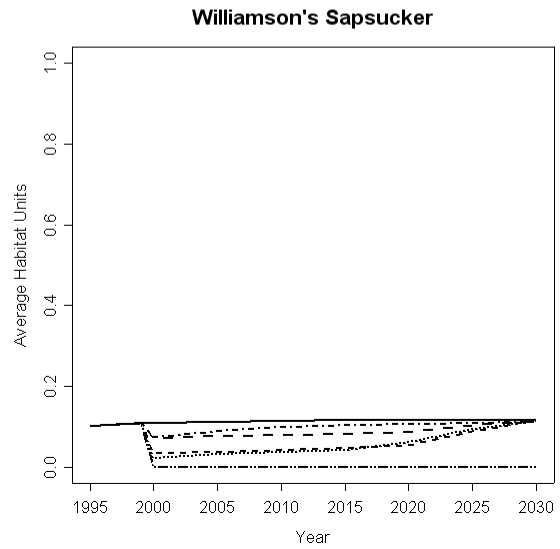
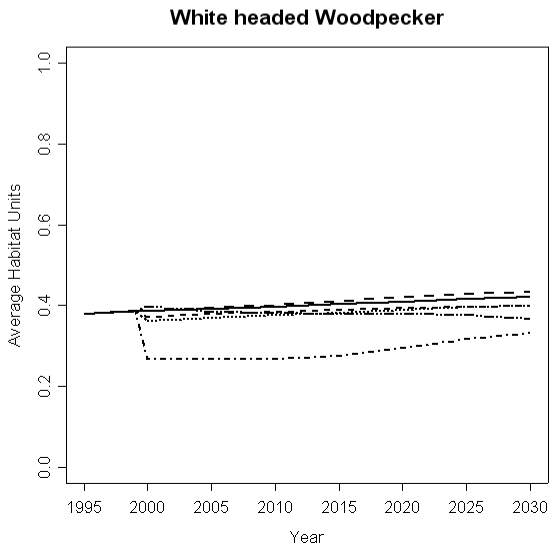
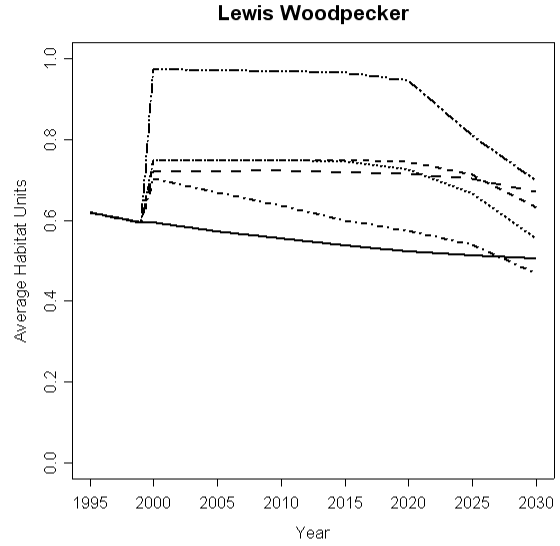
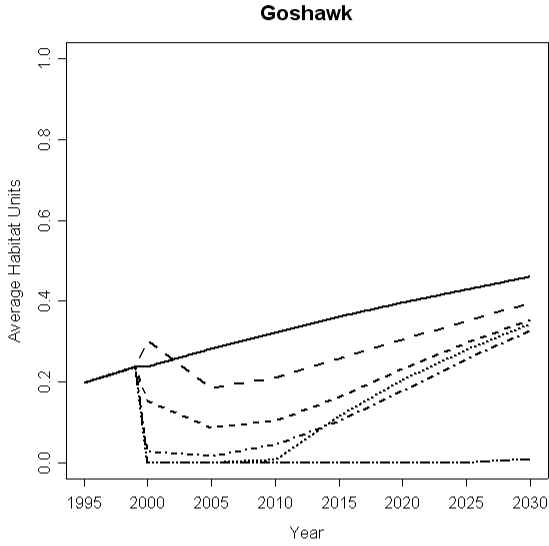
Fremont - High & Moderate Risk Stands: Wildlife HSI without Regeneration

Fremont - High & Moderate Risk Stands: HSI without regeneration



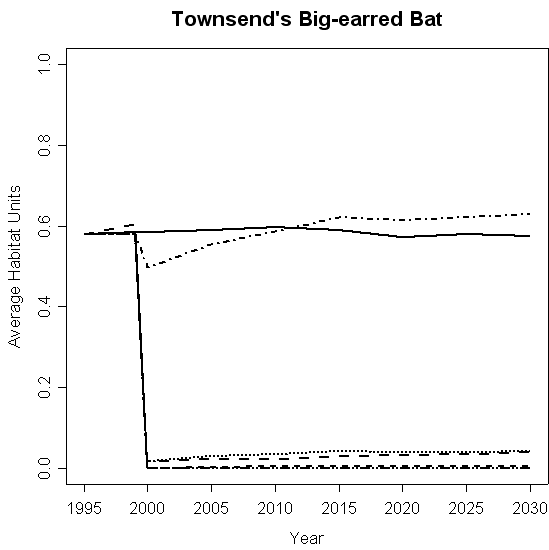
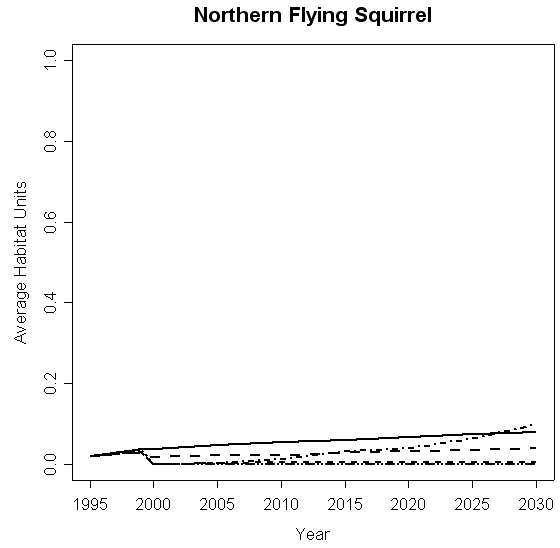
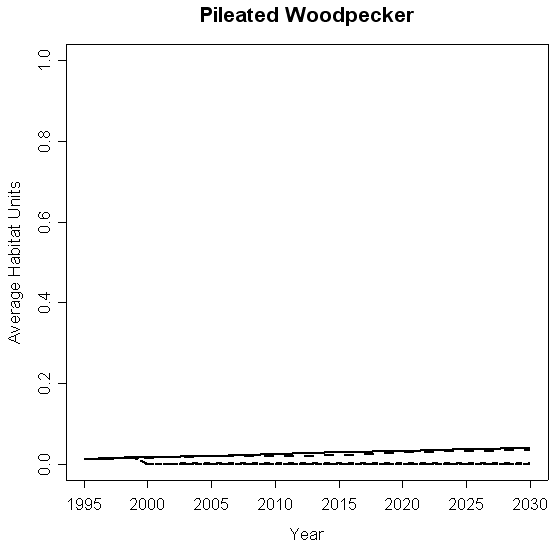
Fremont - High & Moderate Stands: Wildlife HSI with Regeneration

Fremont - High & Moderate Risk Stands: HSI with regeneration



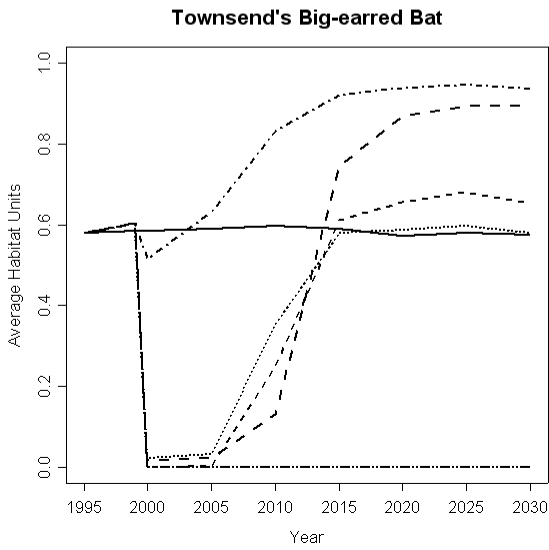
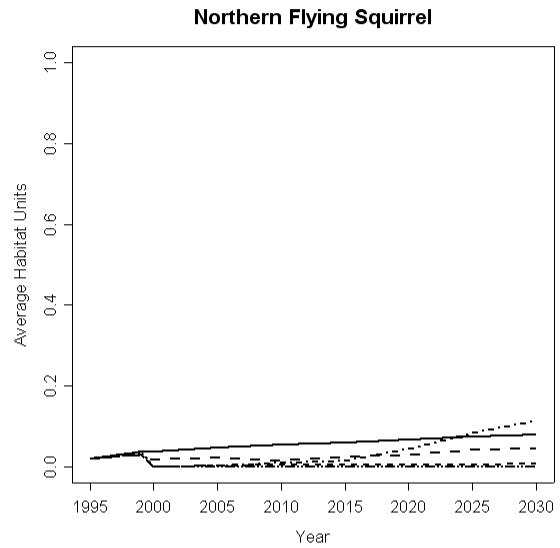
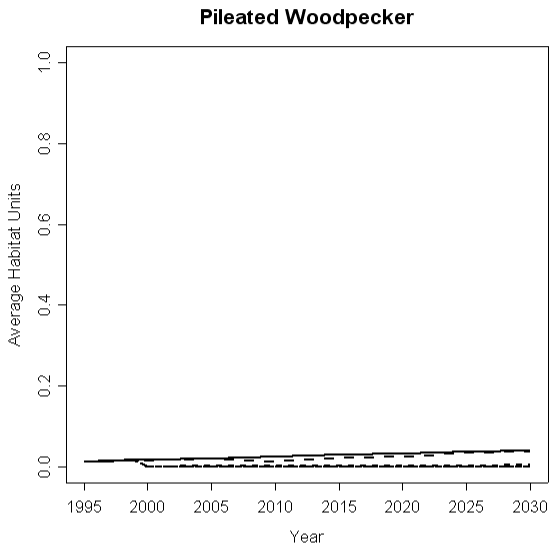
Fremont - High & Moderate Stands: Wildlife Source Habitat without Regeneration

Fremont - High & Moderate Risk Stands: CRB without regeneration



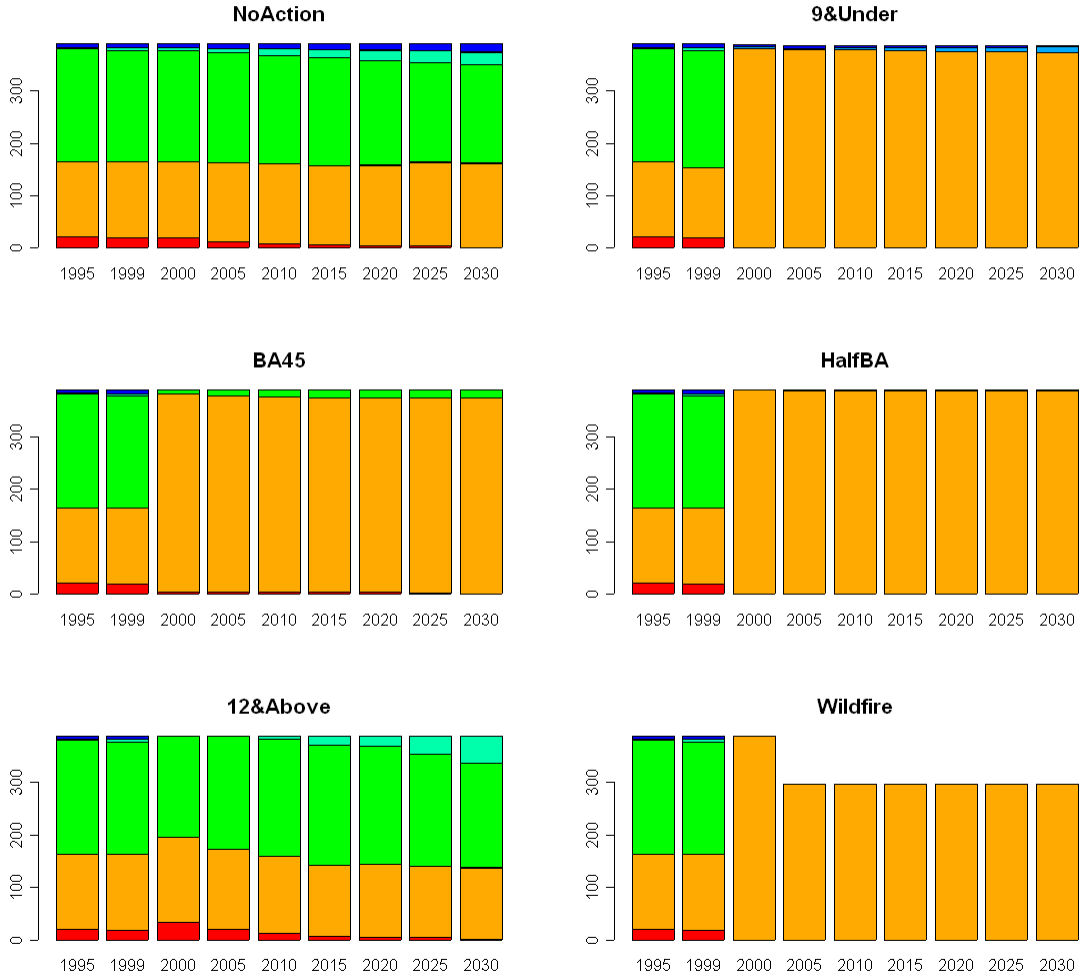
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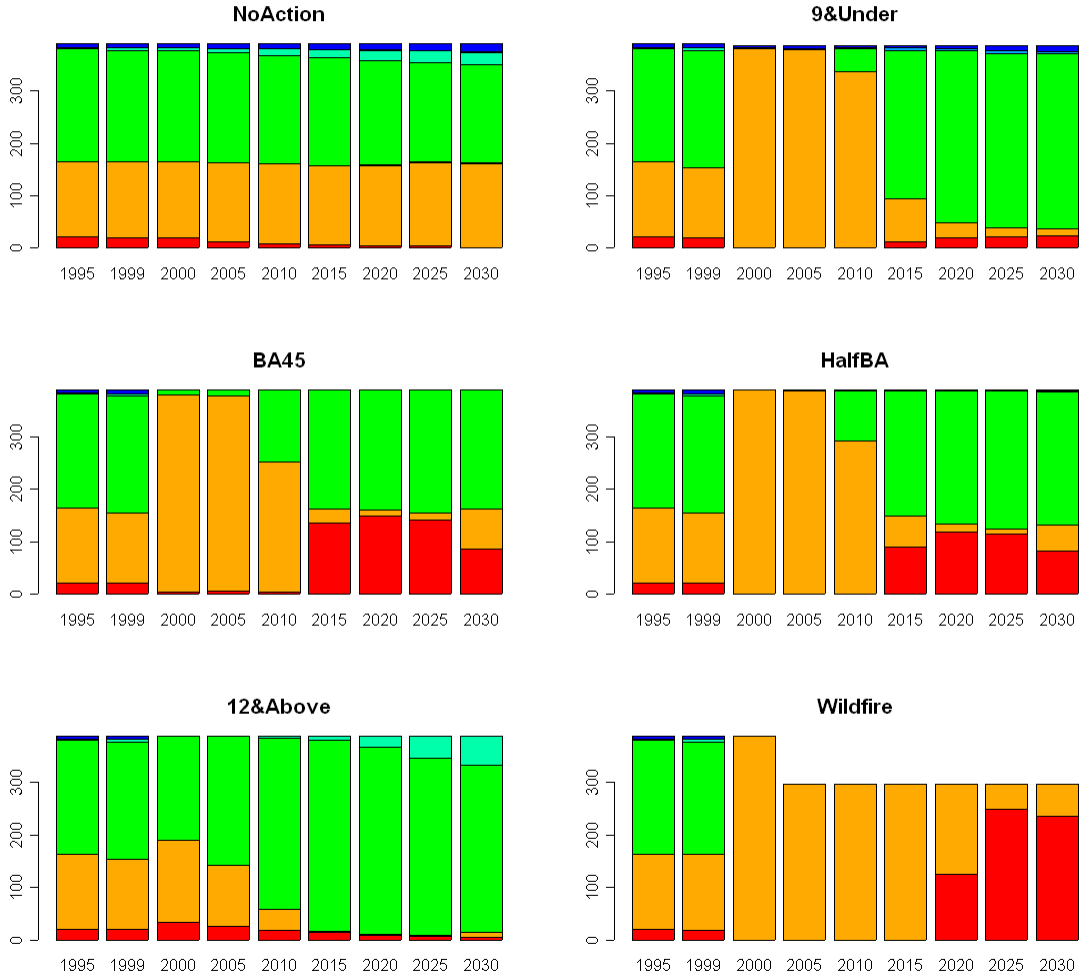
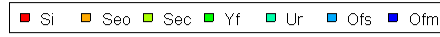
Fremont – High & Moderate Risk: Source Habitat (ICBEMP) Classification without Regeneration

Fremont - High & Moderate Risk Stands: ICBEMP Classification without regeneration



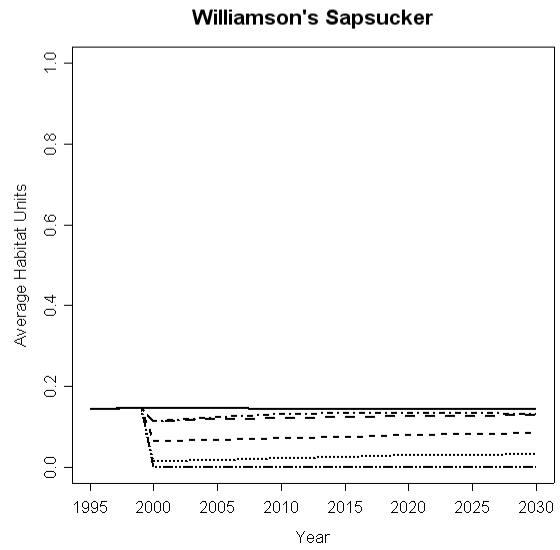
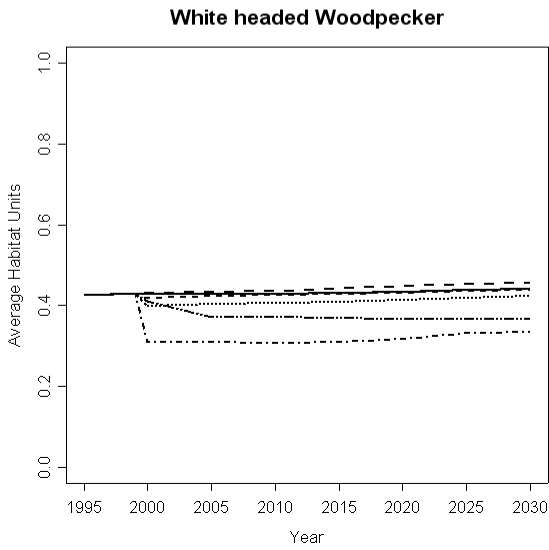
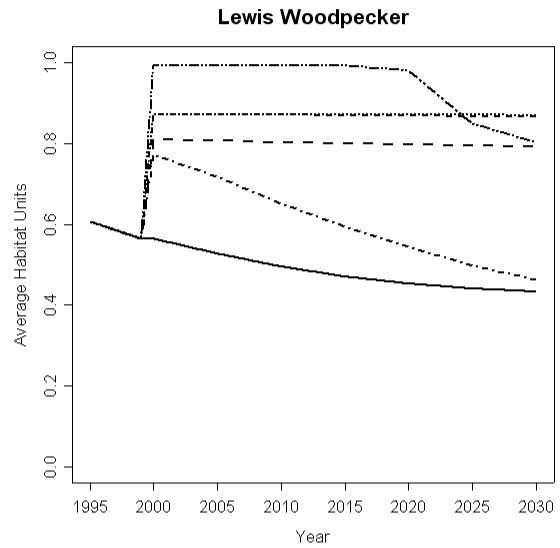
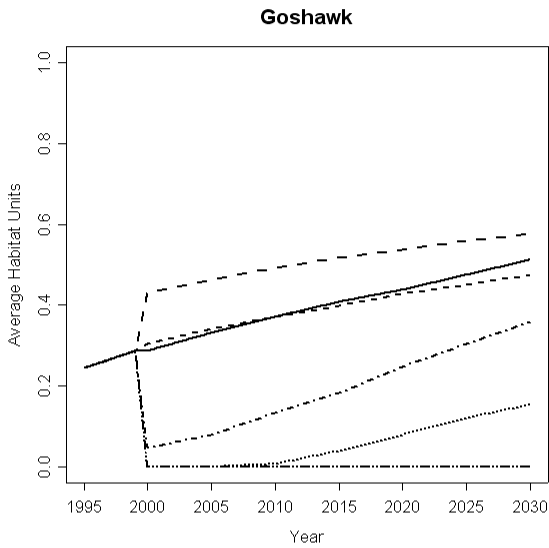
Fremont – High & Moderate Risk: Source Habitat ICBEMP) Classification with Regeneration

Fremont - High & Moderate Risk Stands: ICBEMP Classification with regeneration



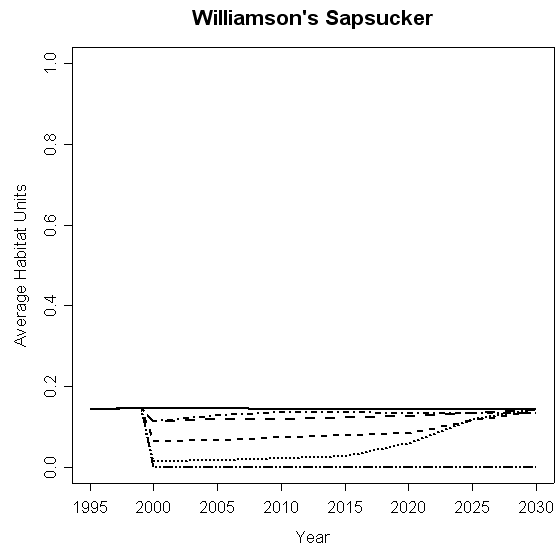
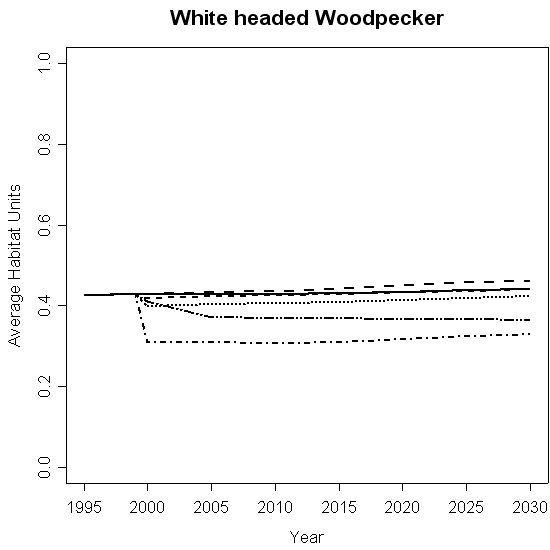
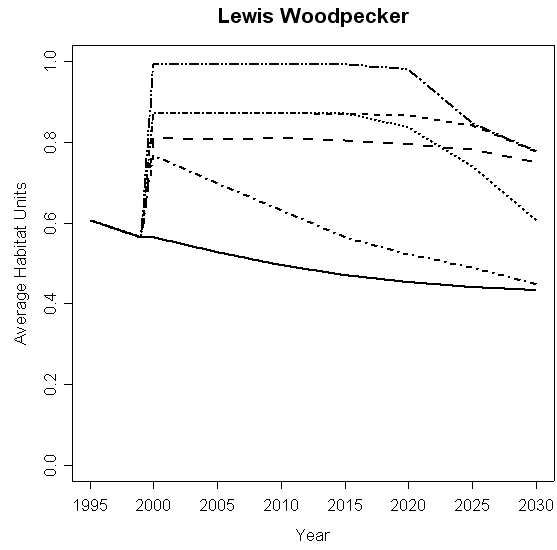
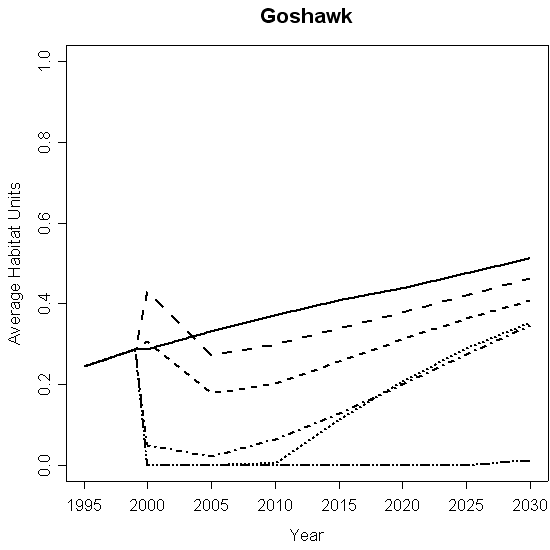
Fremont - High Risk Stands: Wildlife HSI without Regeneration

Fremont - High Risk Stands: HSI without regeneration



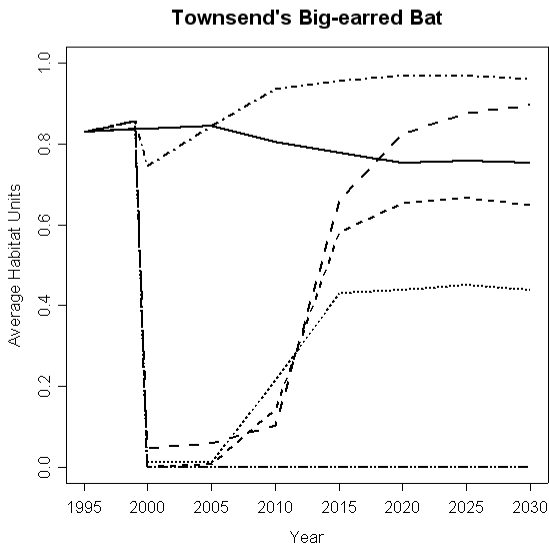
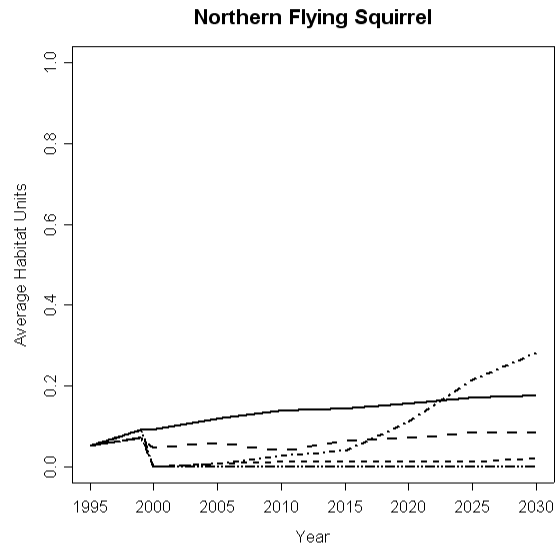
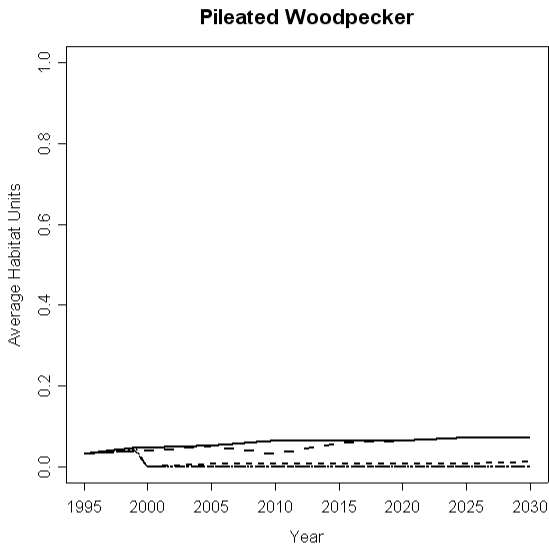
Fremont - High Risk Stands: Wildlife HSI with Regeneration

Fremont - High Risk Stands: HSI with regeneration



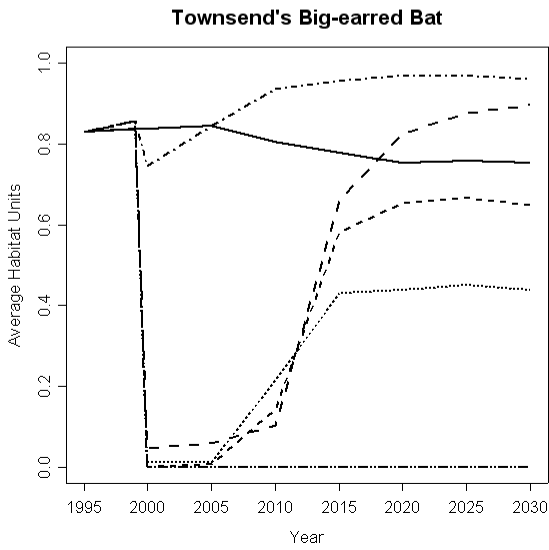
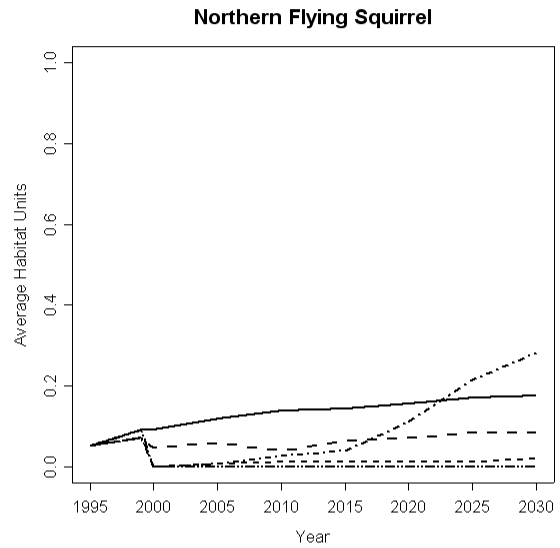
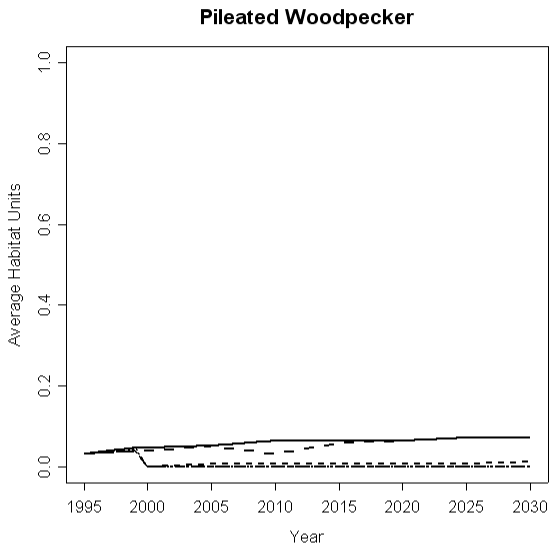
Fremont - High Risk Stands: Wildlife Source Habitat without Regeneration

Fremont - High Risk Stands: CRB with regeneration



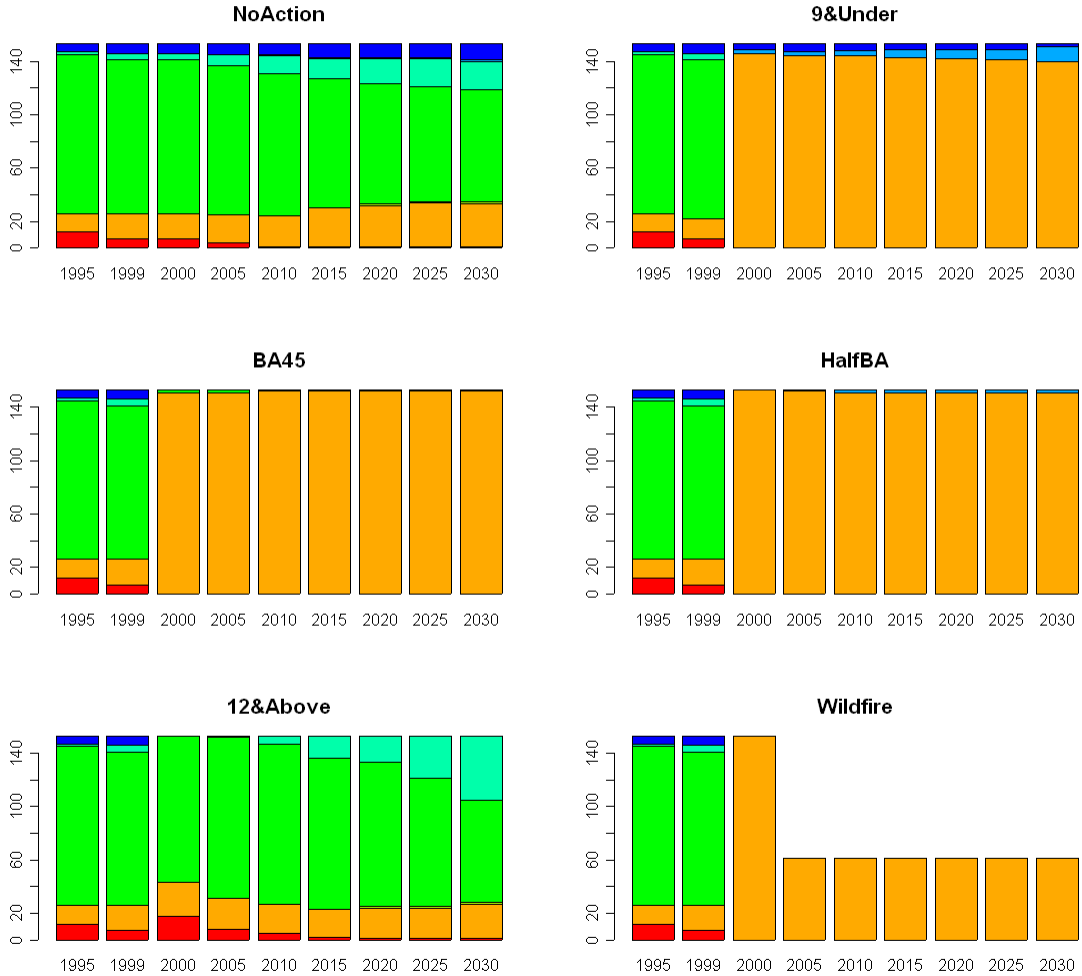
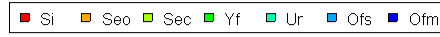
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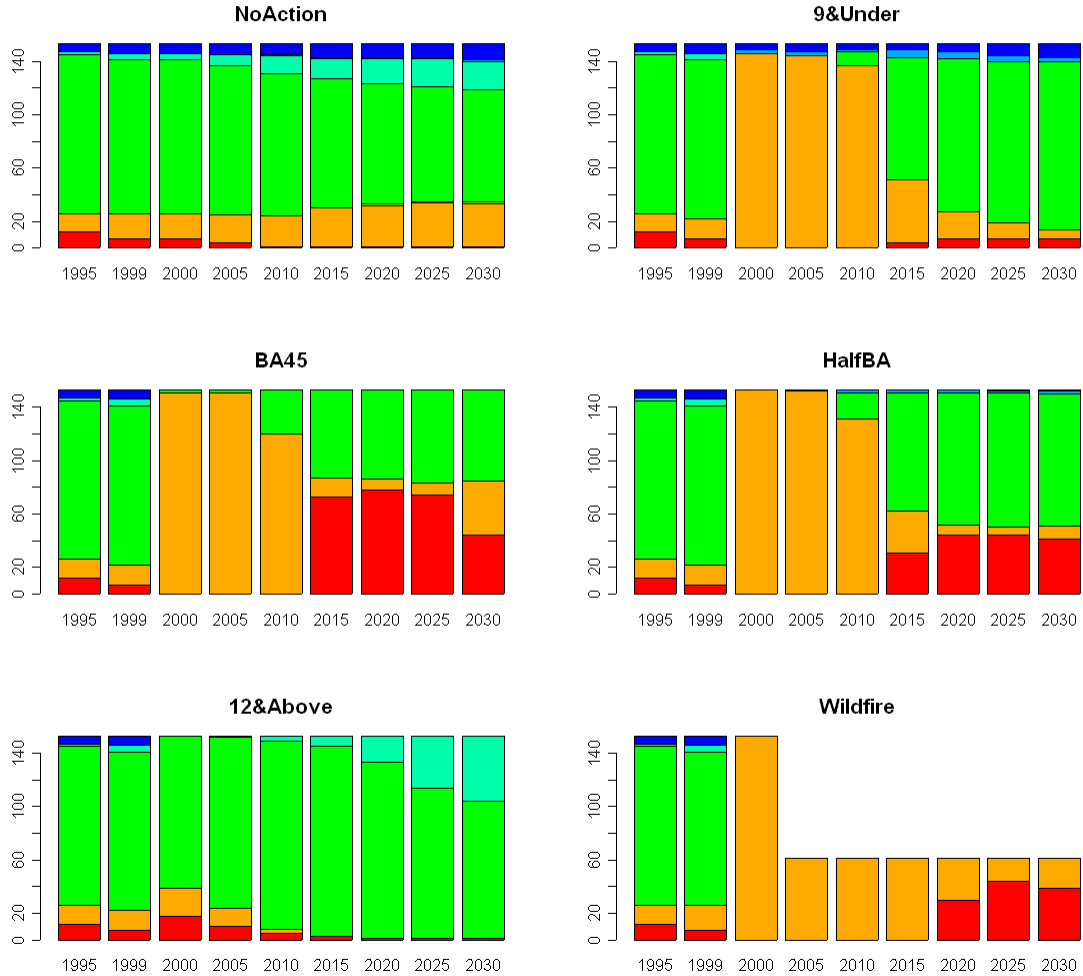
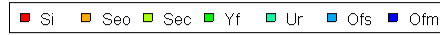
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Fremont - High Risk Stands: ICBEMP Classification without regeneration



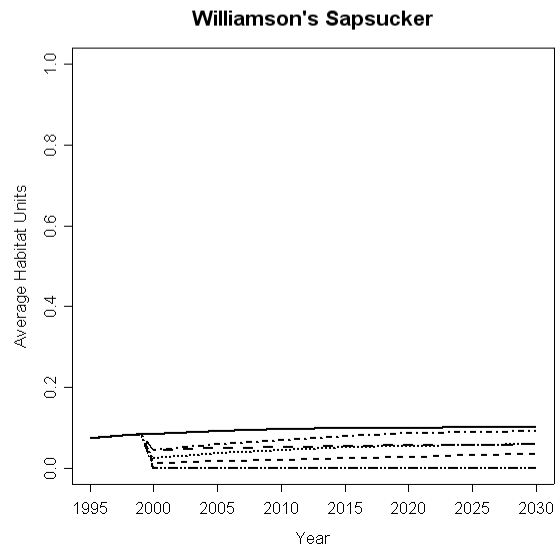
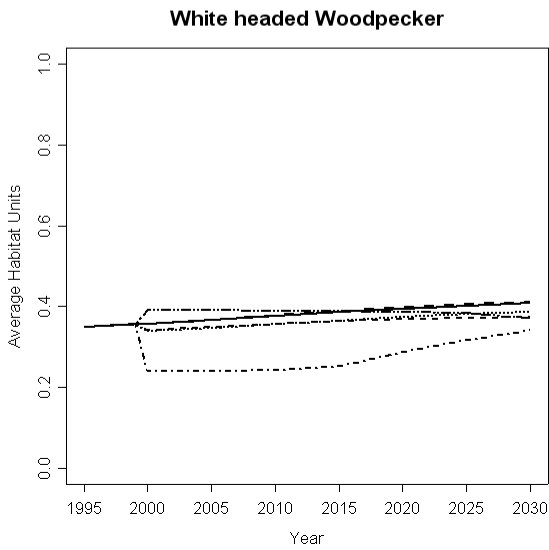
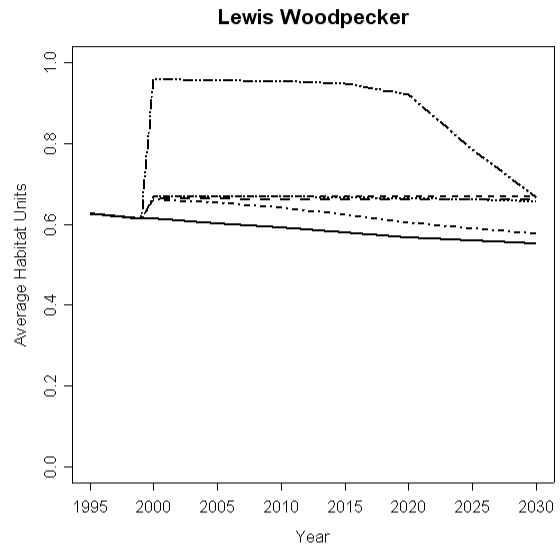
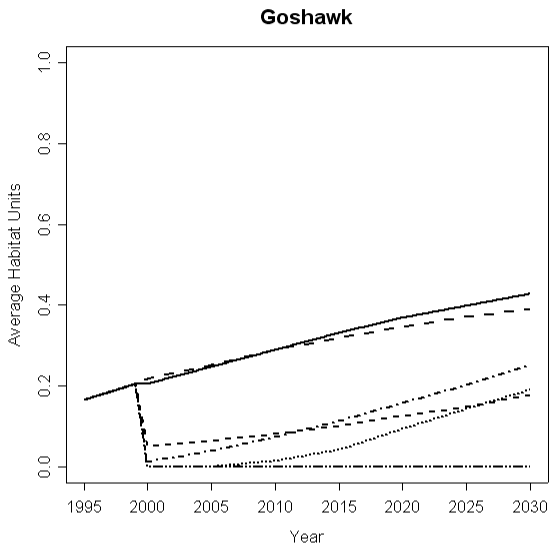
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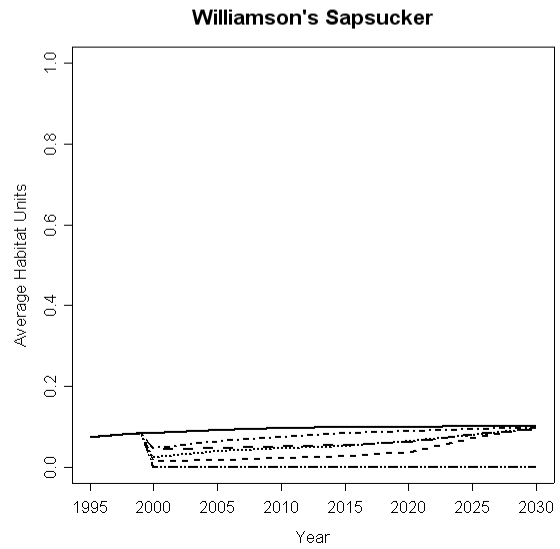
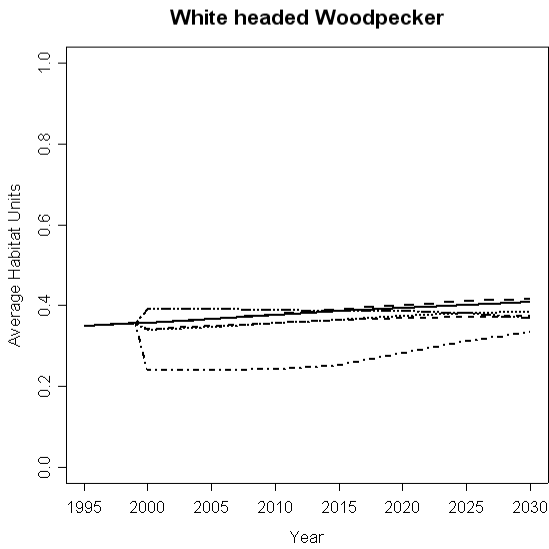
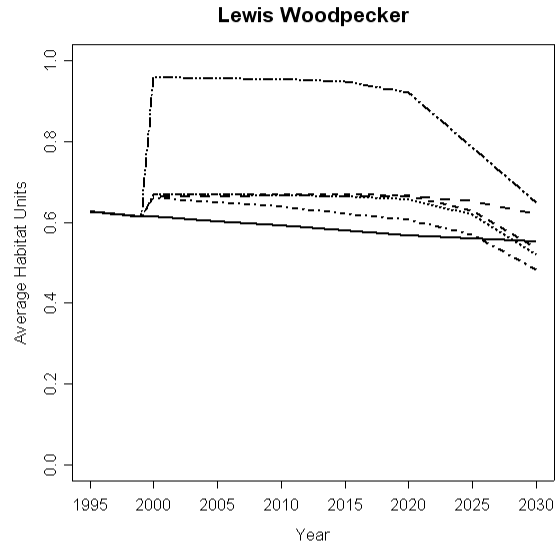
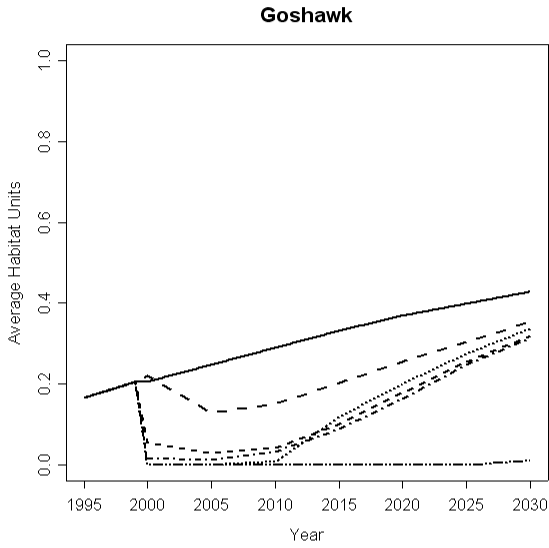
Fremont - Moderate Risk Stands: Wildlife HSI without Regeneration

Fremont - Moderate Risk Stands: HSI without regeneration



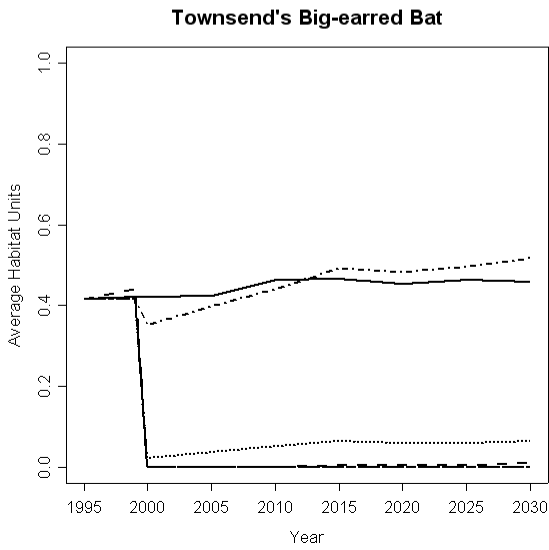
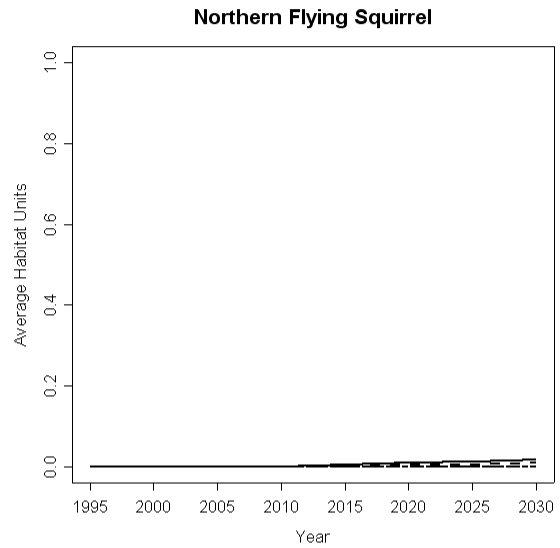
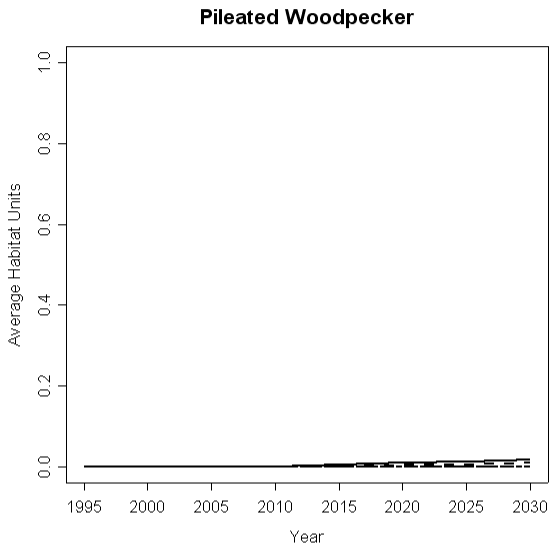
Fremont - Moderate Risk Stands: Wildlife HSI with Regeneration

Fremont - Moderate Risk Stands: HSI with regeneration



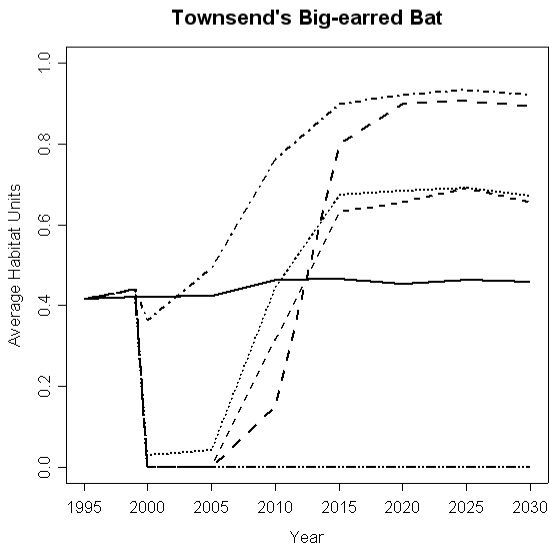
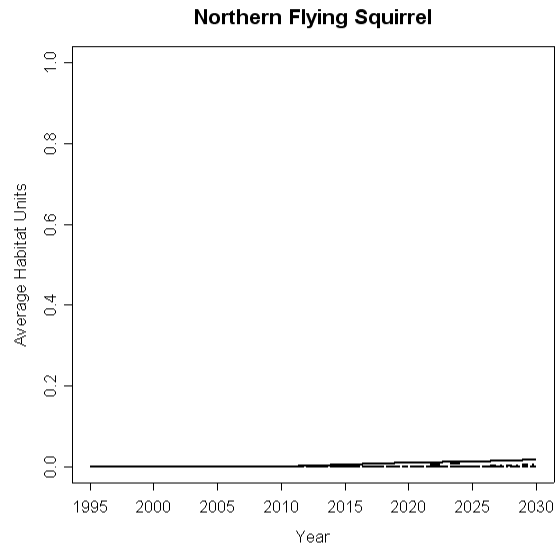
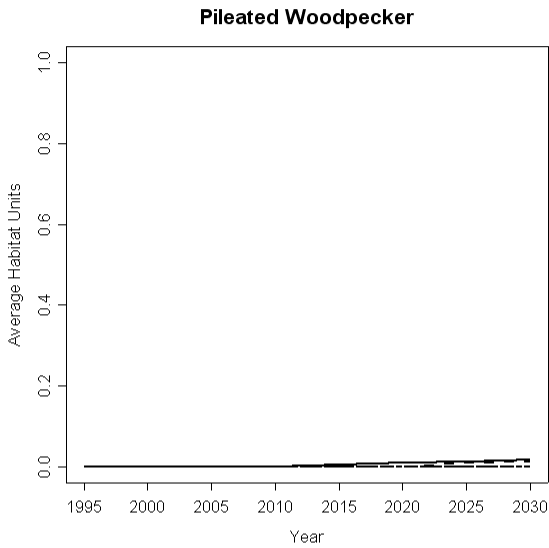
Fremont - Moderate Risk Stands: Wildlife Source Habitat without Regeneration

Fremont - Moderate Risk Stands: CRB without regeneration



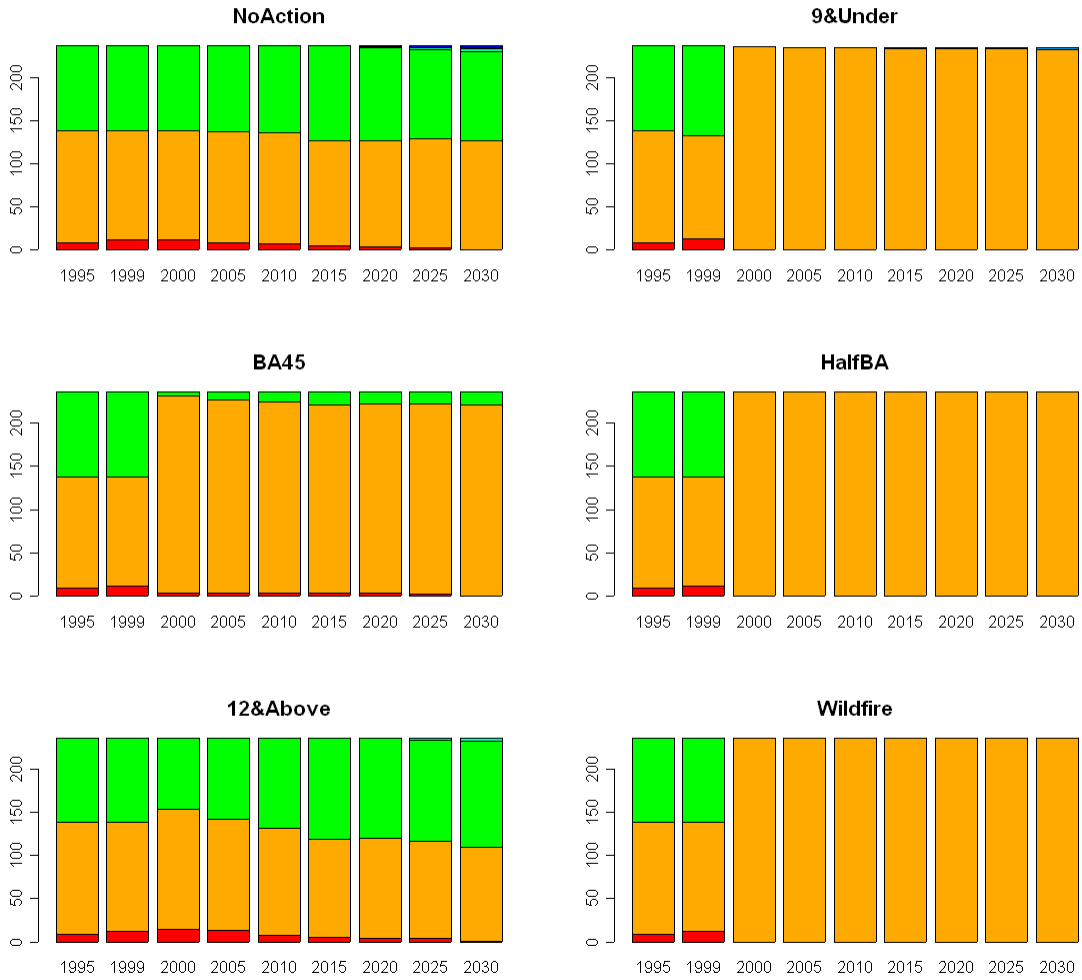
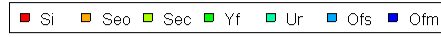
Fremont - Moderate Risk Stands: Wildlife Source Habitat with Regeneration

Fremont - Moderate Risk Stands: CRB with regeneration



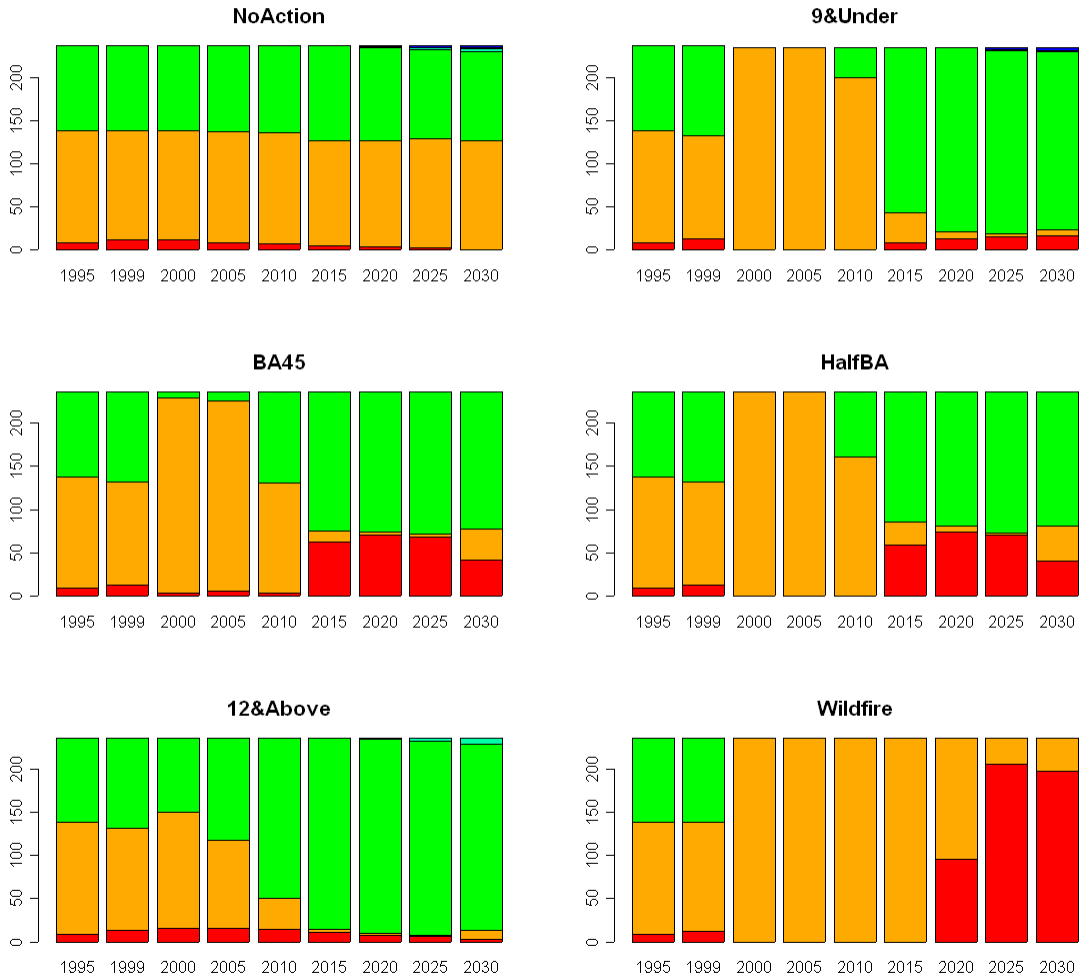
Fremont – Moderate Risk Stands: Source Habitat (ICBEMP) Classification without Regeneration

Fremont - Moderate Risk Stands: ICBEMP Classification without regeneration



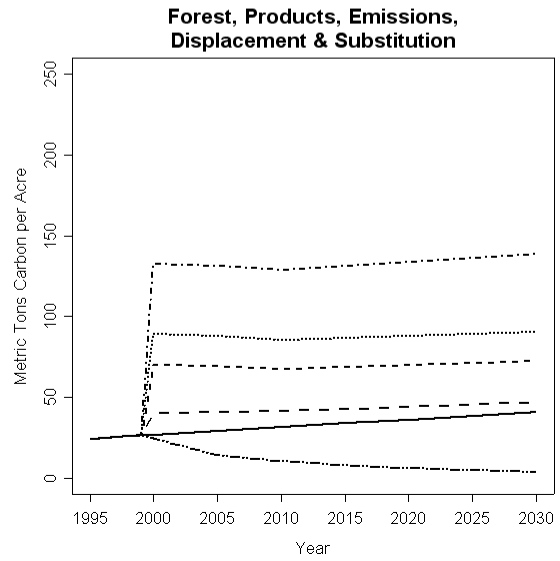
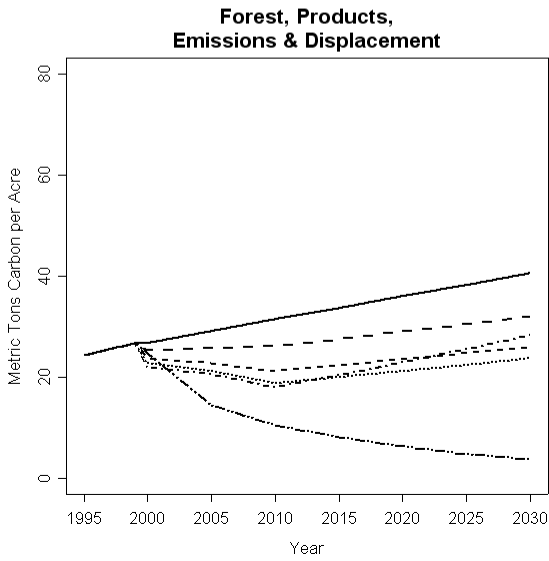
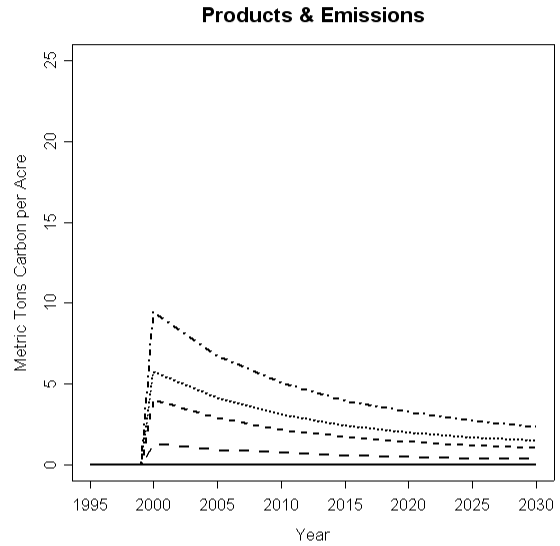
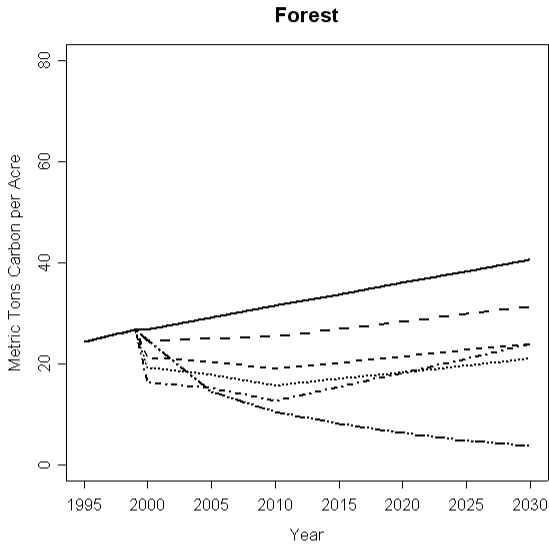
Fremont – Moderate Risk Stands: Source Habitat (ICBEMP) Classification with Regeneration

Fremont - Moderate Risk Stands: ICBEMP Classification with regeneration



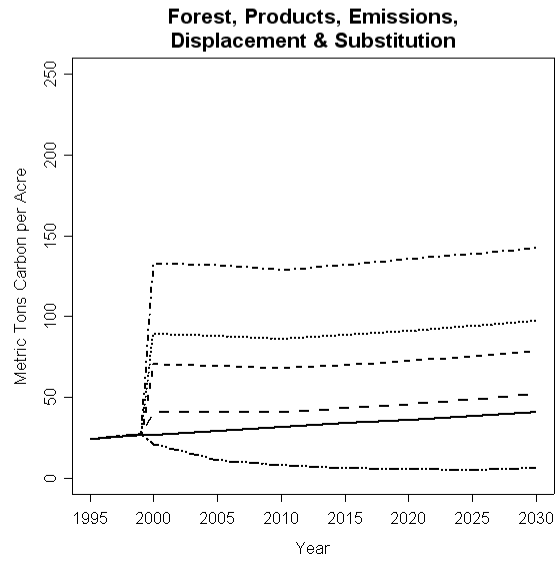
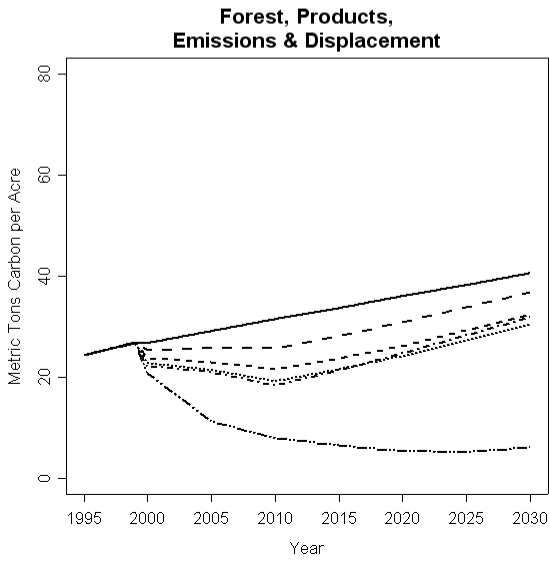
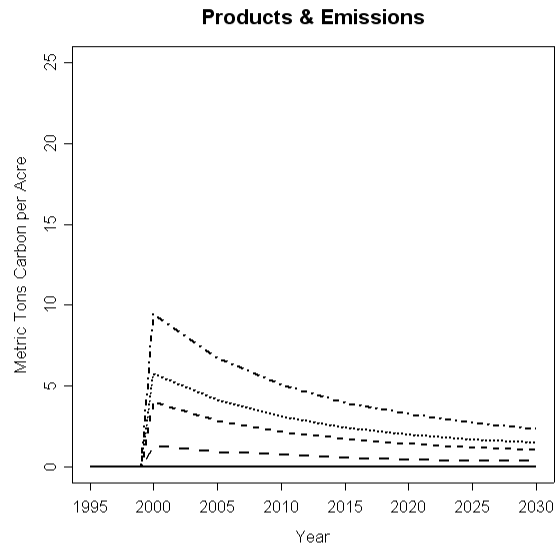
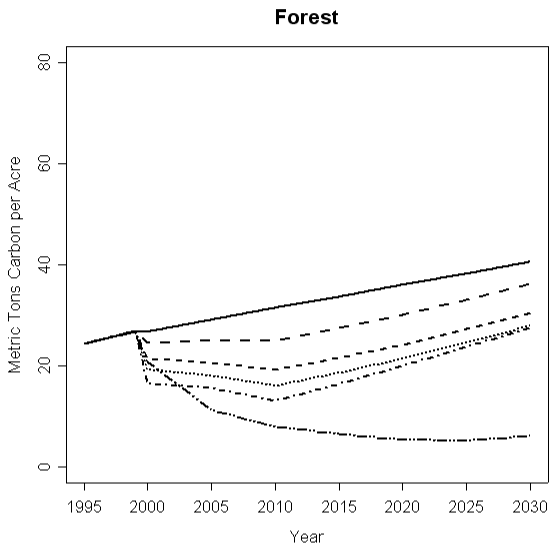
Fremont - High & Moderate Risk Stands: Carbon without regeneration

Fremont - High & Moderate Risk Stands: Carbon without regeneration



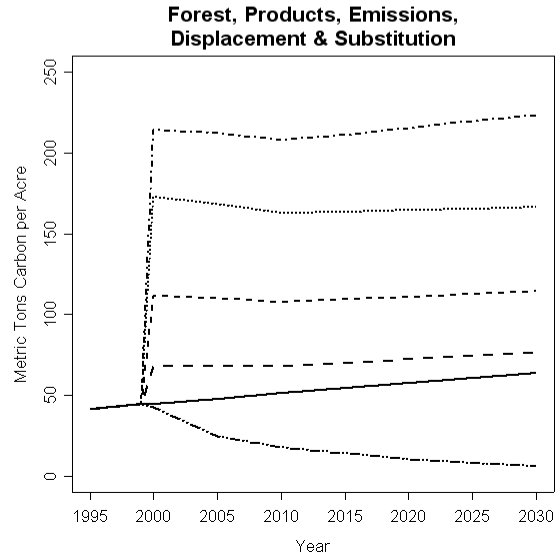
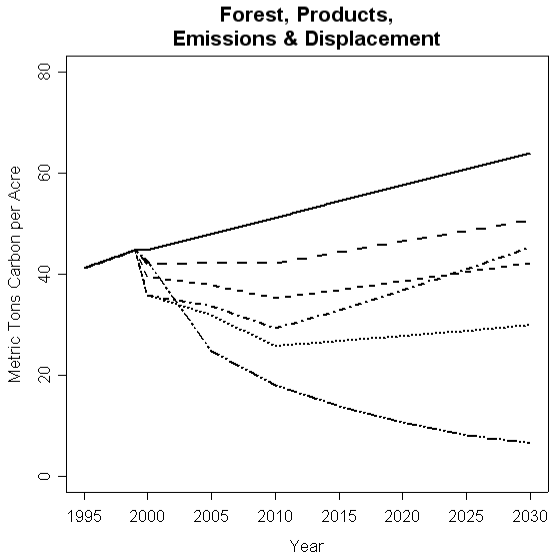
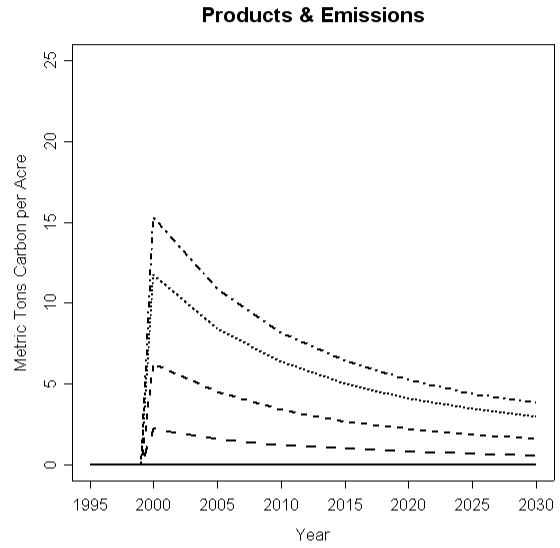
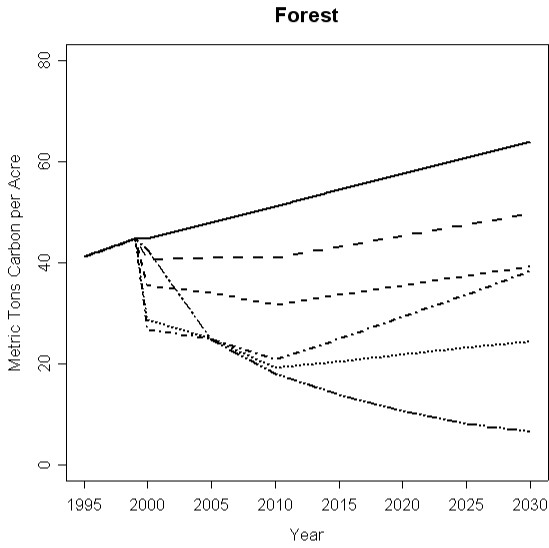
Fremont - High & Moderate Risk Stands: Carbon with regeneration

Fremont - High & Moderate Risk Stands: Carbon with regeneration



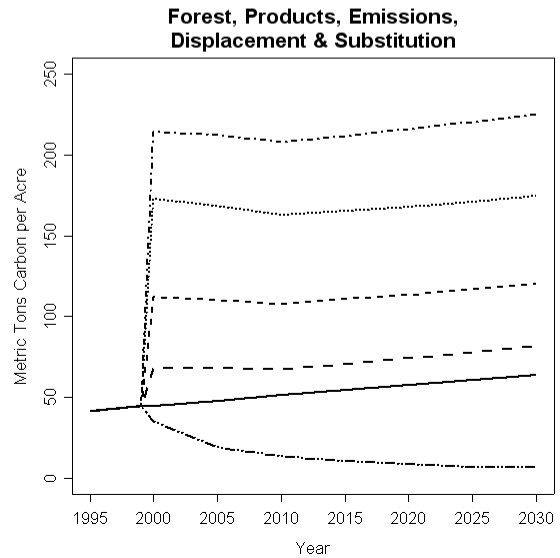
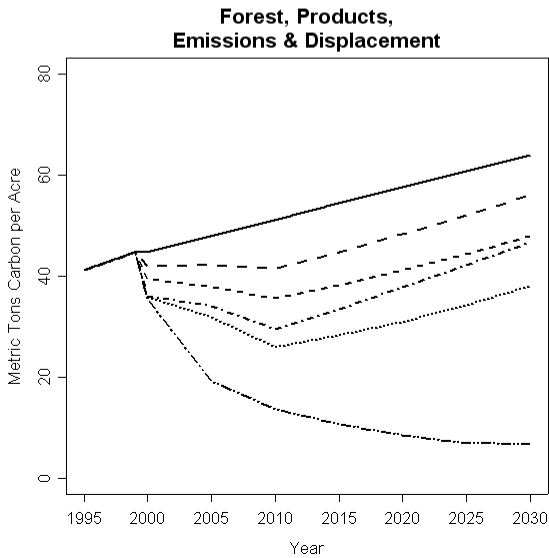
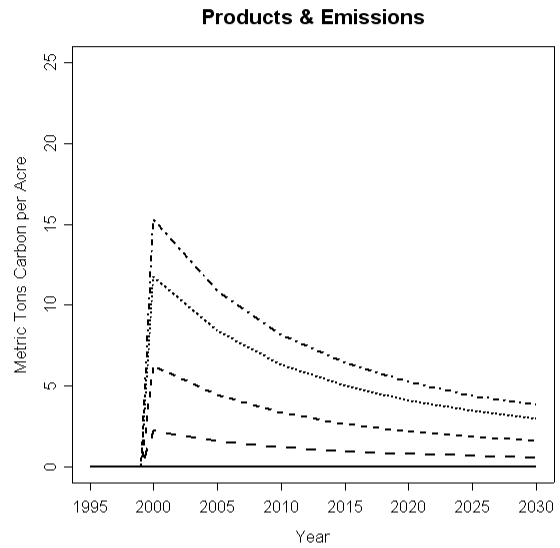
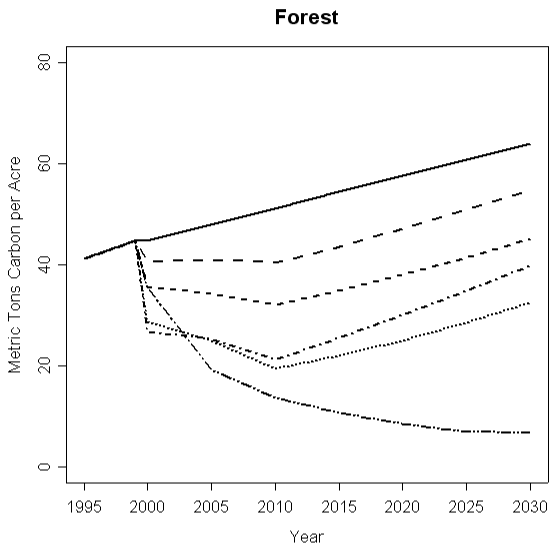
Fremont - High Risk Stands: Carbon without regeneration

Fremont - High Risk Stands: Carbon without regeneration



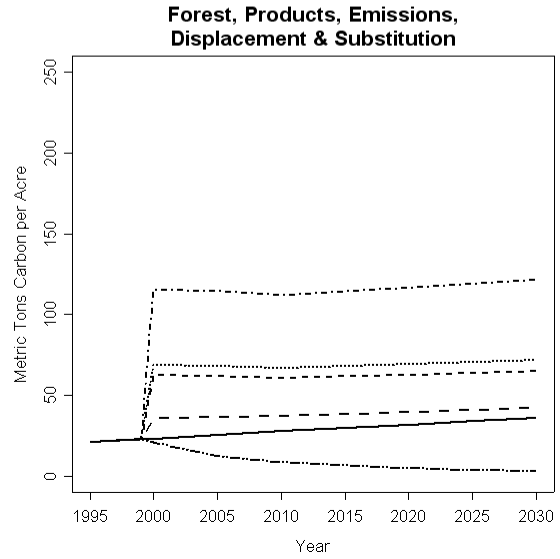
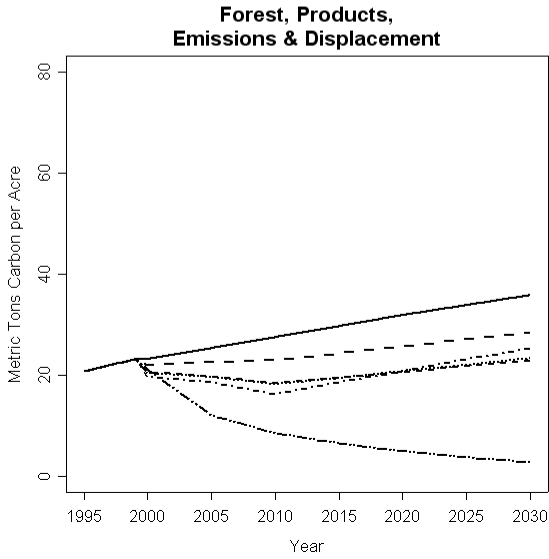
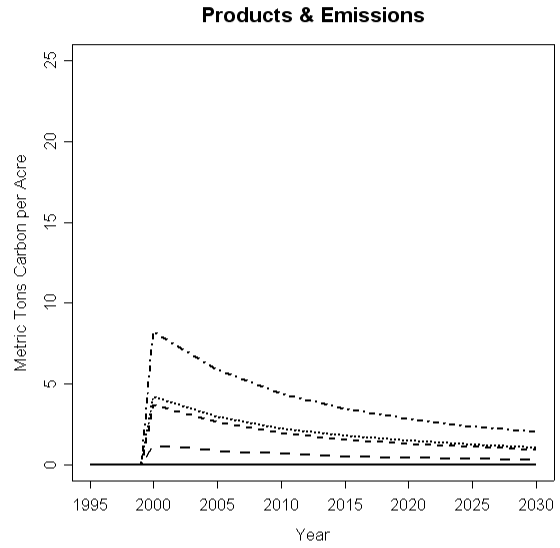
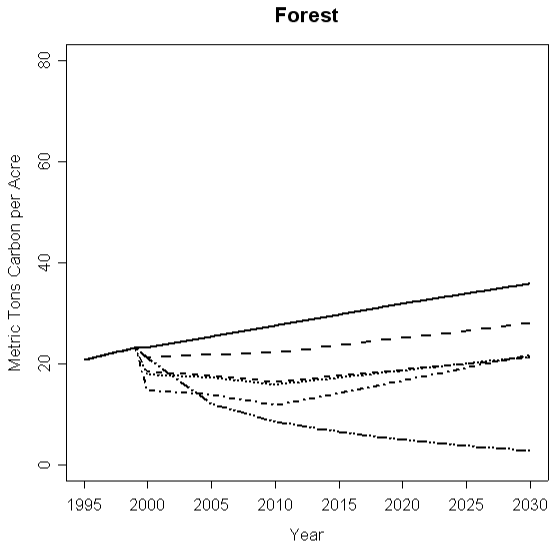
Fremont - High Risk Stands: Carbon with regeneration

Fremont - High Risk Stands: Carbon with regeneration



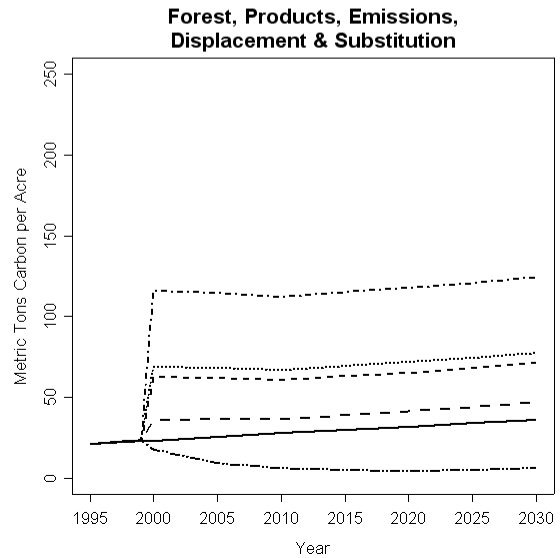
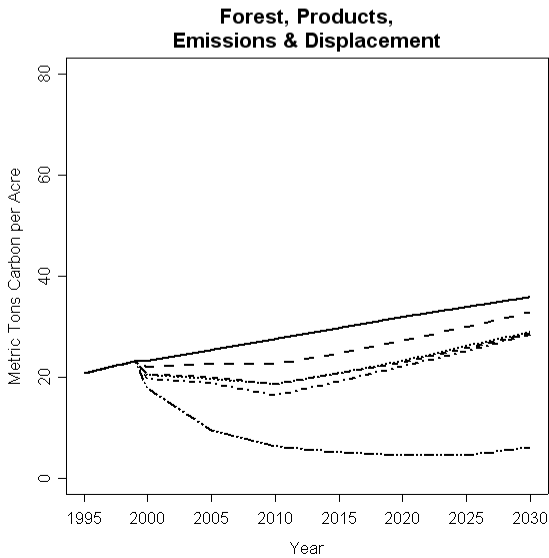
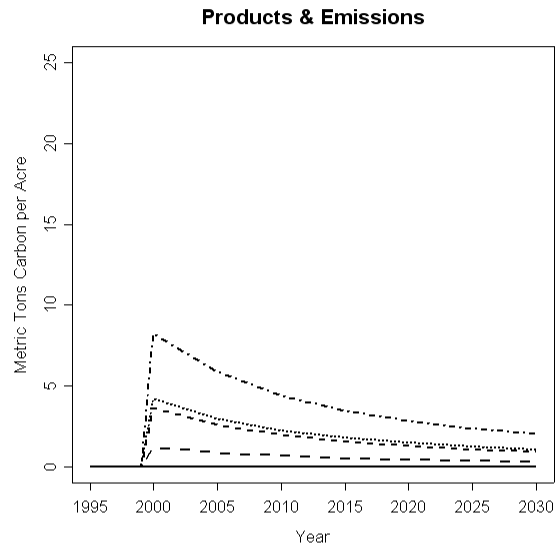
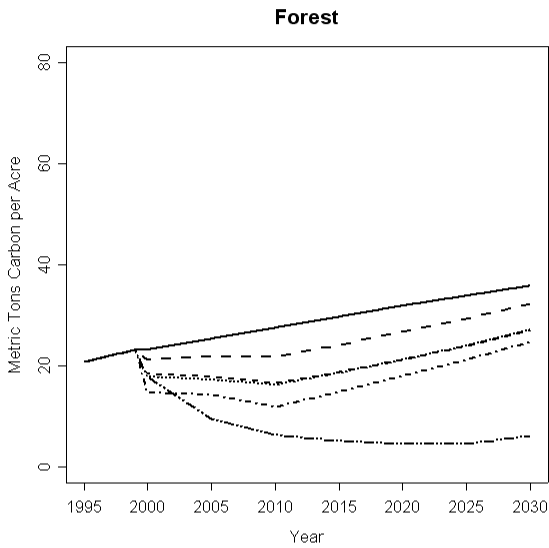
Fremont - Moderate Risk Stands: Carbon without regeneration

Fremont - Moderate Risk Stands: Carbon without regeneration

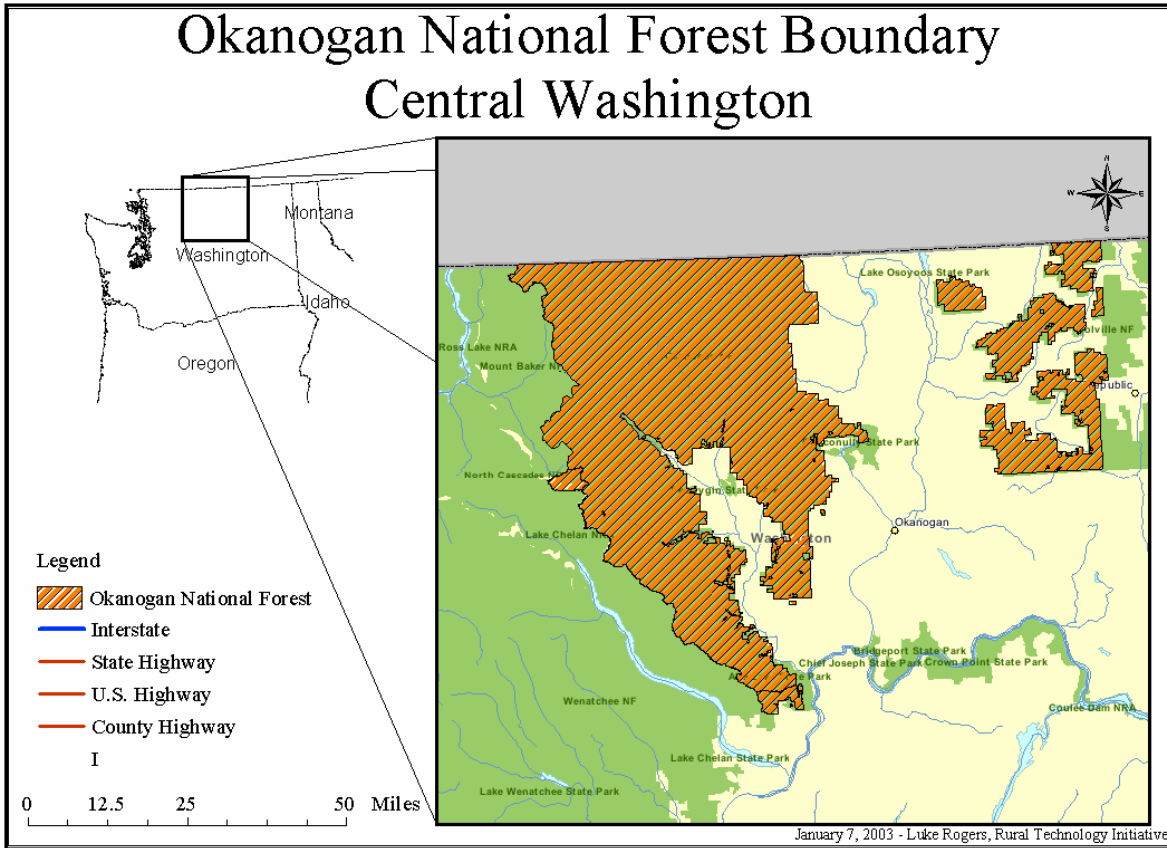


Fremont - Moderate Risk Stands: Carbon with regeneration

Fremont - Moderate Risk Stands: Carbon with regeneration



APPENDIX C. OKANOGAN NATIONAL FOREST



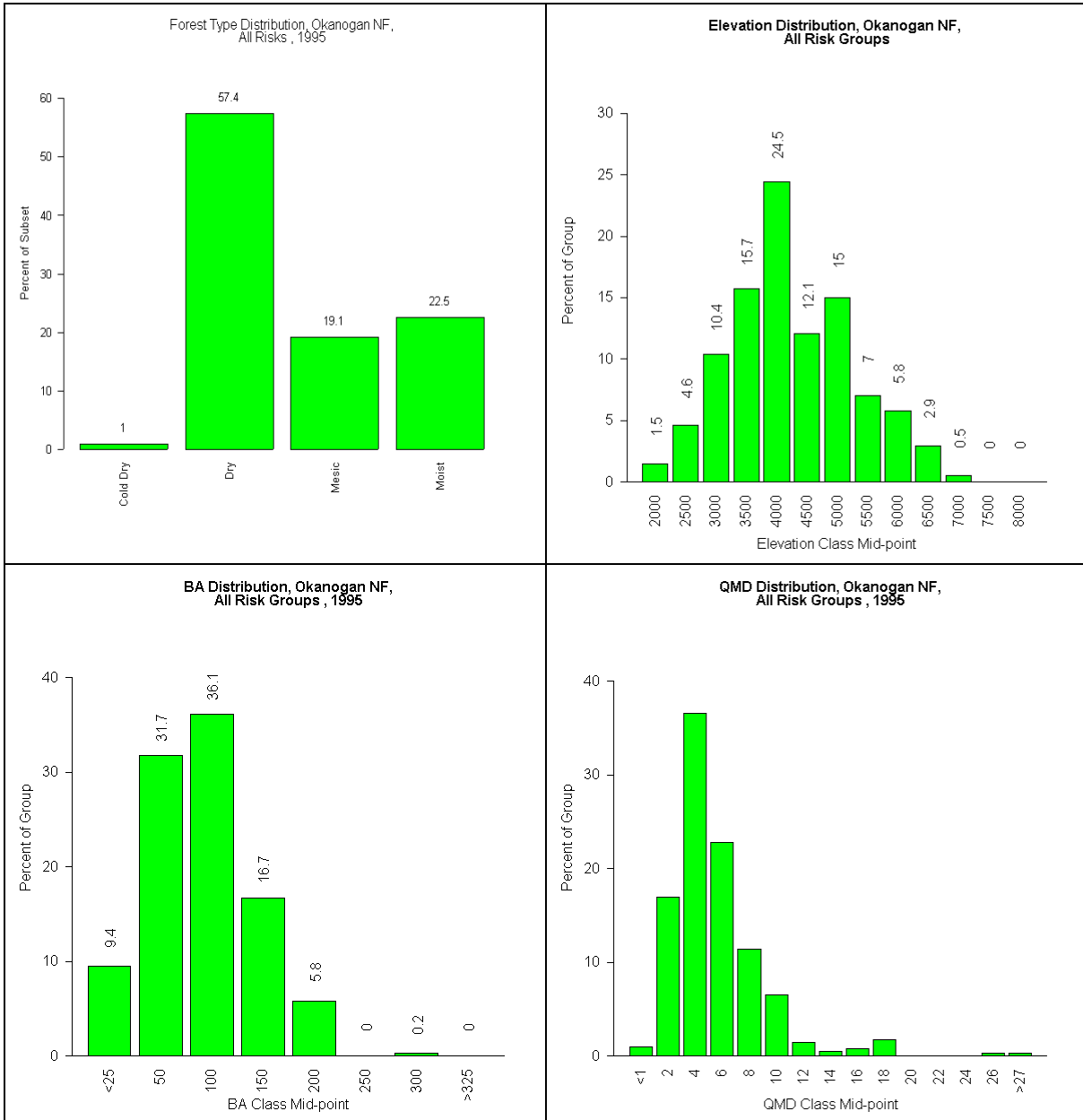
Okanogan National Forest Risk Classes

Risk Class	Stands	Percent
High Risk	117	28.33
Moderate Risk	200	48.43
Low Risk	96	23.24
Total	413	

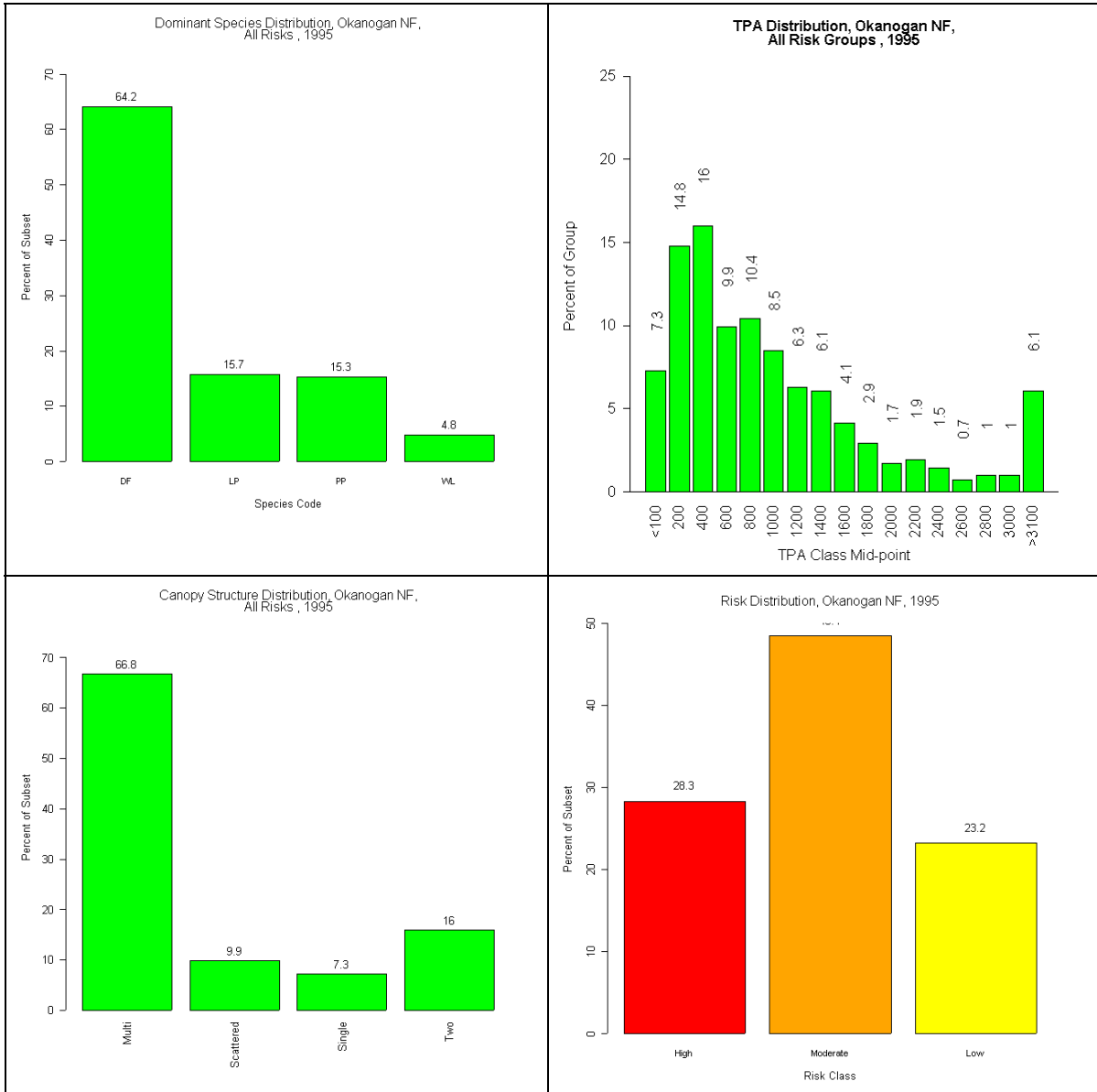
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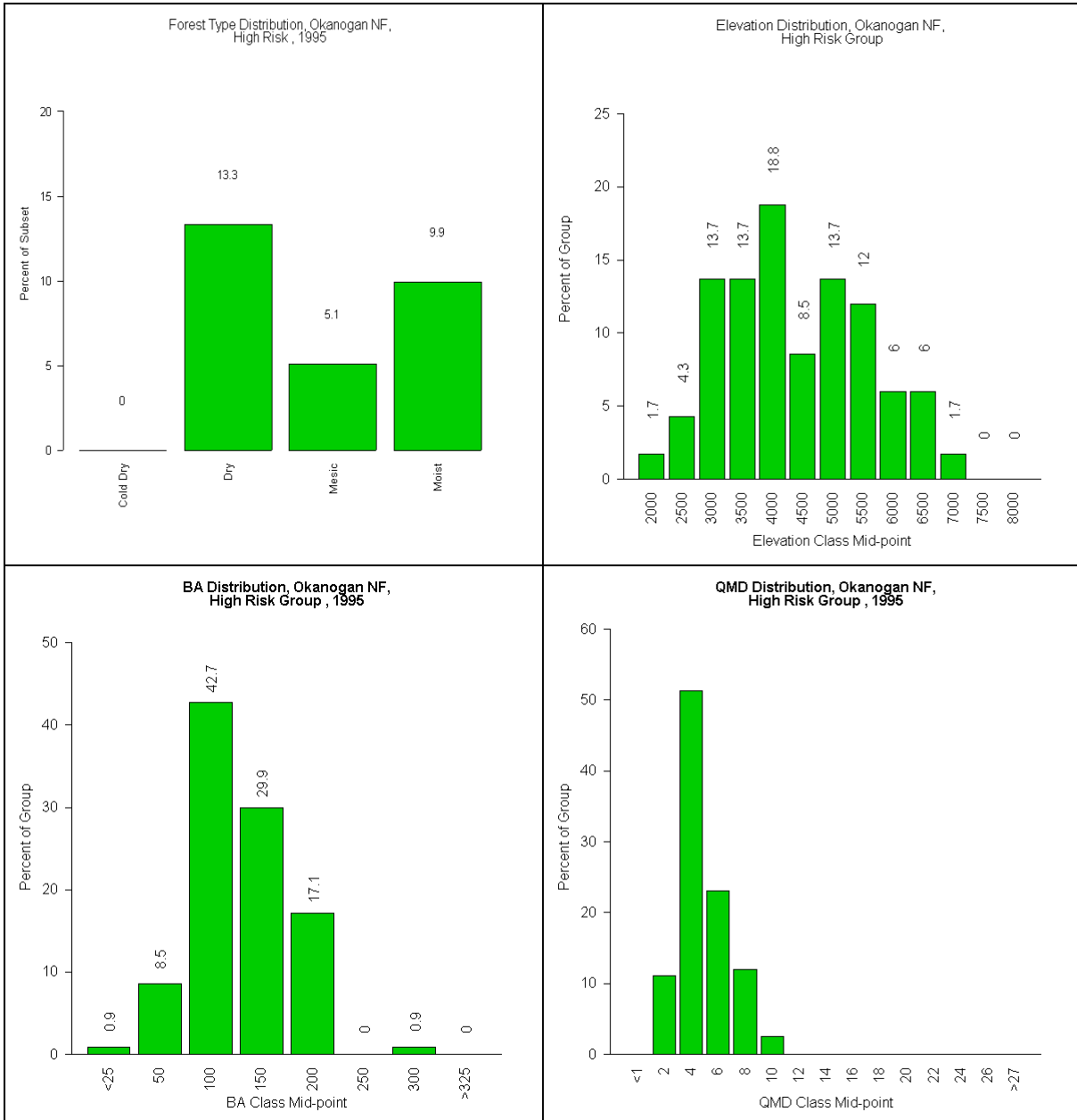
Okanogan - Forest type, Elevation, Basal area, QMD



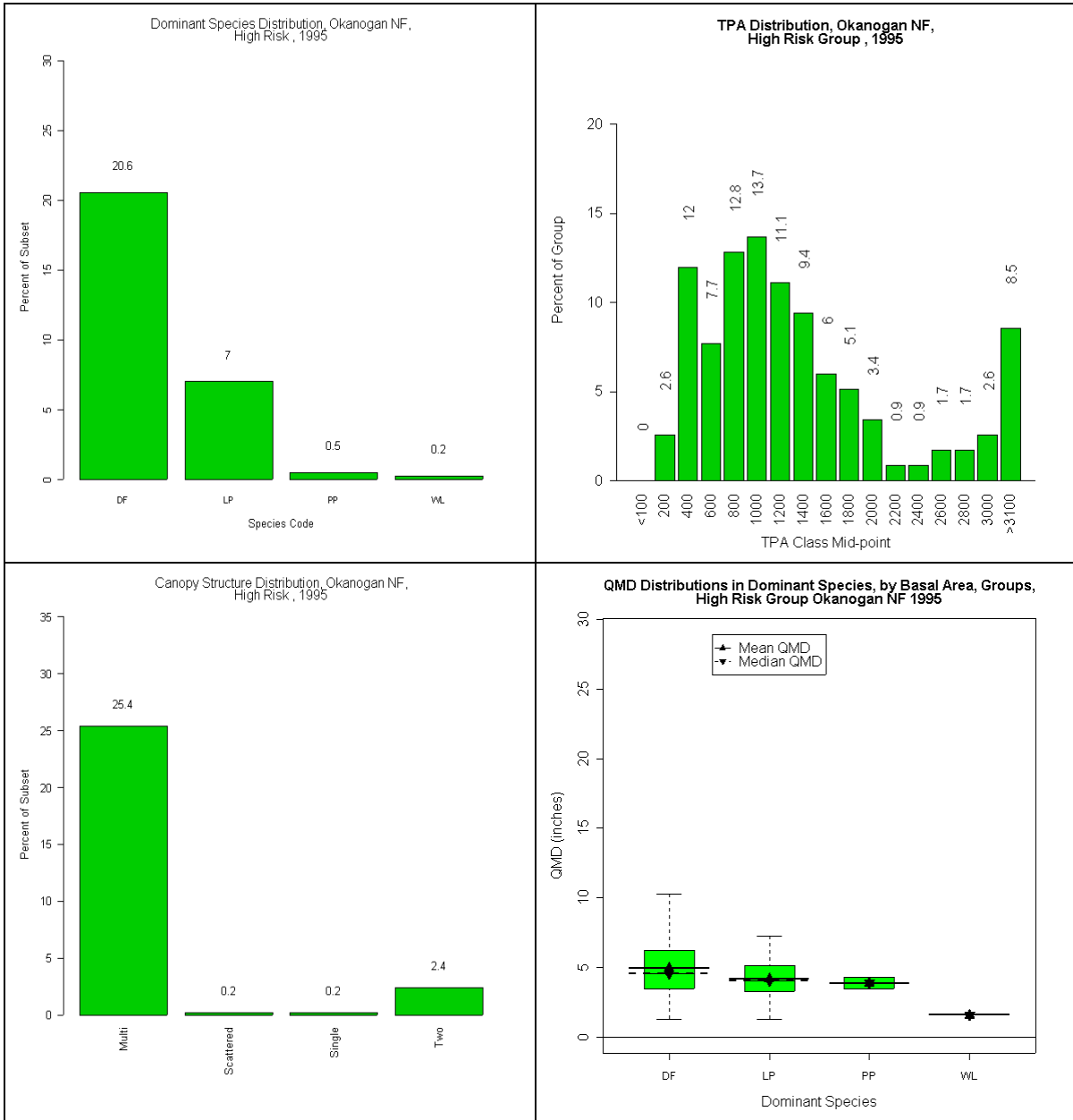
Okanogan - Species, TPA, Canopy structure, Fire risk



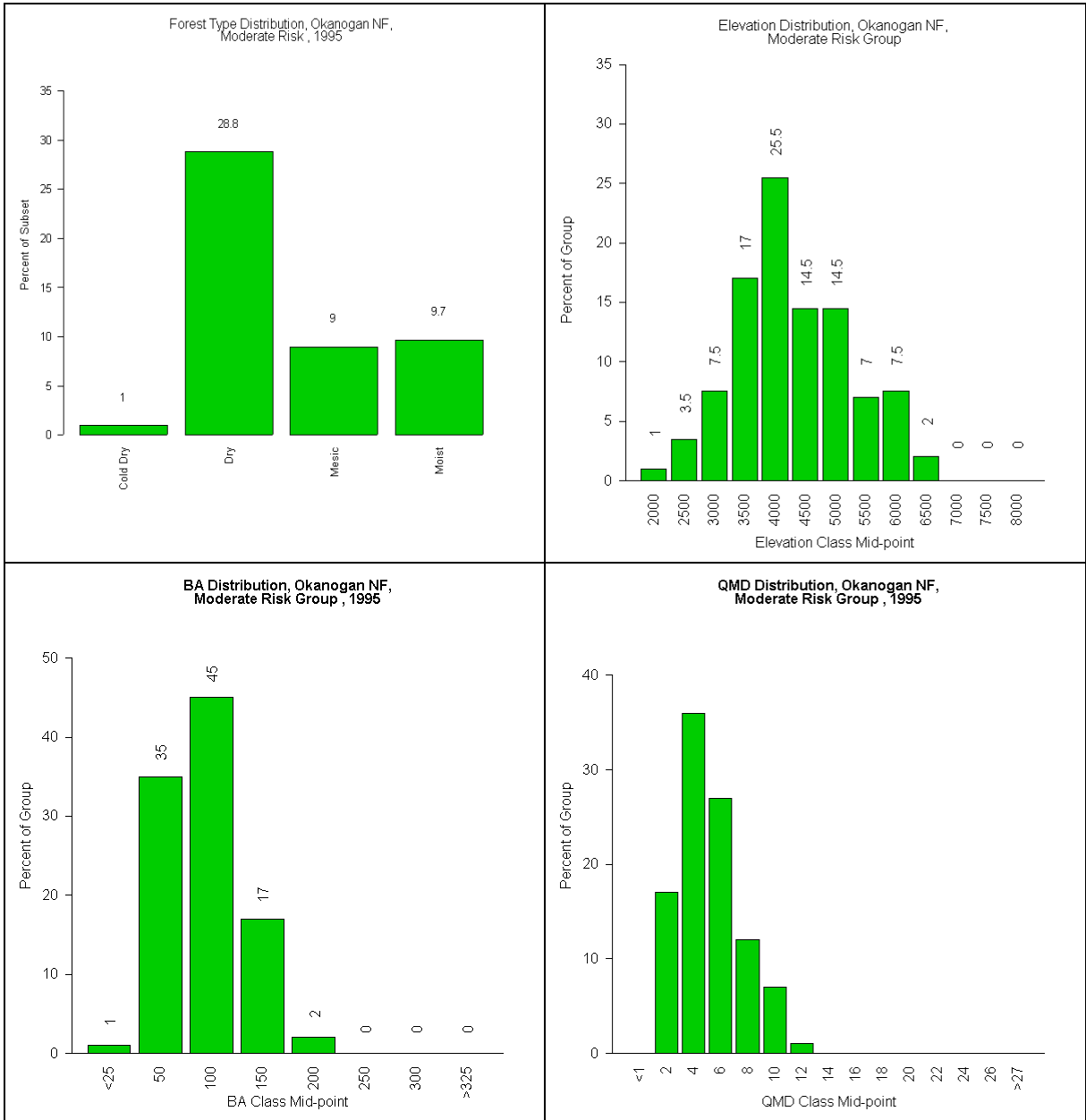
Okanogan - High Risk Stands: Forest type, Elevation, Basal area, QMD



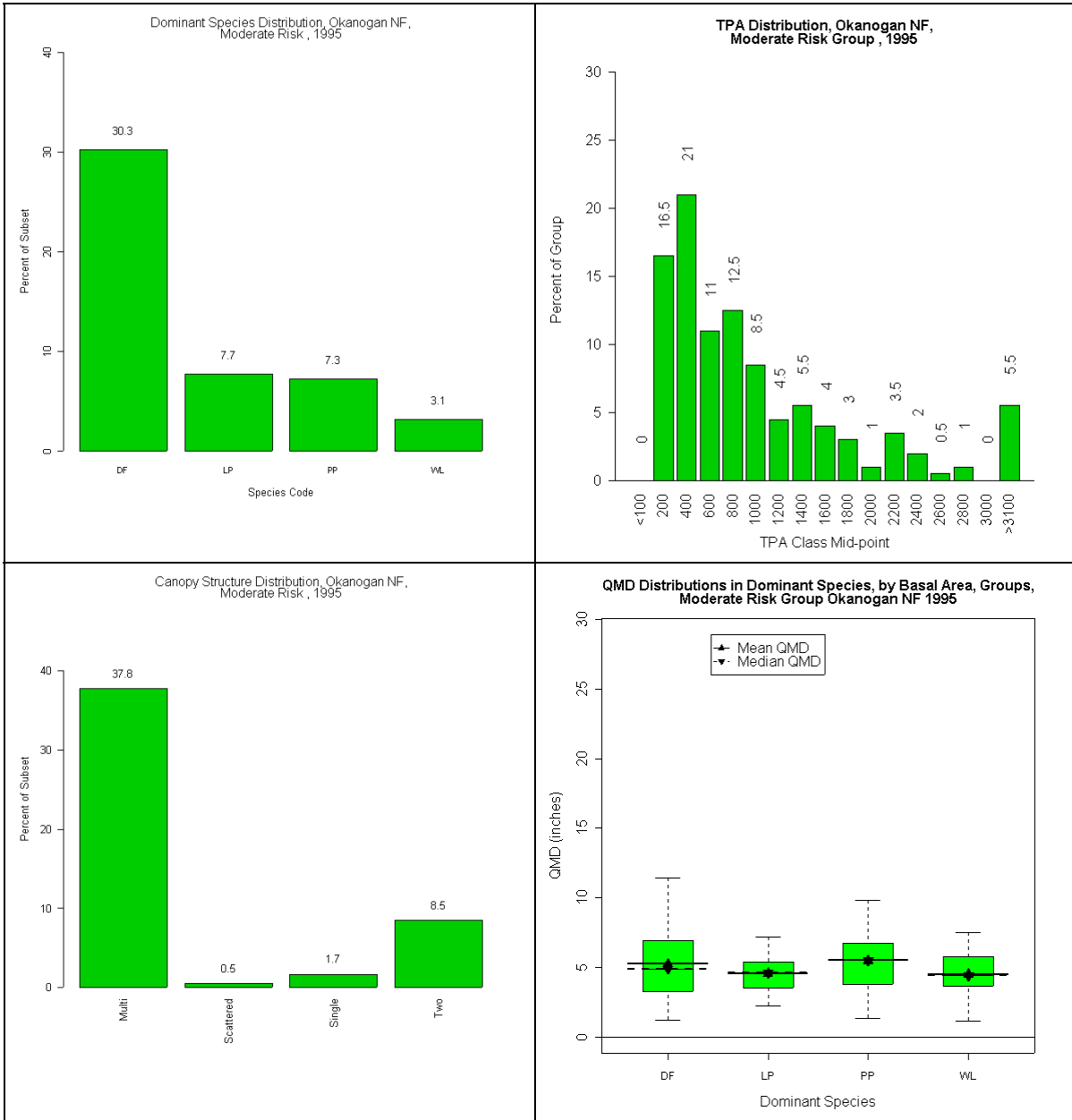
Okanogan - High Risk Stands: Species, TPA, Canopy Structure



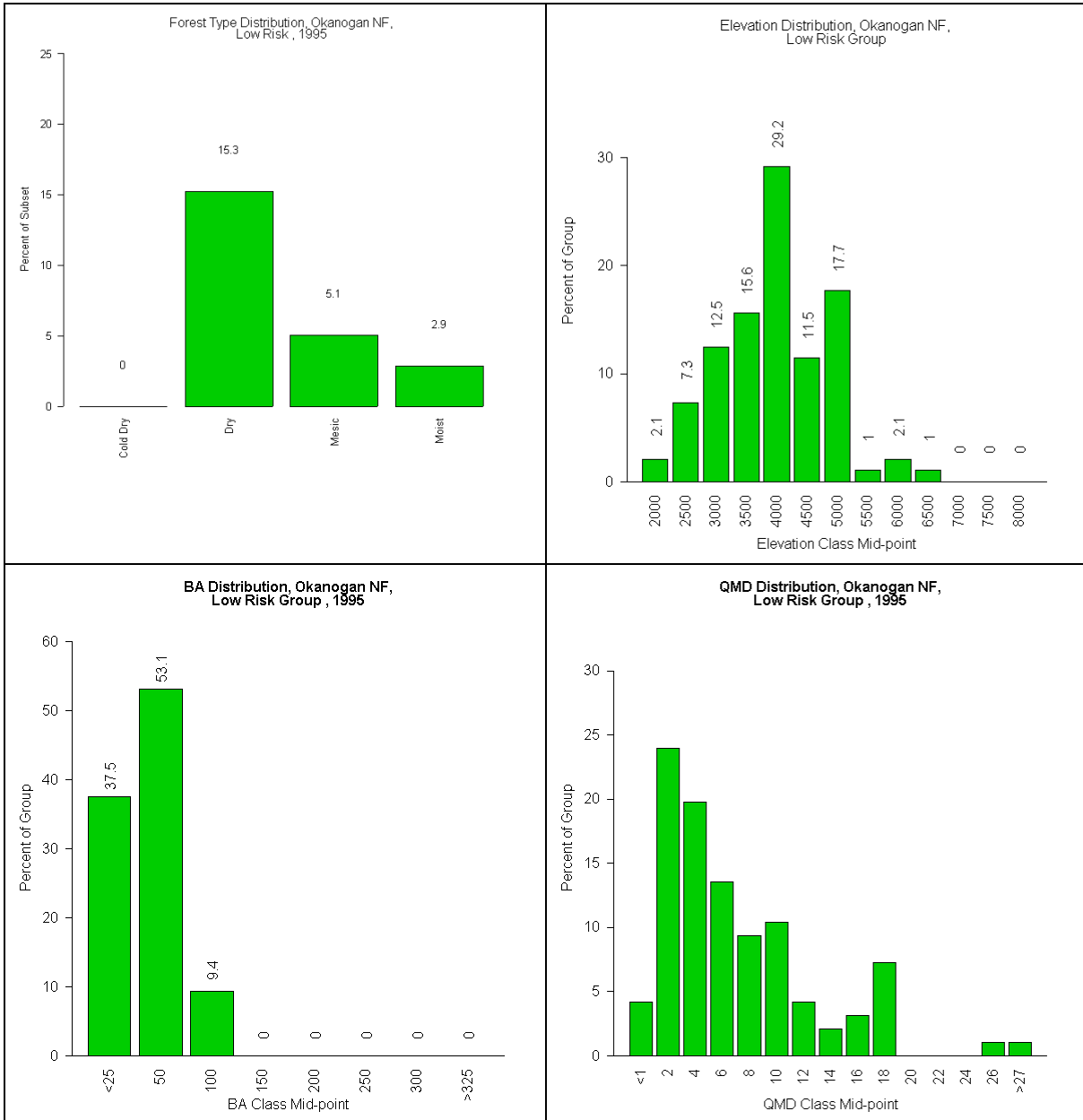
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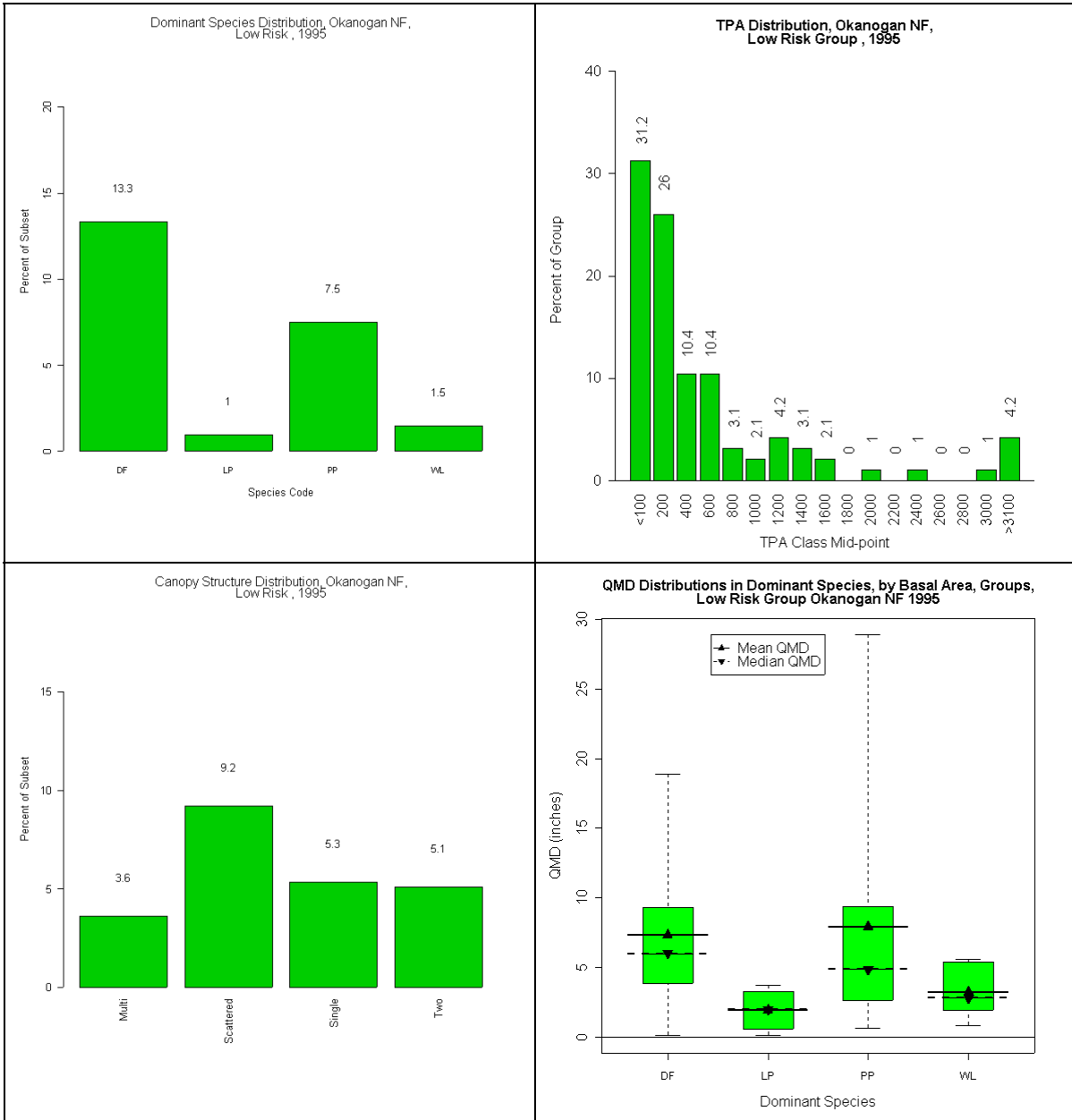
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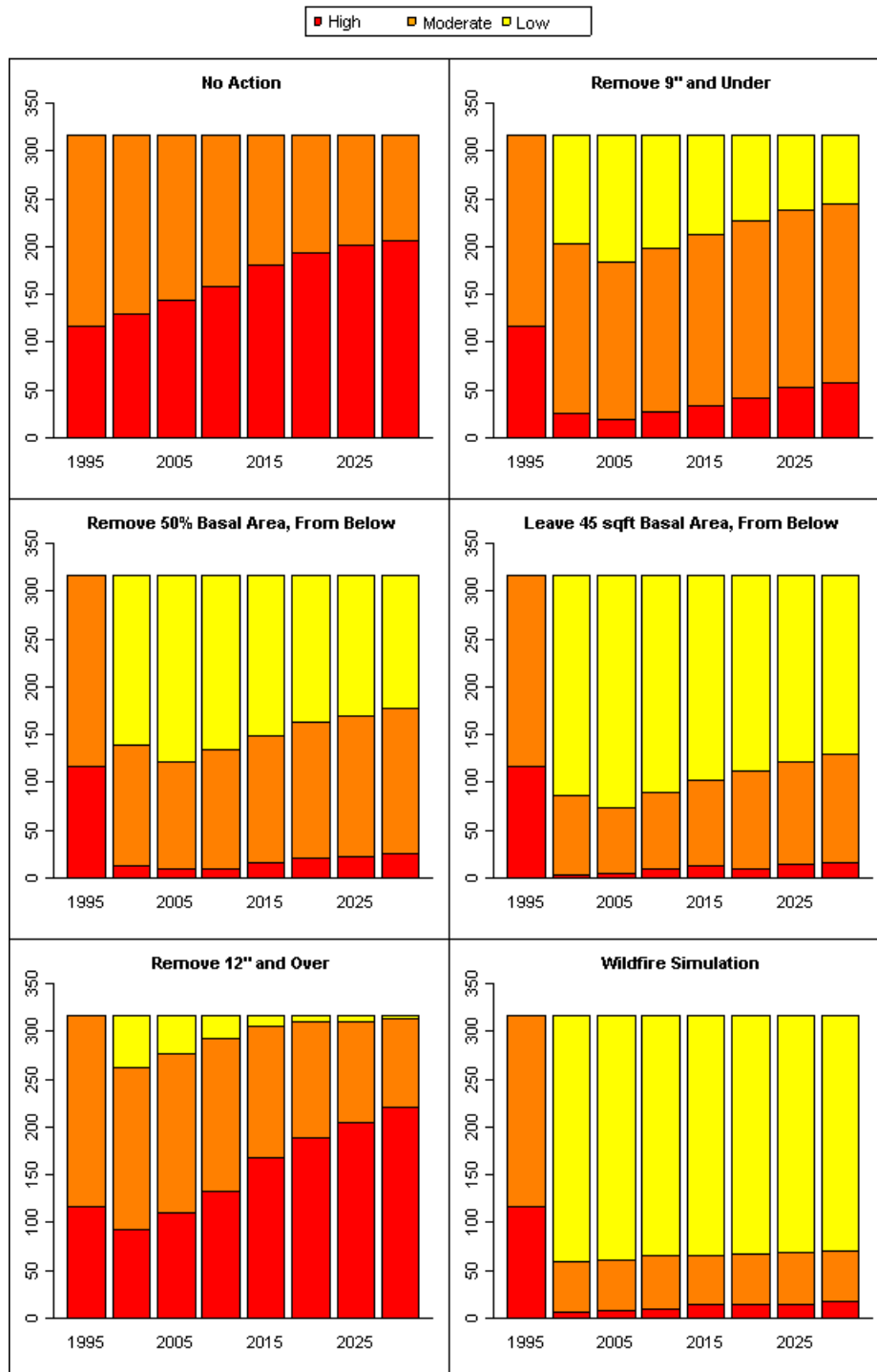
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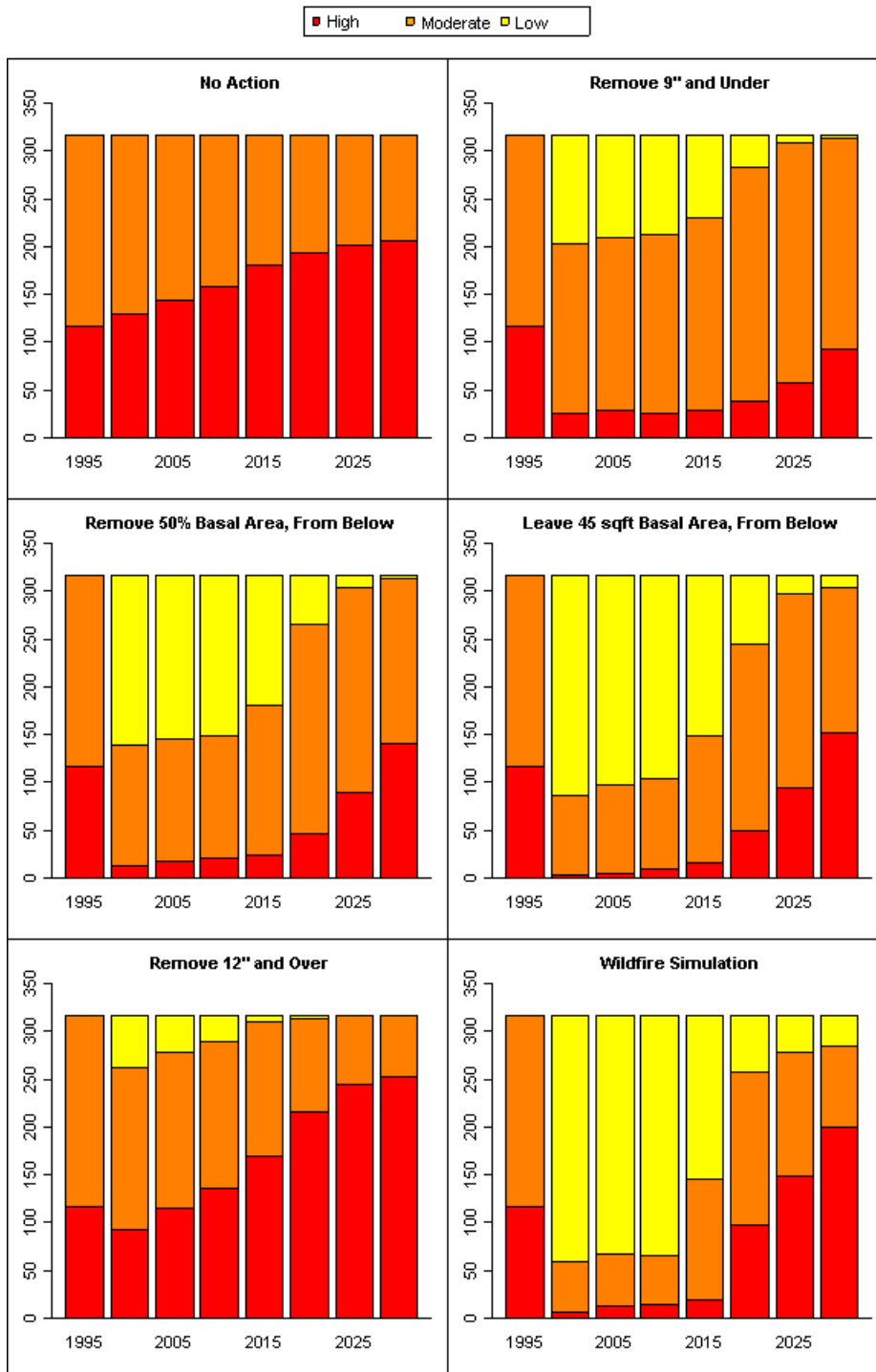
Okanogan - Low Risk Stands: Species, TPA, Canopy Structure



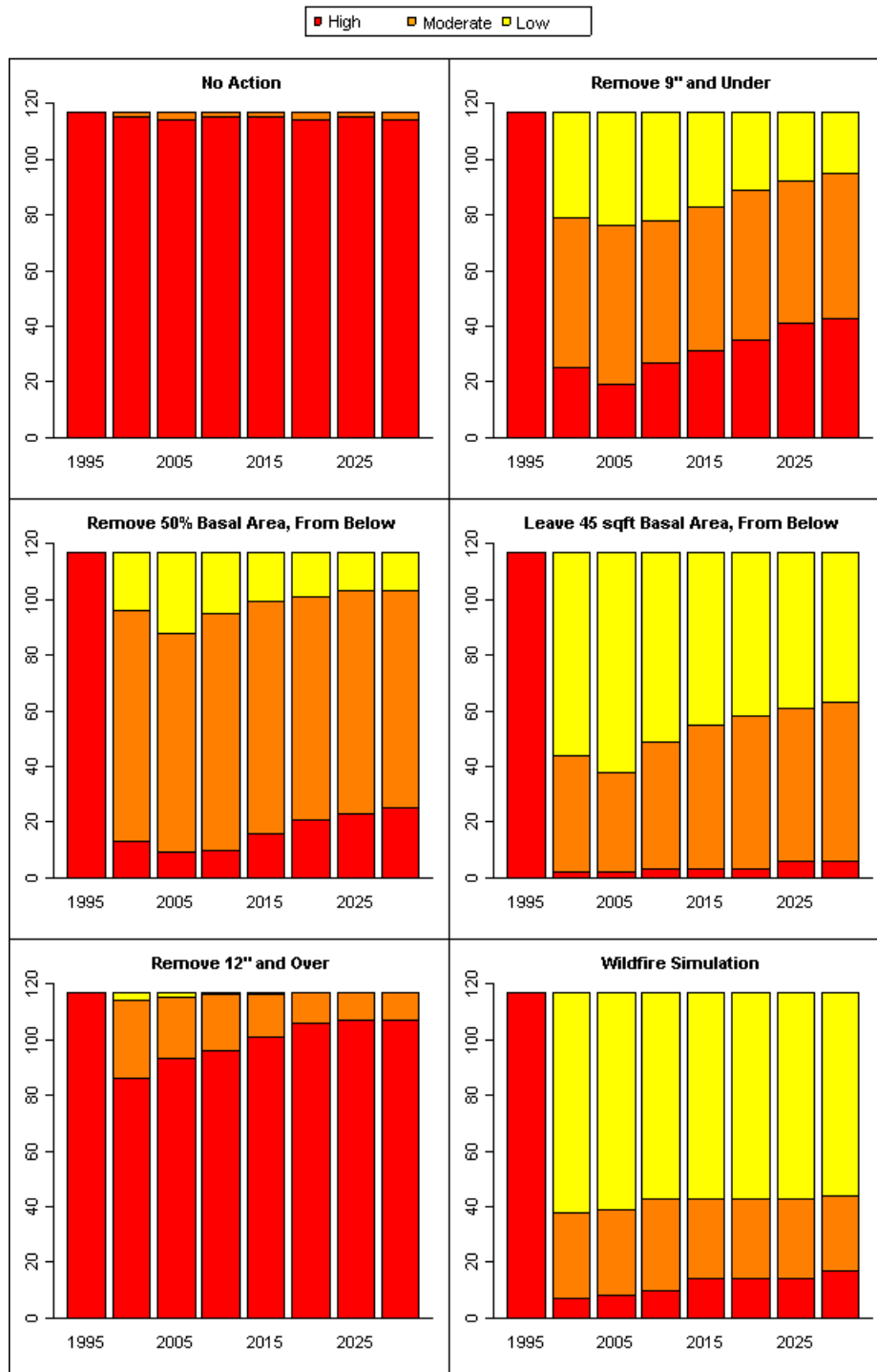
Okanogan - High & Moderate Risk Stands: Fire Risk without regeneration



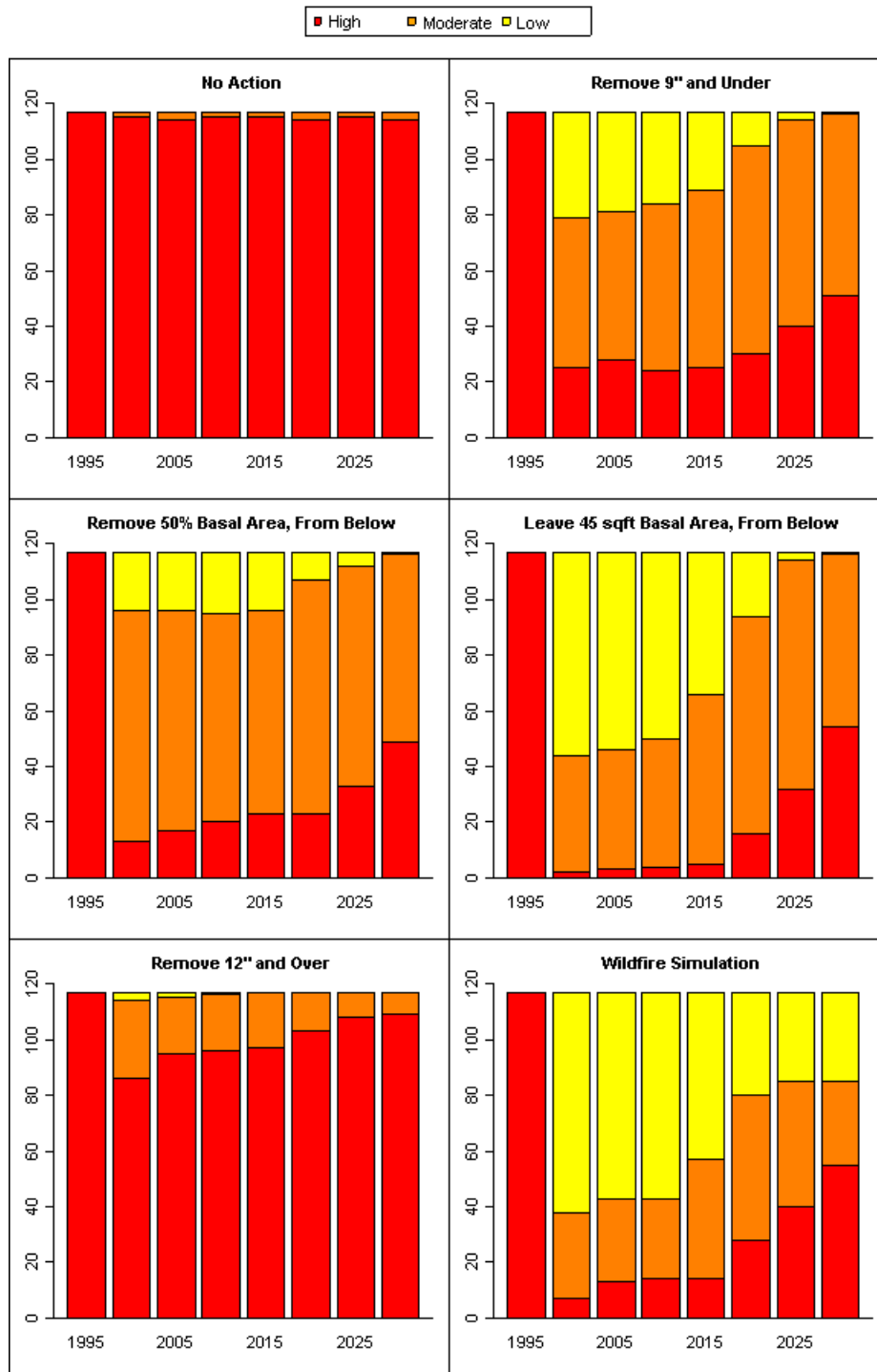
Okanogan - High & Moderate Risk Stands: Fire Risk with regeneration



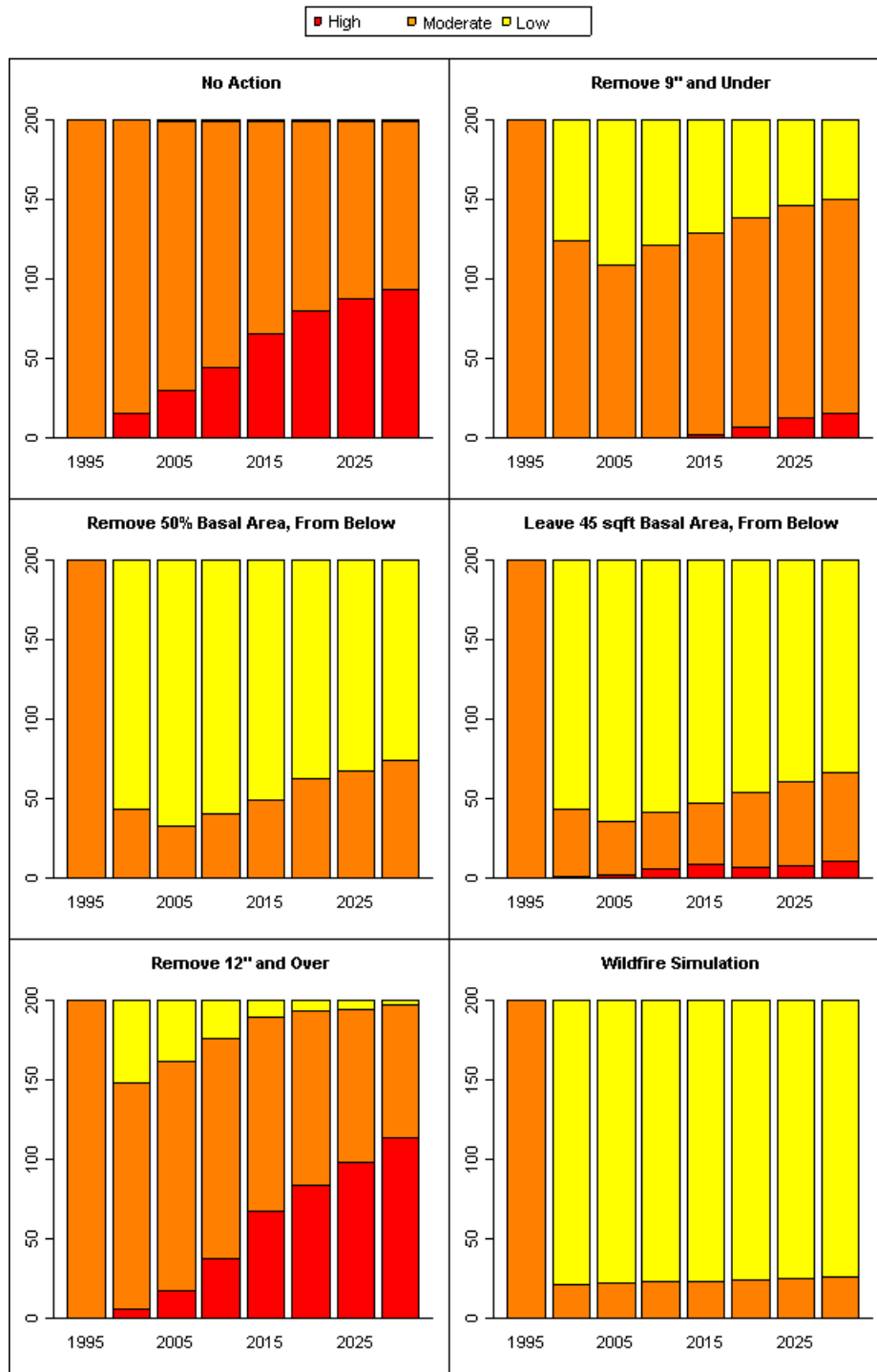
Okanogan - High Risk Stands: Fire Risk without regeneration



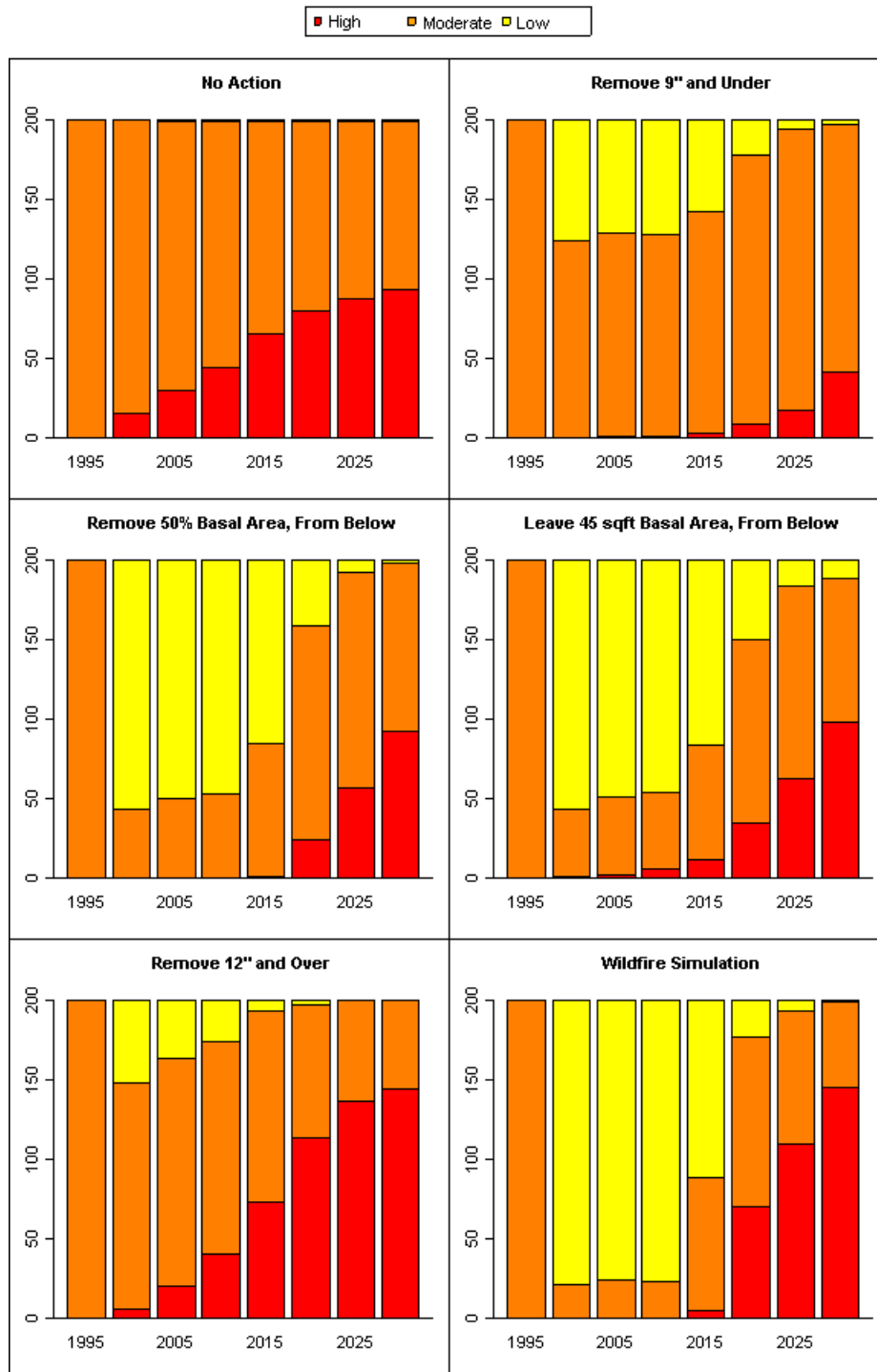
Okanogan - High Risk Stands: Fire Risk with regeneration



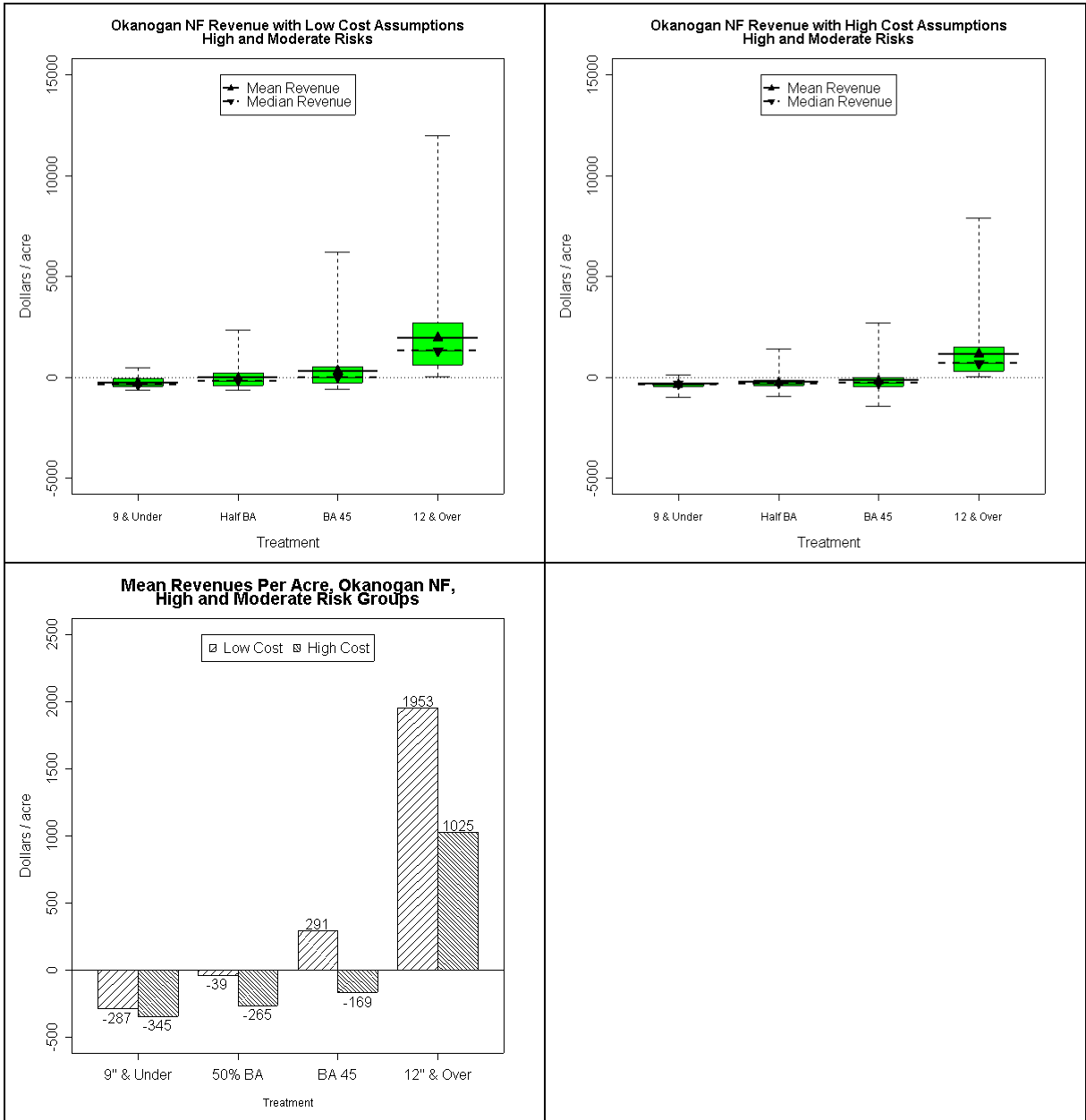
Okanogan - Moderate Risk Stands: Fire Risk without regeneration



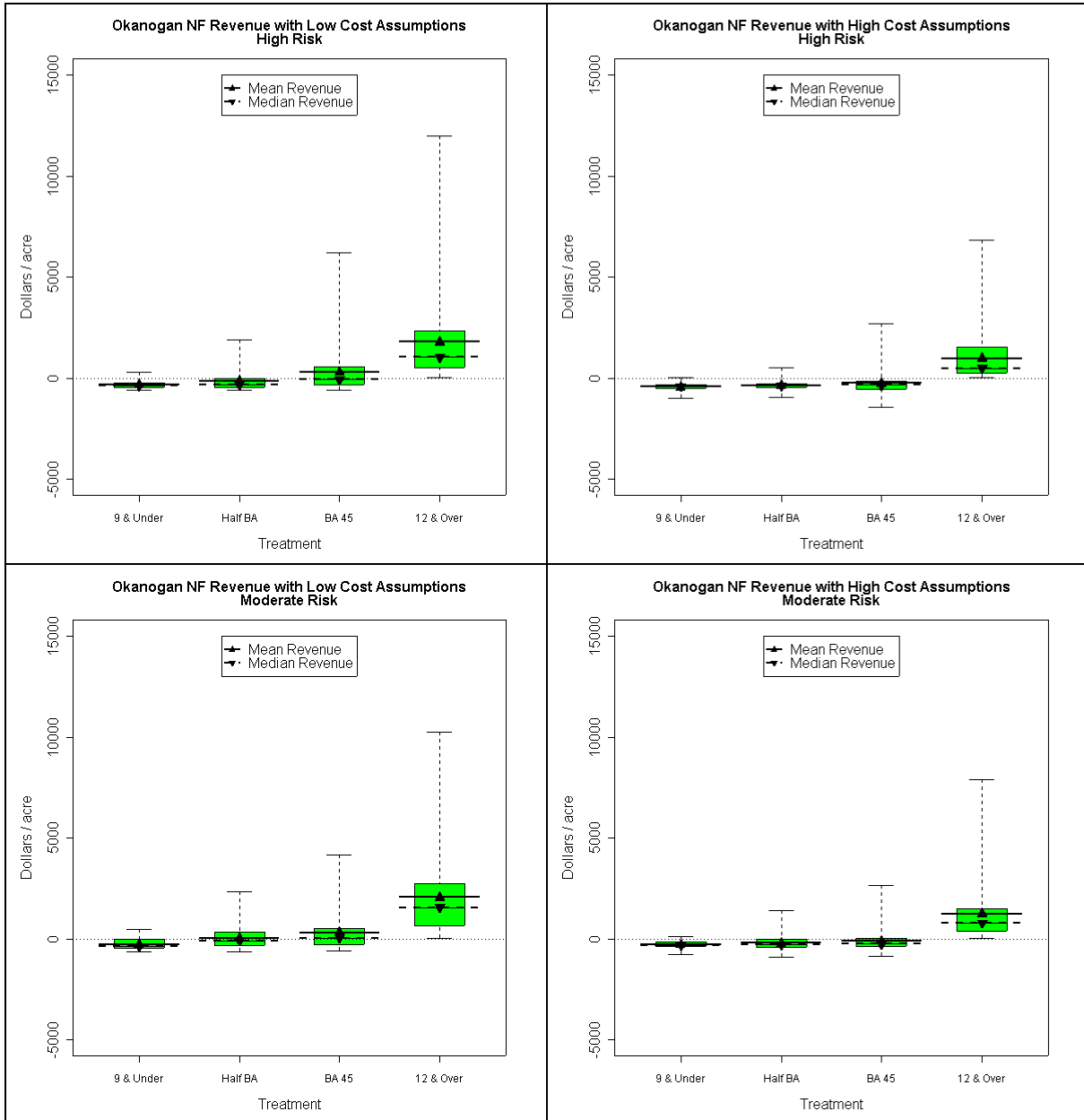
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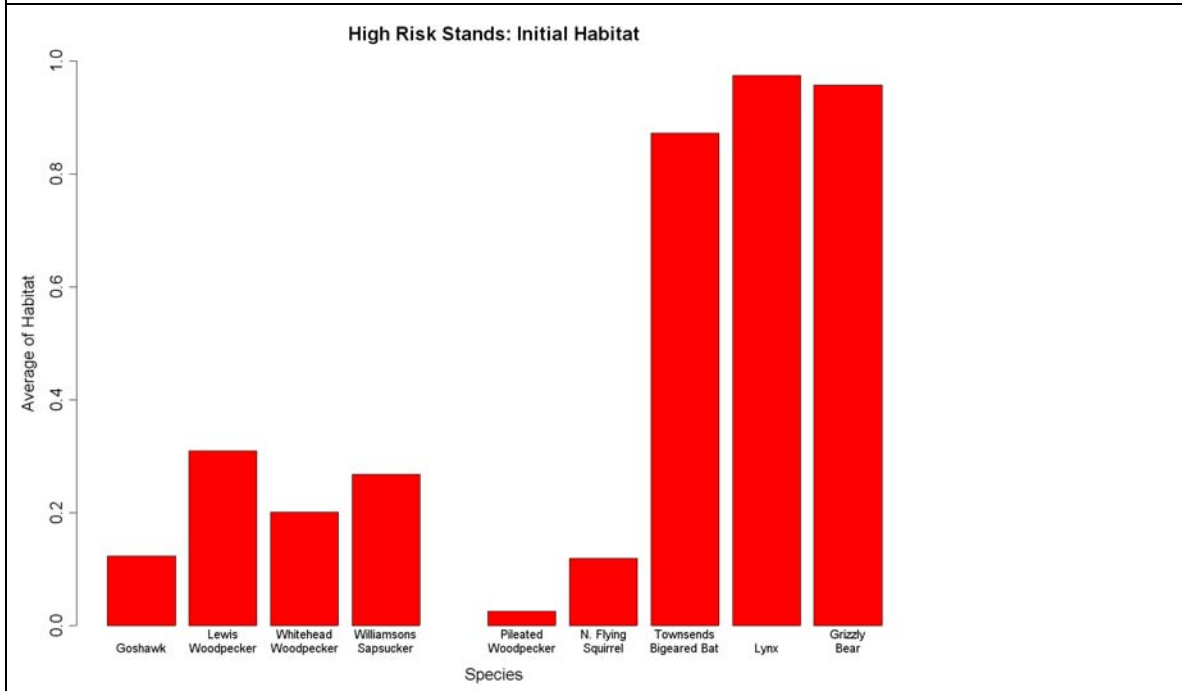
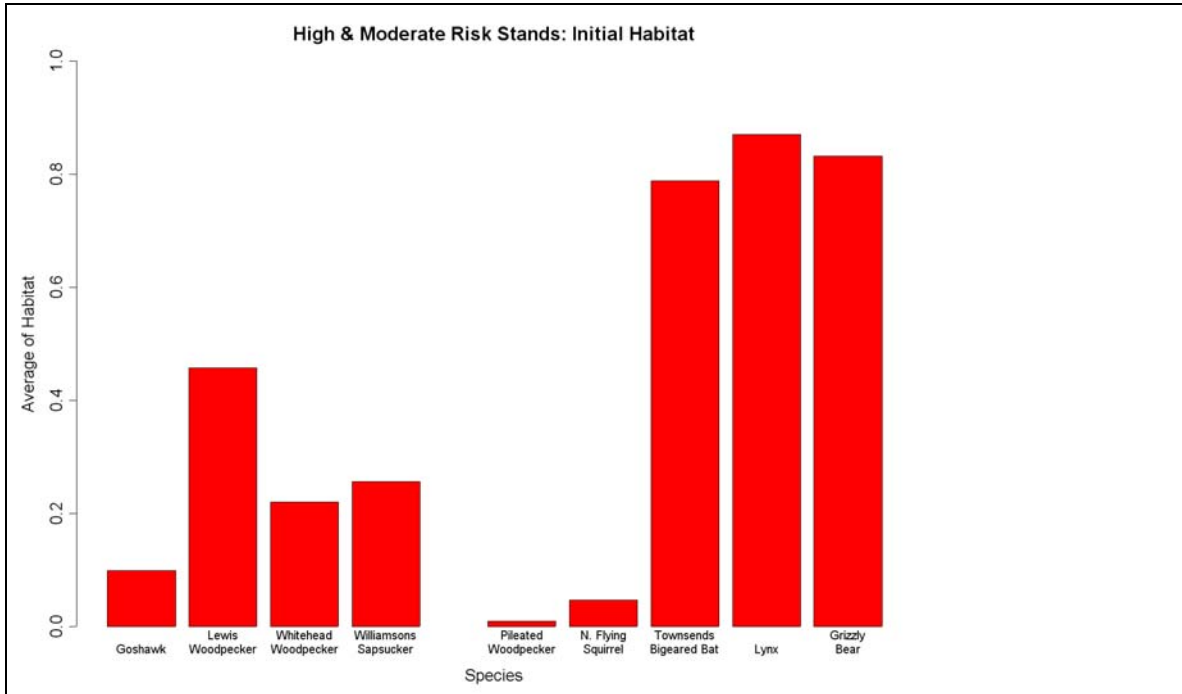
Okanogan – High & Moderate Risk Stands: Economics, Low & High Cost



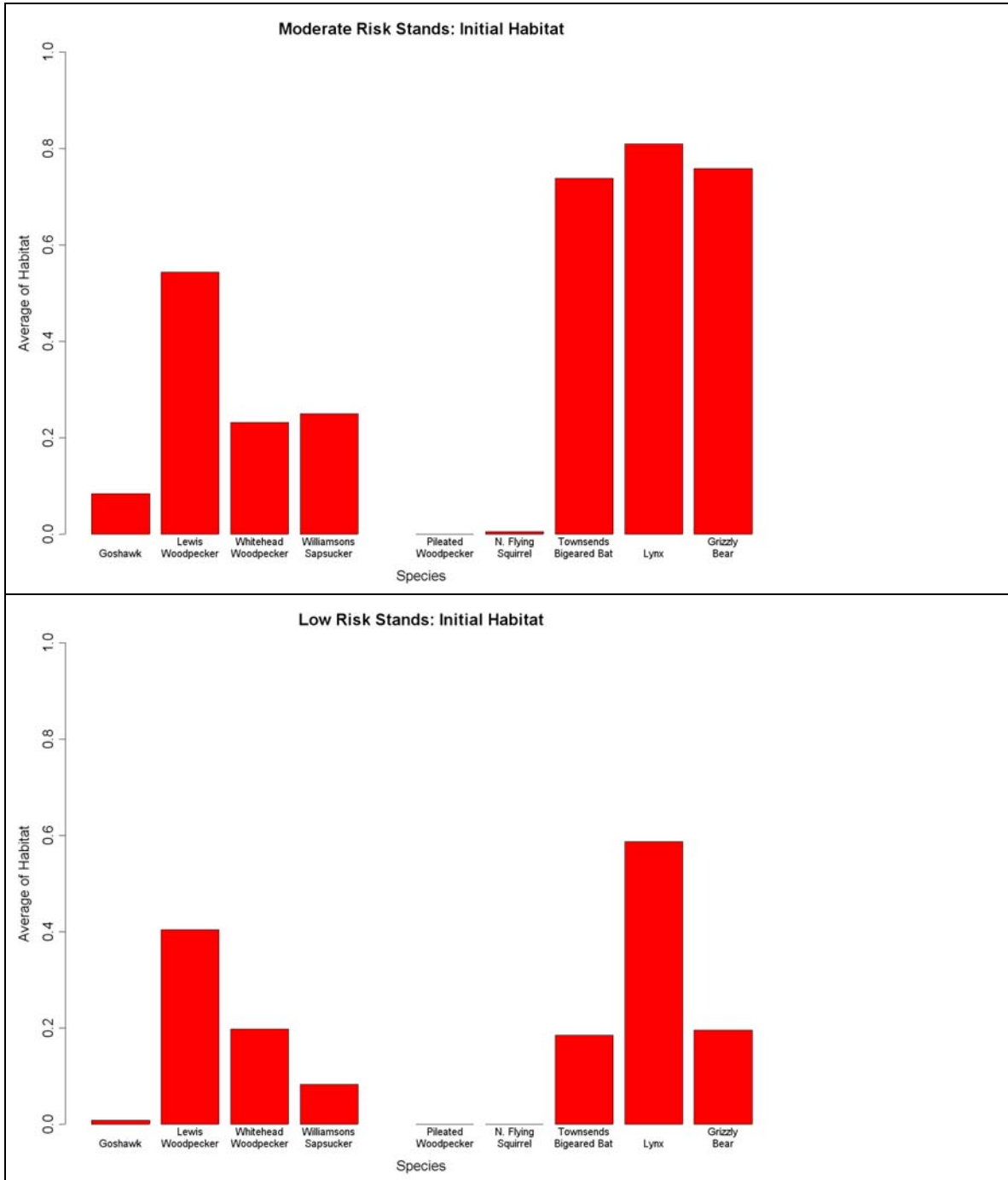
Okanogan – High Risk & Moderate Risk Stands: Economics, Low & High Cost



Okanogan – High & Moderate Risk Stands: Initial Habitat

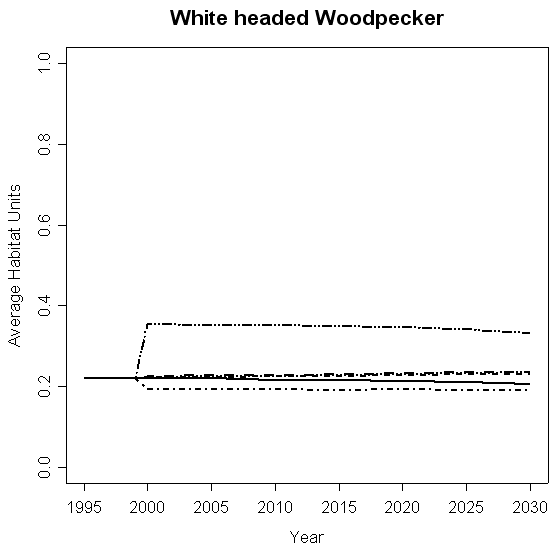
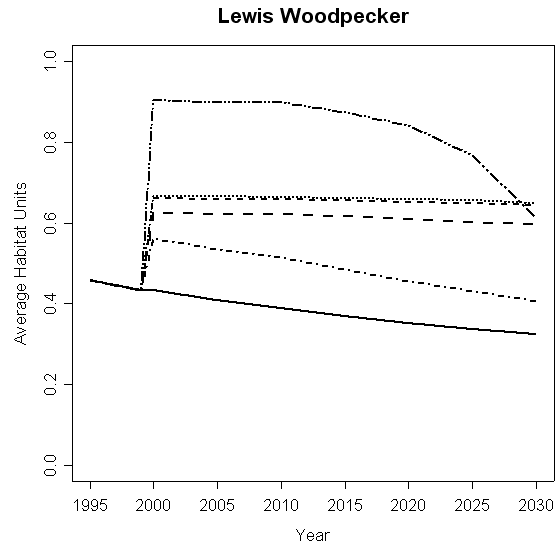
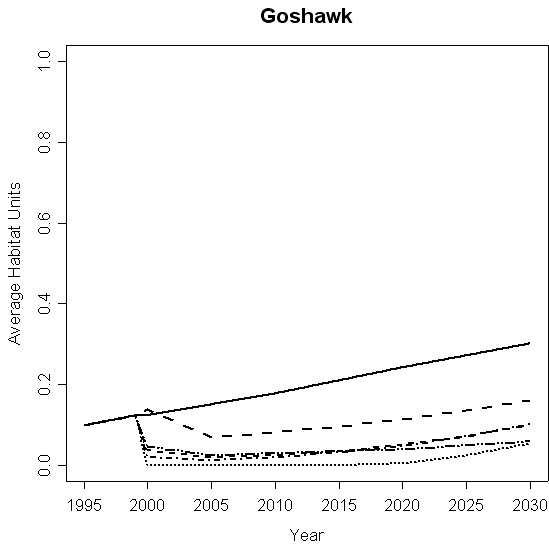


Okanogan – High Risk & Moderate Risk: Initial Habitat



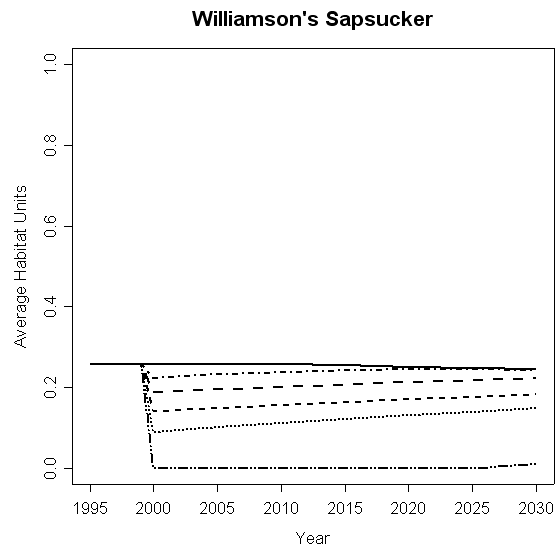
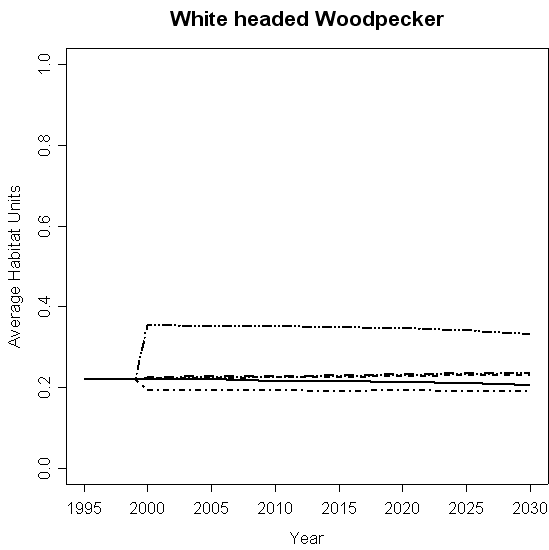
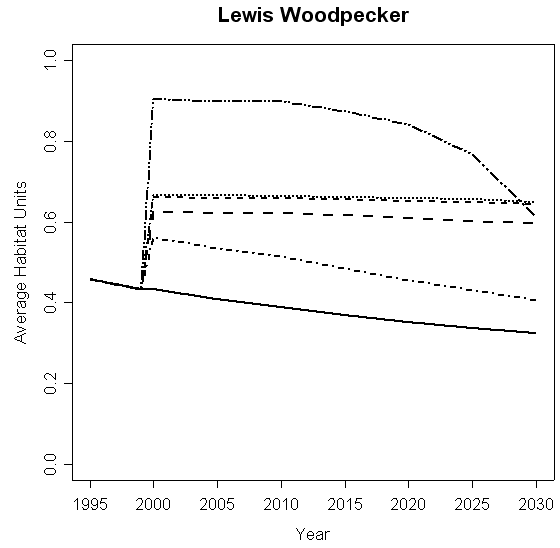
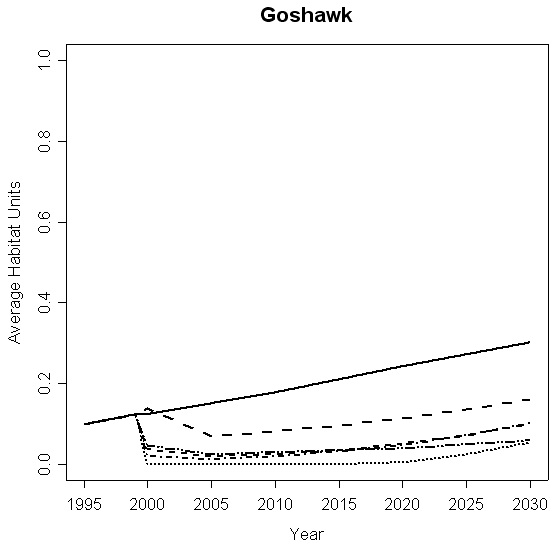
Okanogan - High & Moderate Risk Stands: Wildlife HSI without Regeneration

Okanogan - High & Moderate Risk Stands: HSI with regeneration



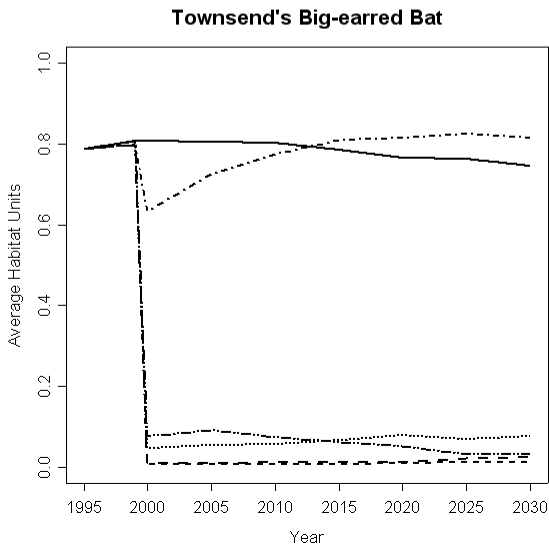
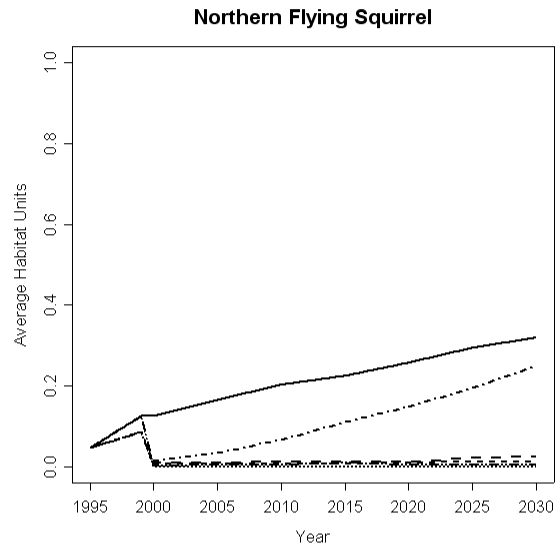
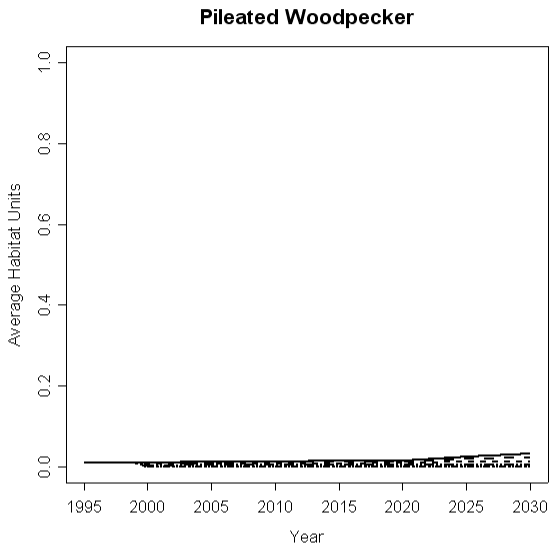
Okanogan - High & Moderate Risk Stands: Wildlife HSI with Regeneration

Okanogan - High & Moderate Risk Stands: HSI with regeneration



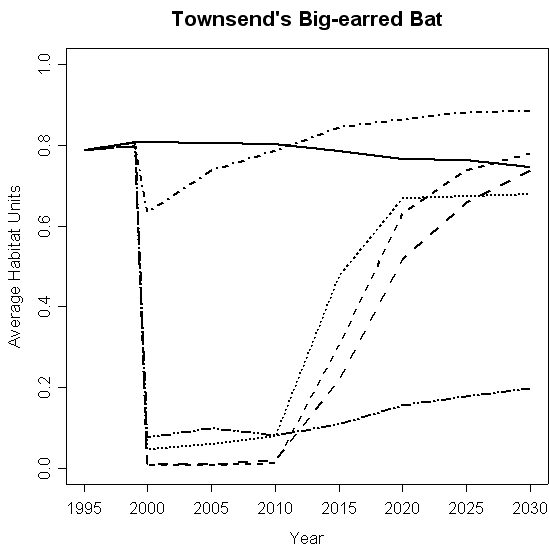
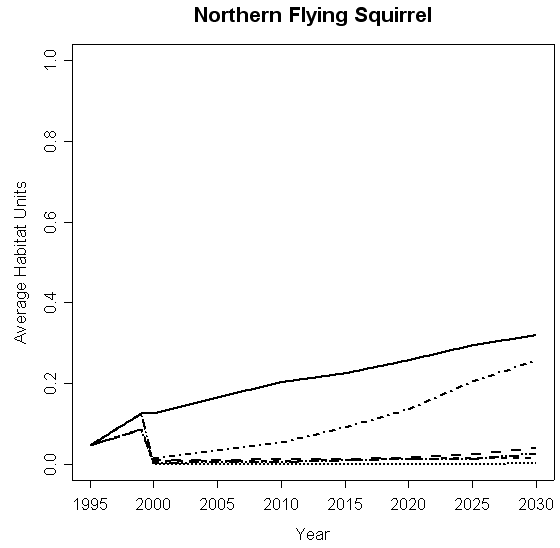
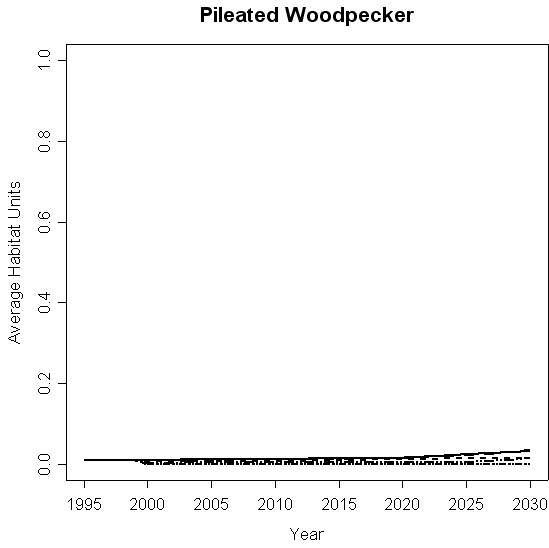
Okanogan - High & Moderate Risk Stands: Wildlife Source Habitat without Regeneration

Okanogan - High & Moderate Risk Stands: CRB without regeneration



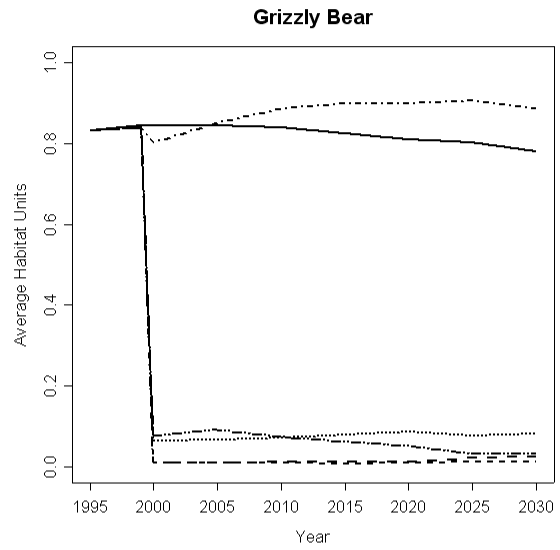
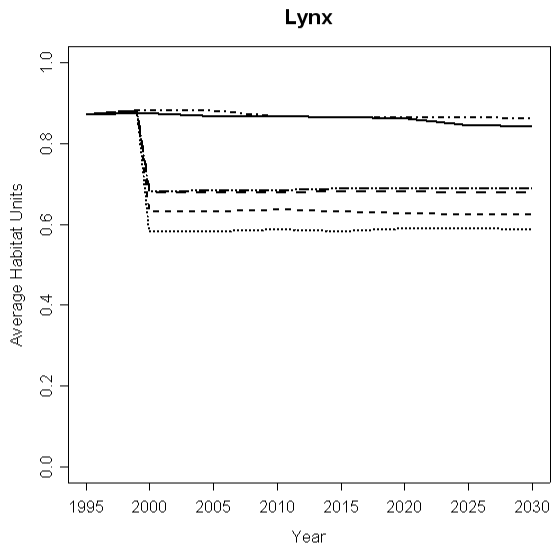
Okanogan - High & Moderate Risk Stands: Wildlife Source Habitat with Regeneration

Okanogan - High & Moderate Risk Stands: CRB with regeneration



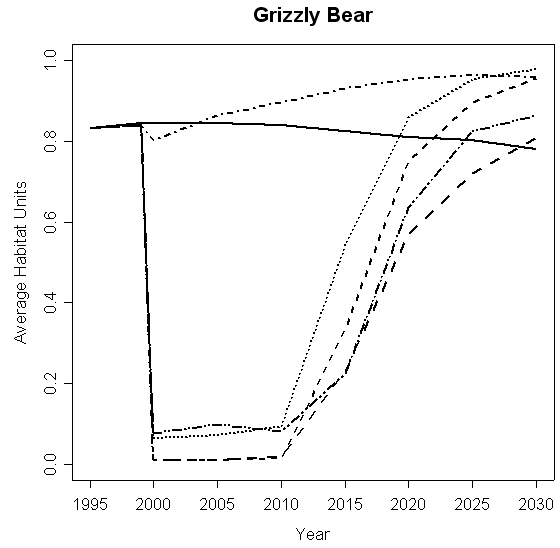
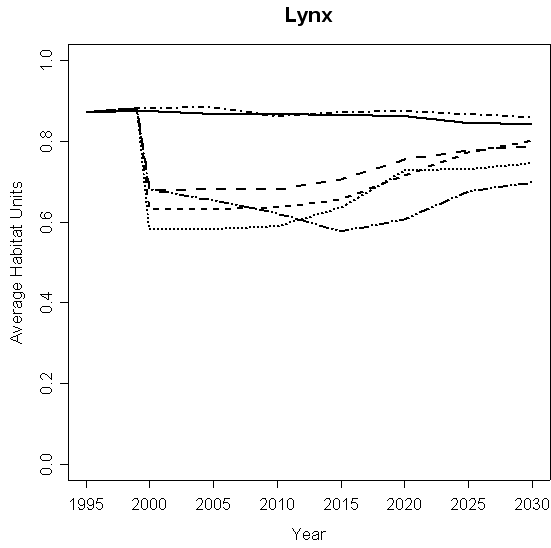
Okanogan - High & Moderate Risk Stands: Wildlife Source Habitat without Regeneration

Okanogan - High & Moderate Risk Stands: CRB without regeneration



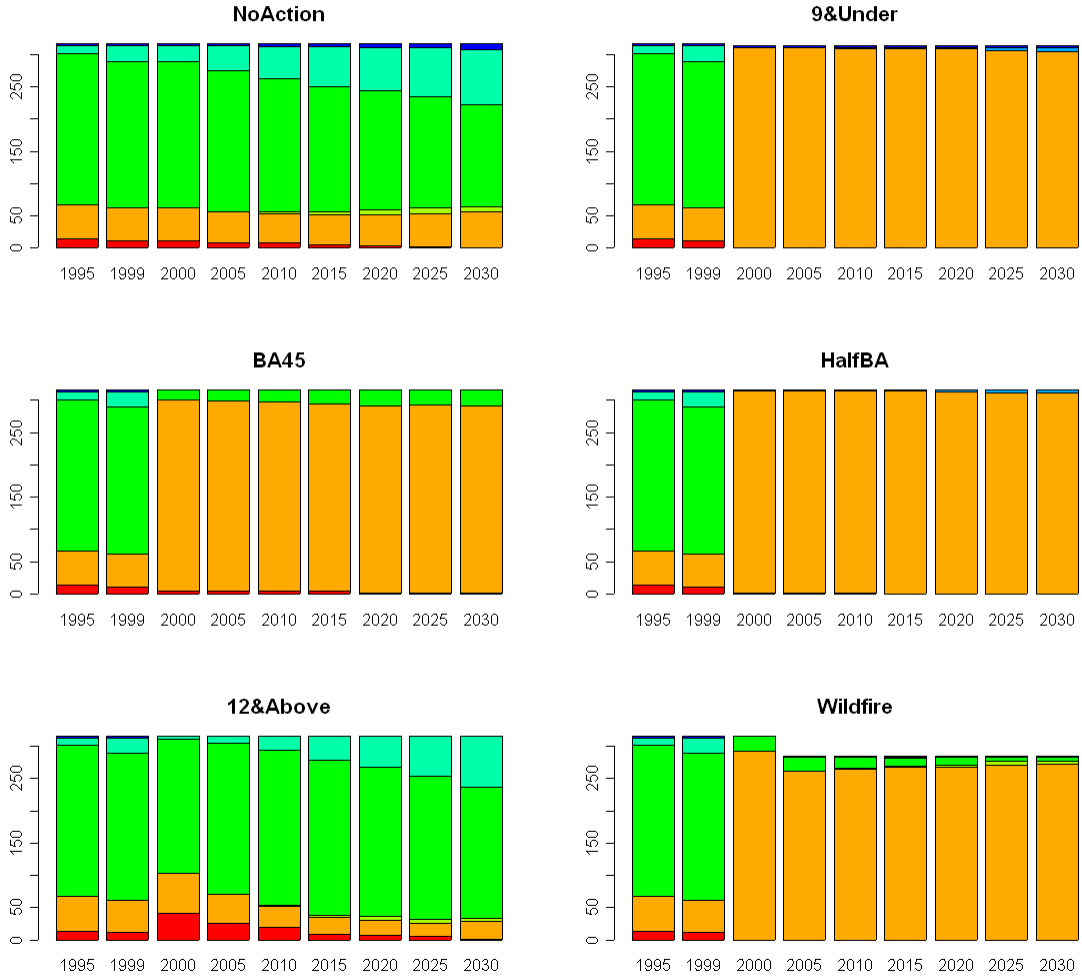
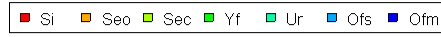
Okanogan - High & Moderate Risk Stands: Wildlife Source Habitat with Regeneration

Okanogan - High & Moderate Risk Stands: CRB with regeneration



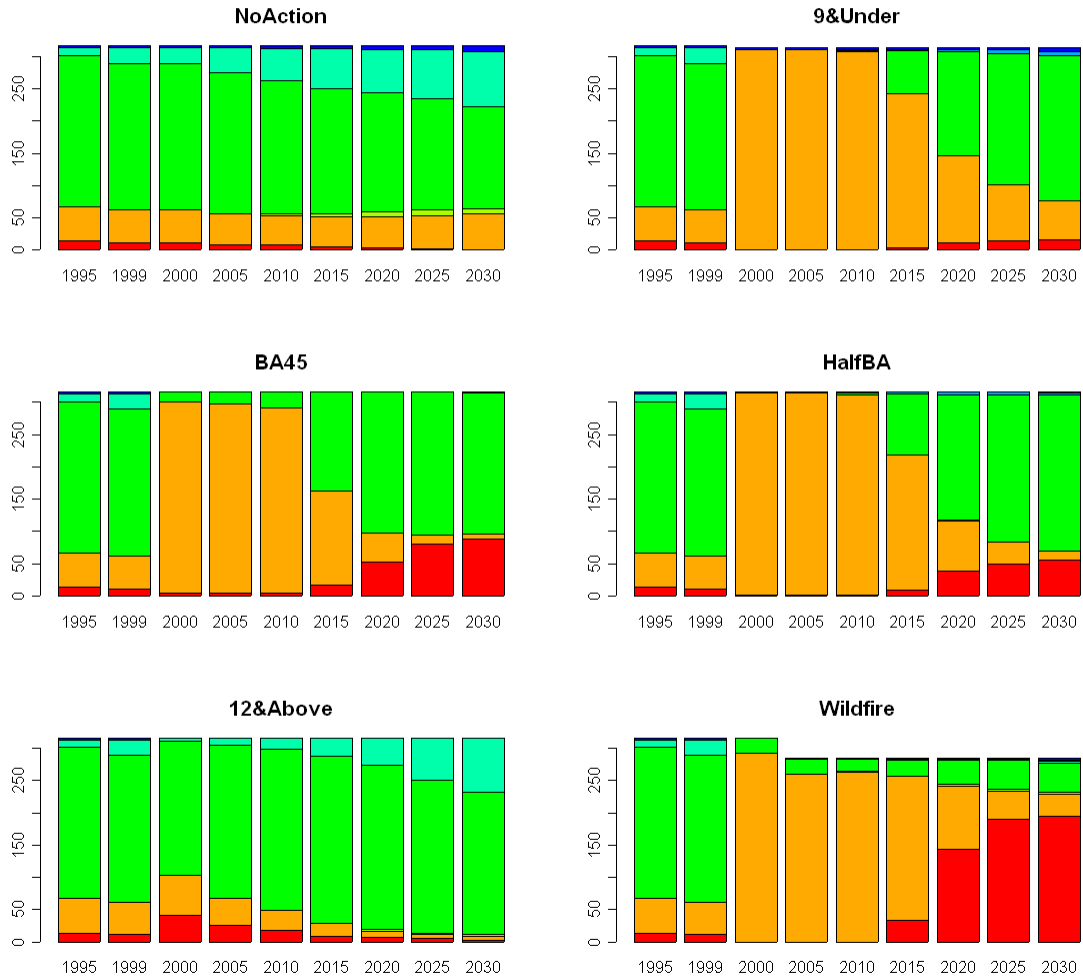
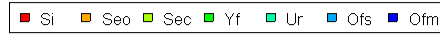
Okanogan – High & Moderate Stands: Source Habitat (ICBEMP) Classification without Regeneration

Okanogan - High & Moderate Risk Stands: ICBEMP Classification without regeneration



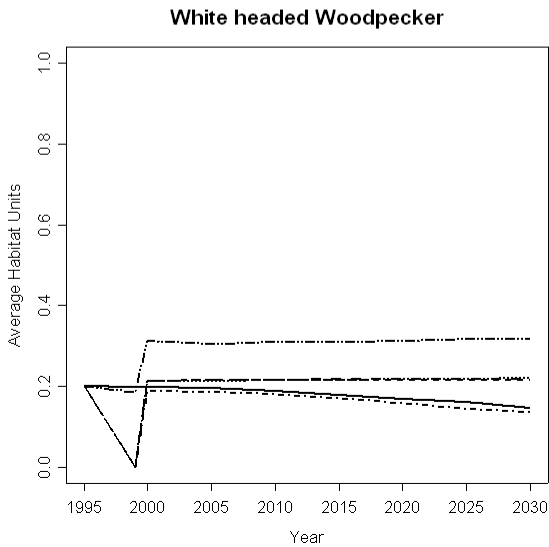
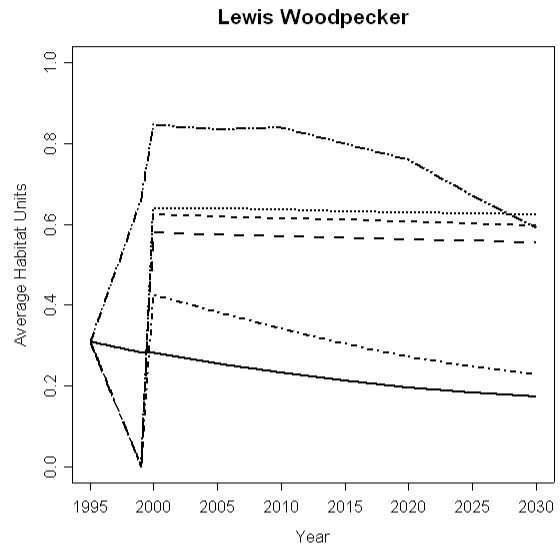
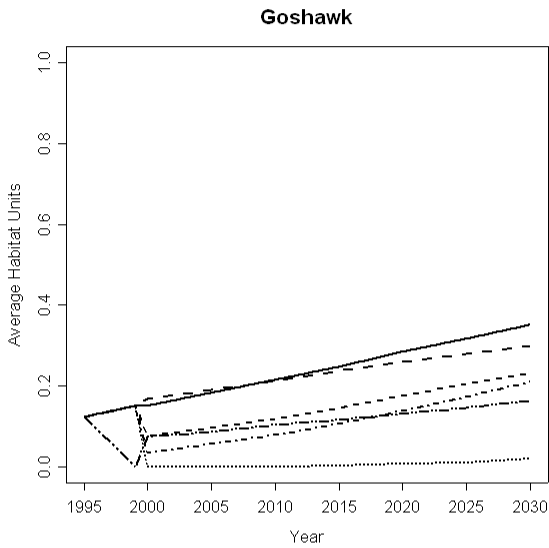
Okanogan – High & Moderate Stands: Source Habitat (ICBEMP) Classification with Regeneration

Okanogan - High & Moderate Risk Stands: ICBEMP Classification with regeneration



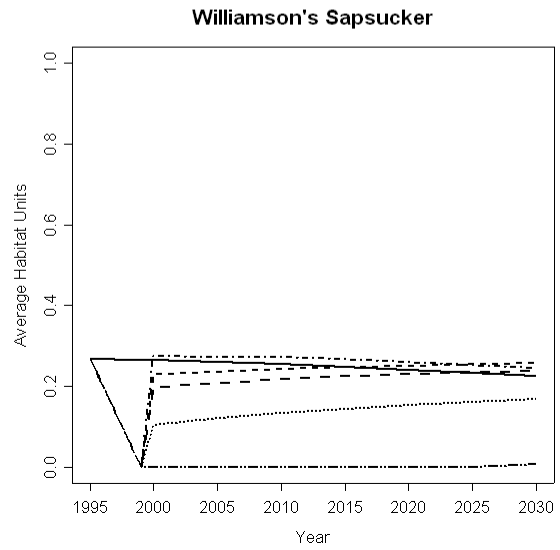
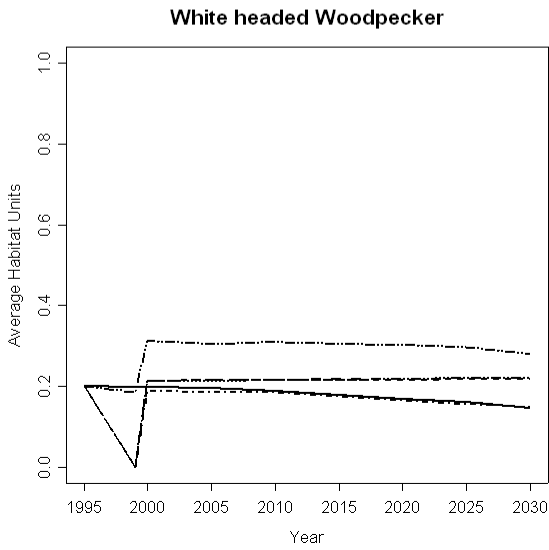
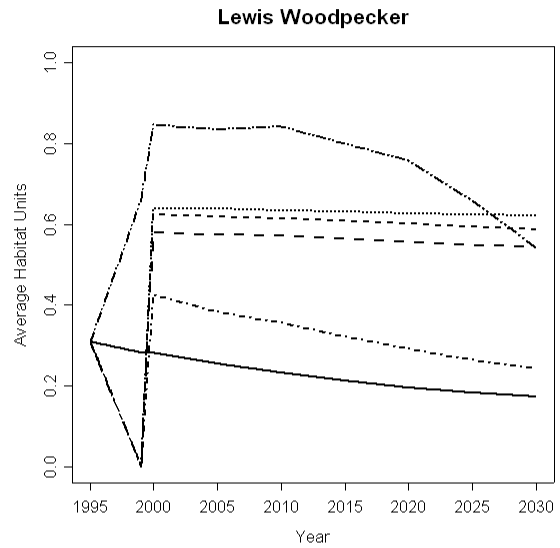
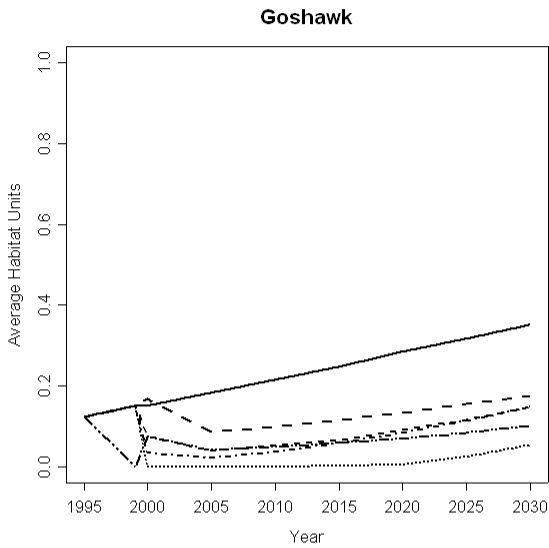
Okanogan - High Risk Stands: Wildlife HSI without Regeneration

Okanogan - High Risk Stands: HSI without regeneration



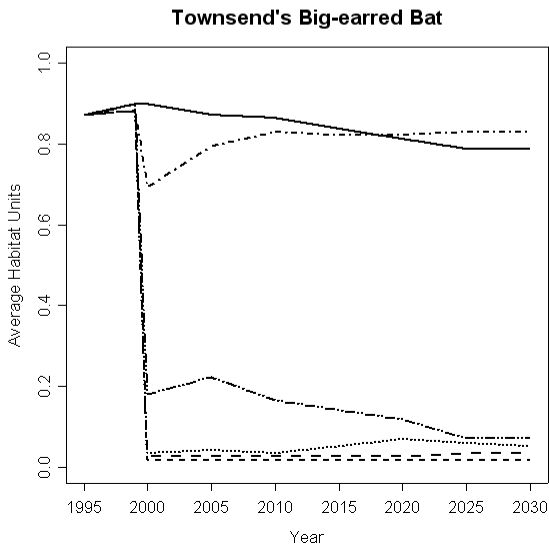
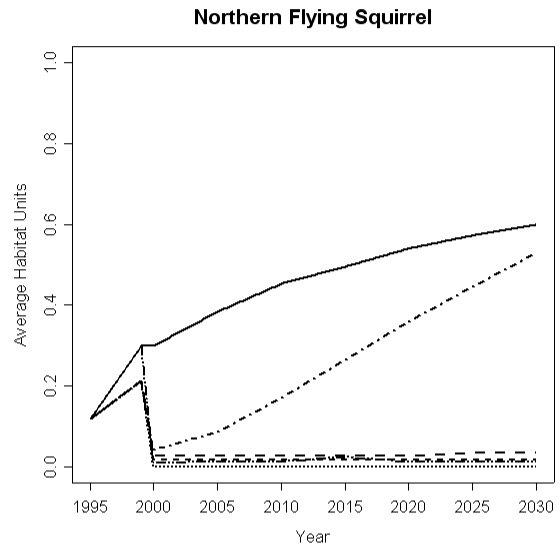
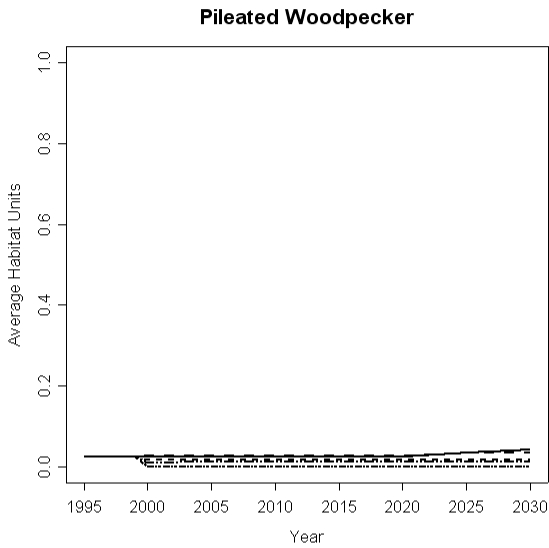
Okanogan - High Risk Stands: Wildlife HSI with Regeneration

Okanogan - High Risk Stands: HSI with regeneration



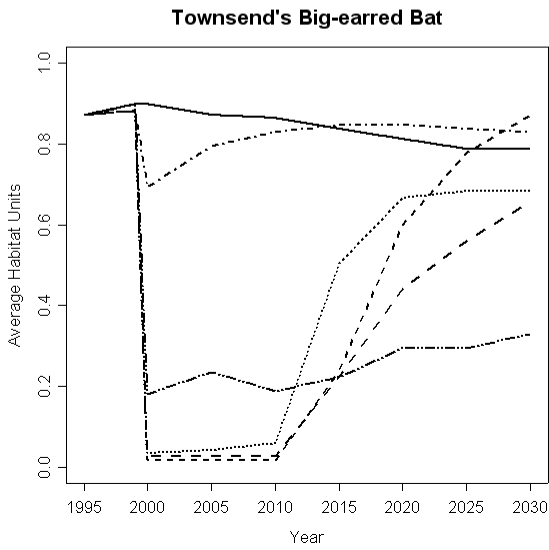
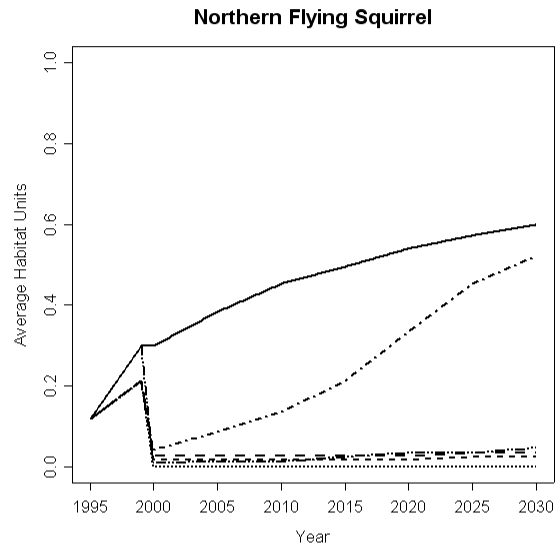
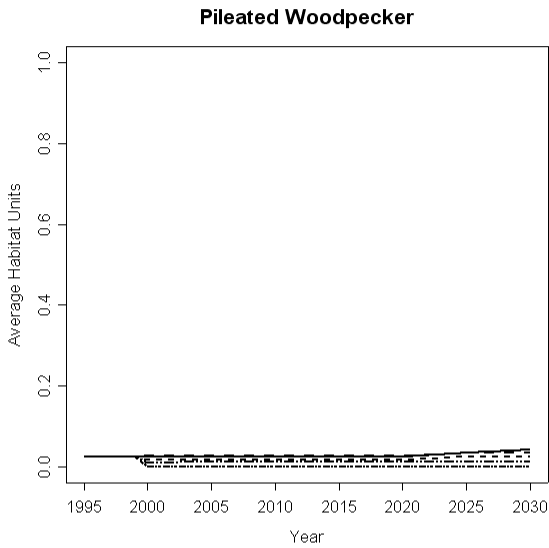
Okanogan - High Risk Stands: Wildlife Source Habitat without Regeneration

Okanogan - High Risk Stands: CRB without regeneration



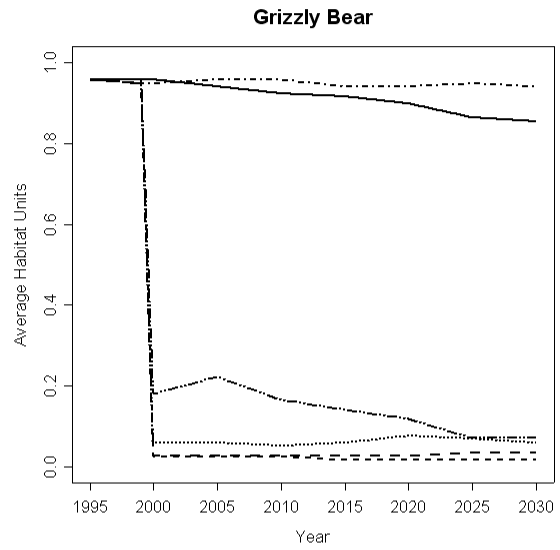
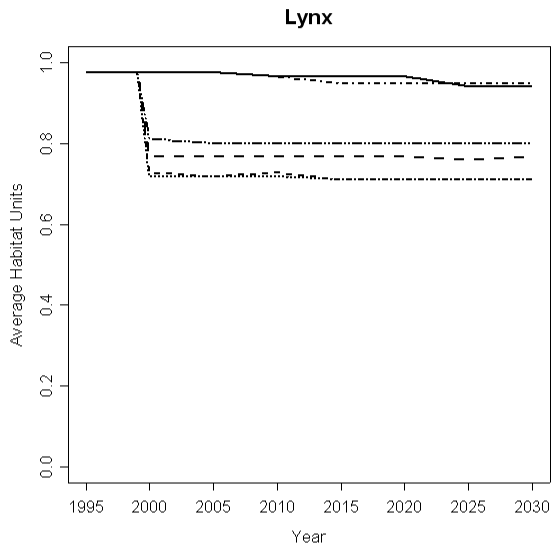
Okanogan - High Risk Stands: Wildlife Source Habitat with Regeneration

Okanogan - High Risk Stands: CRB with regeneration



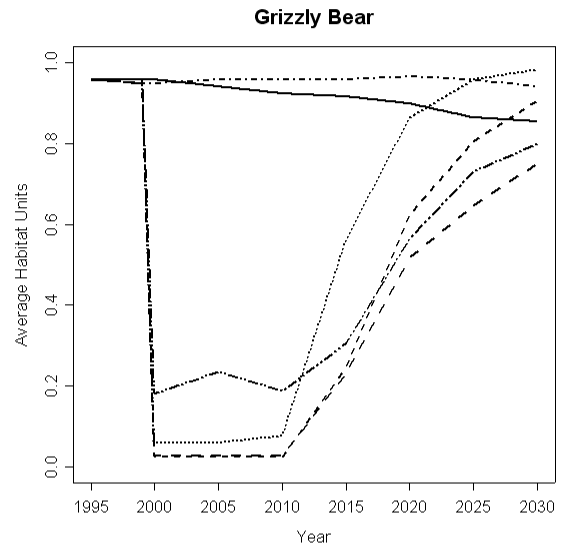
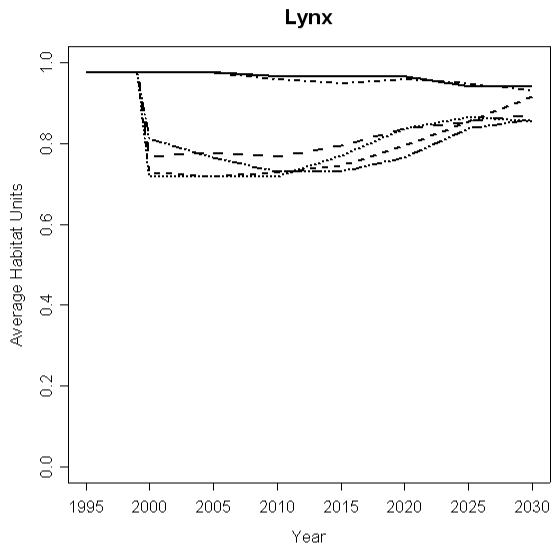
Okanogan - High Risk Stands: Wildlife Source Habitat without Regeneration

Okanogan - High Risk Stands: CRB without regeneration



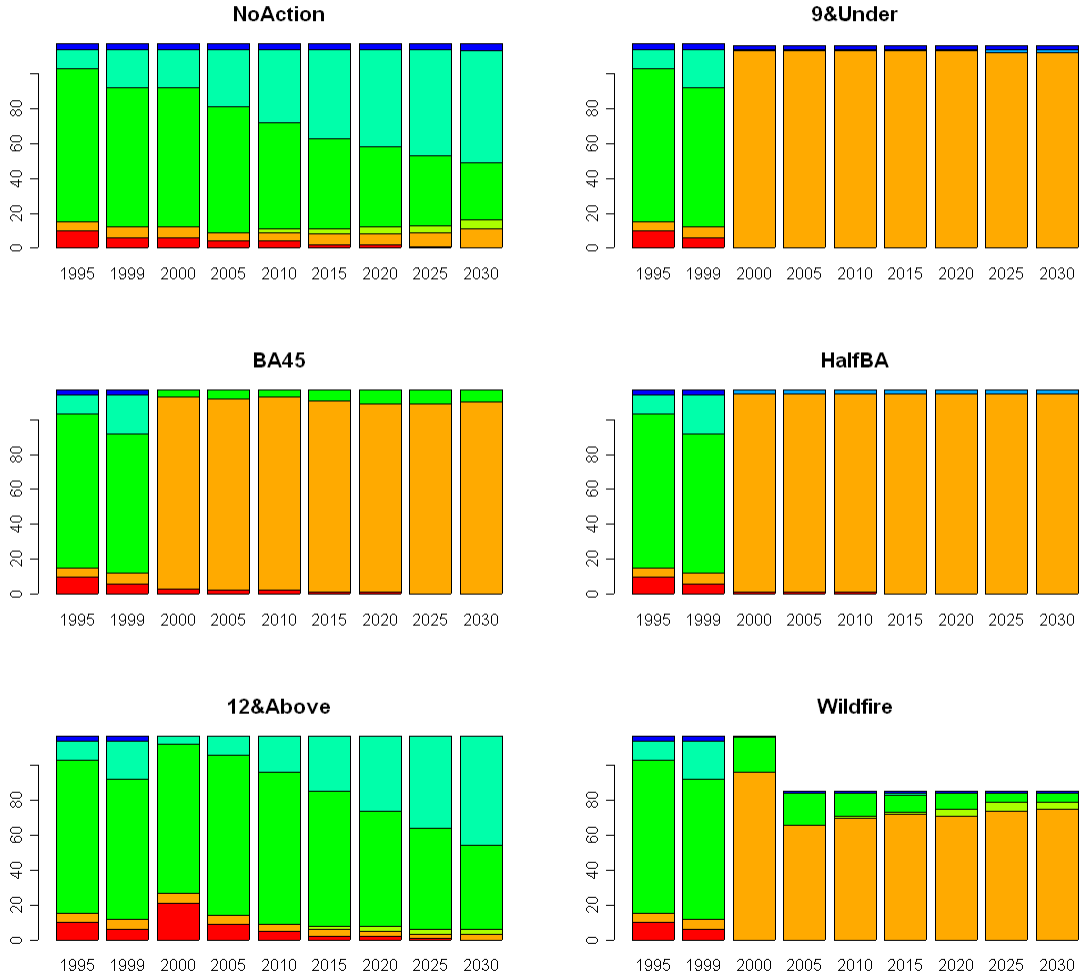
Okanogan - High Risk Stands: Wildlife Source Habitat with Regeneration

Okanogan - High Risk Stands: CRB with regeneration



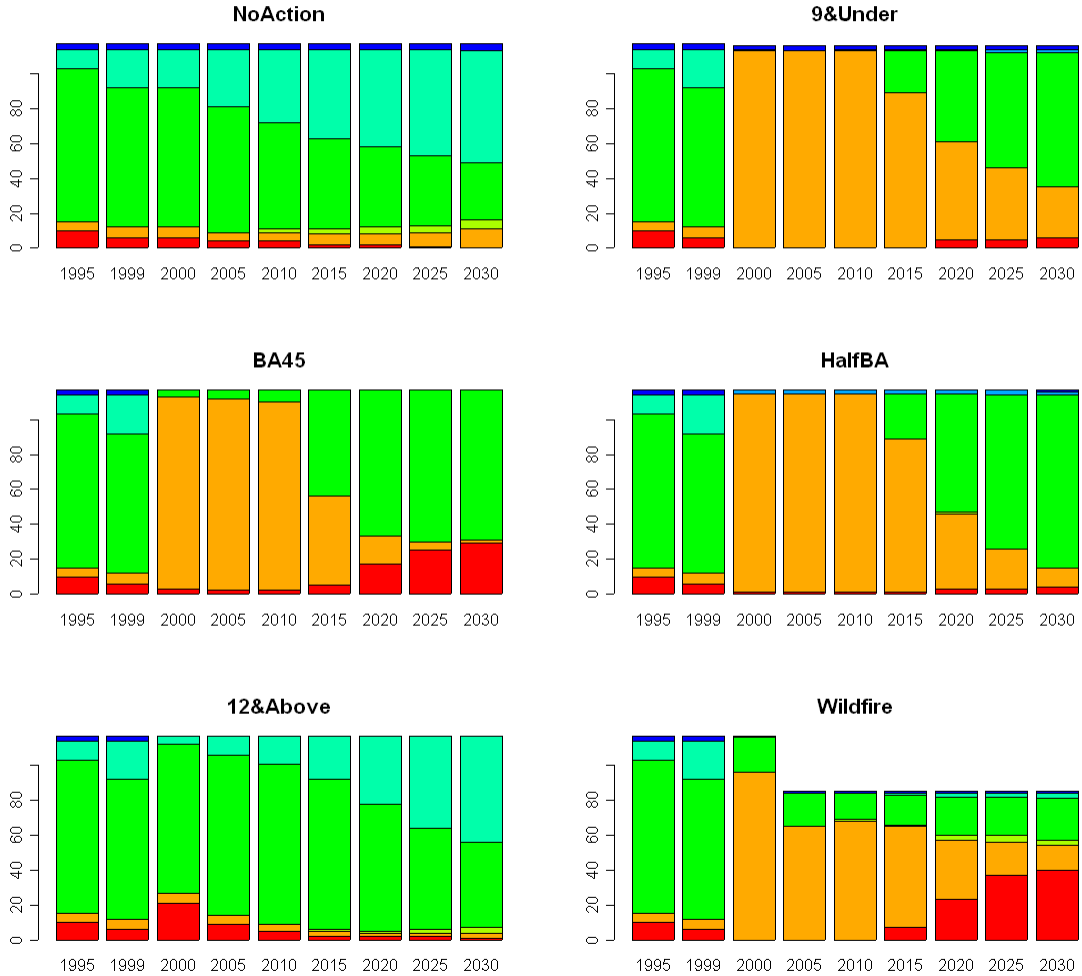
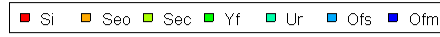
Okanogan – High Risk Stands: Source Habitat (ICBEMP) Classification without Regeneration

Okanogan - High Risk Stands: ICBEMP Classification without regeneration



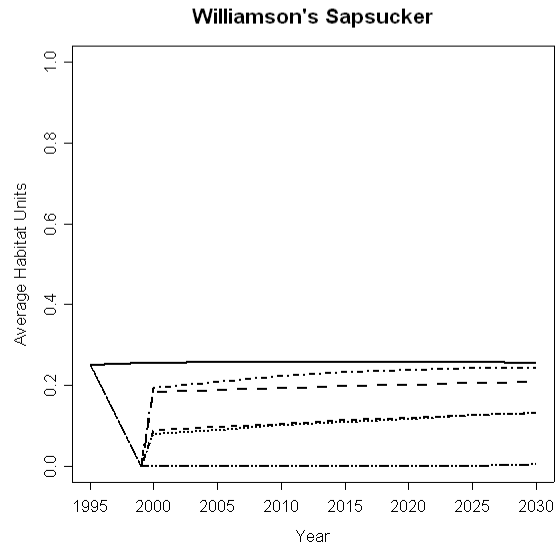
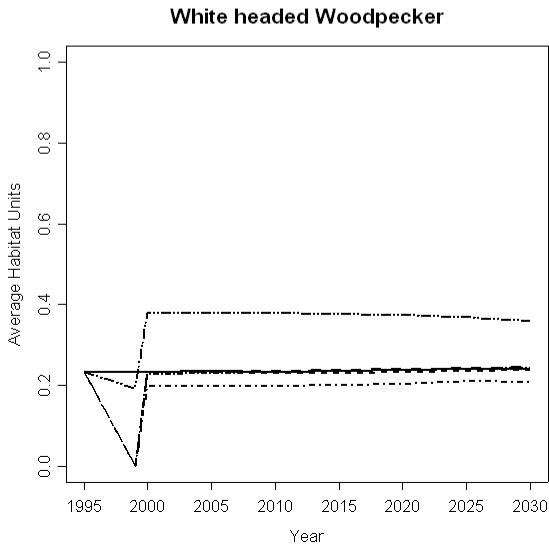
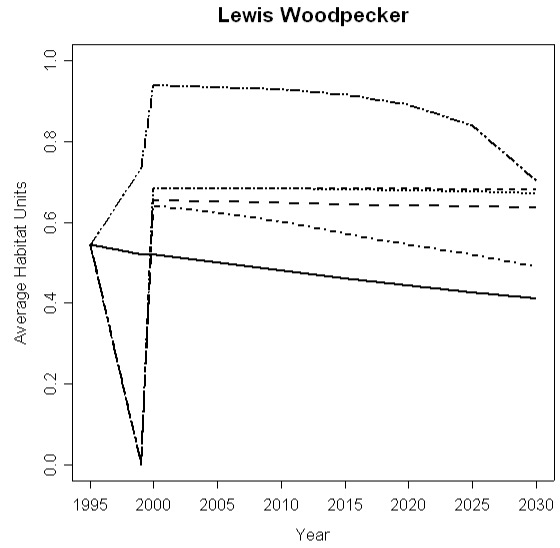
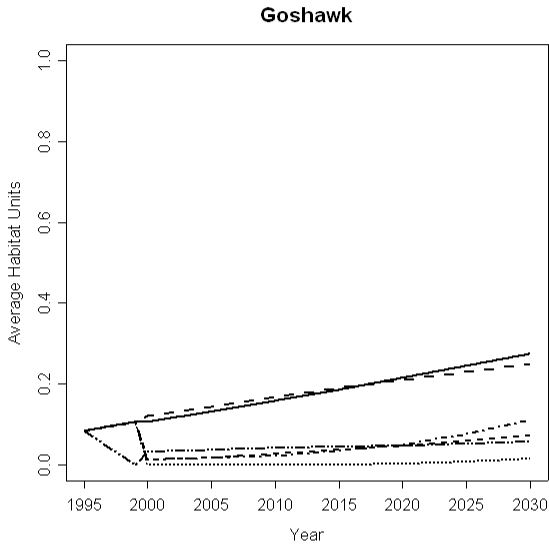
Okanogan – High Risk Stands: Source Habitat (ICBEMP) Classification with Regeneration

Okanogan - High Risk Stands: ICBEMP Classification with regeneration



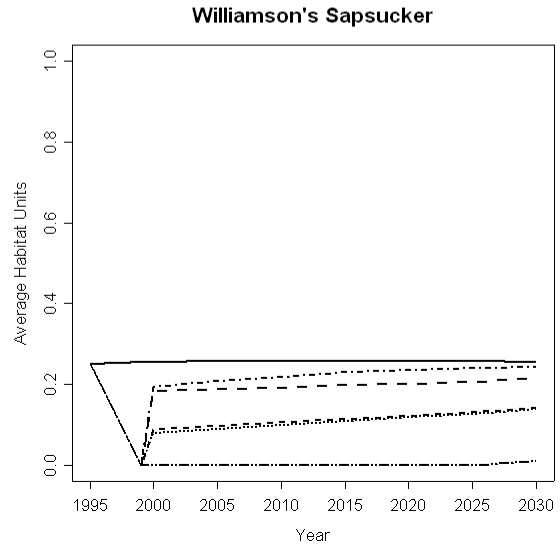
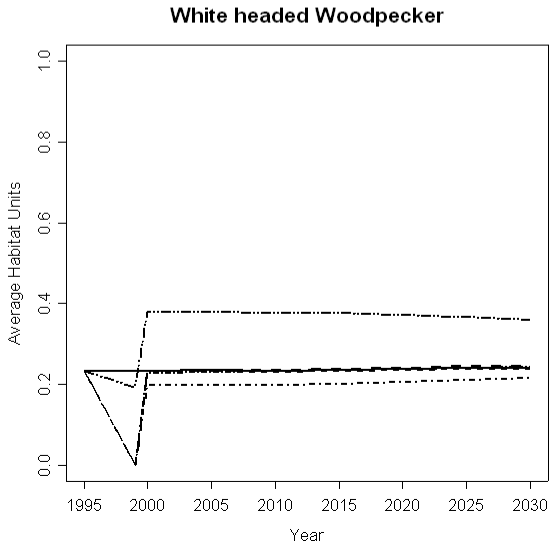
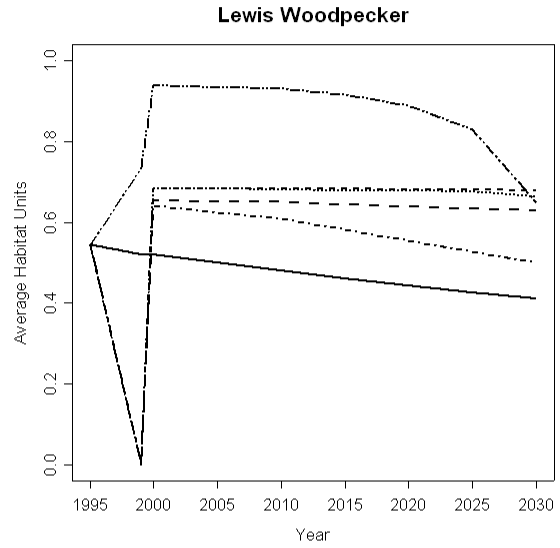
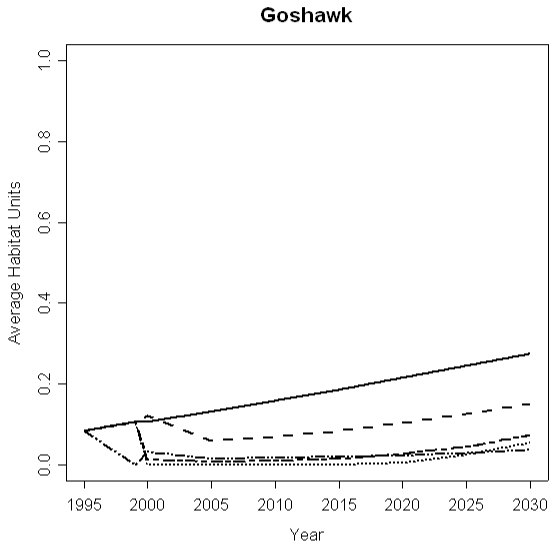
Okanogan - Moderate Risk Stands: Wildlife HSI without Regeneration

Okanogan - Moderate Risk Stands: HSI without regeneration



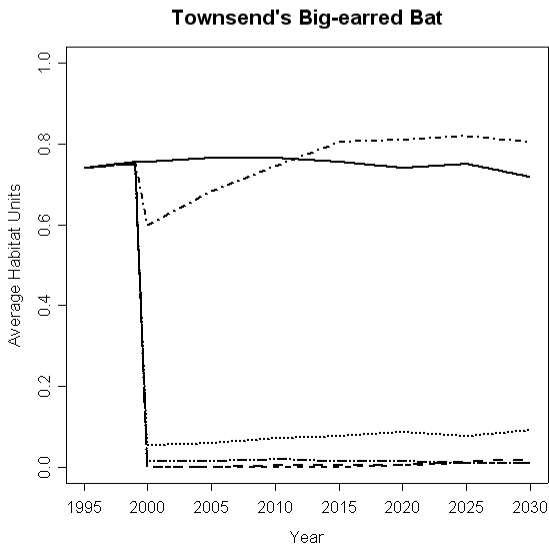
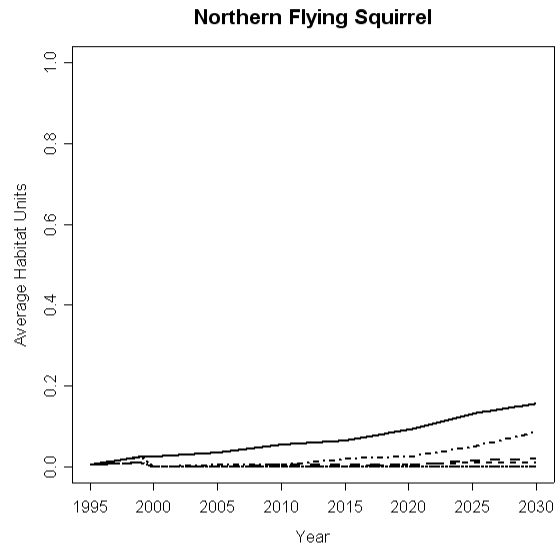
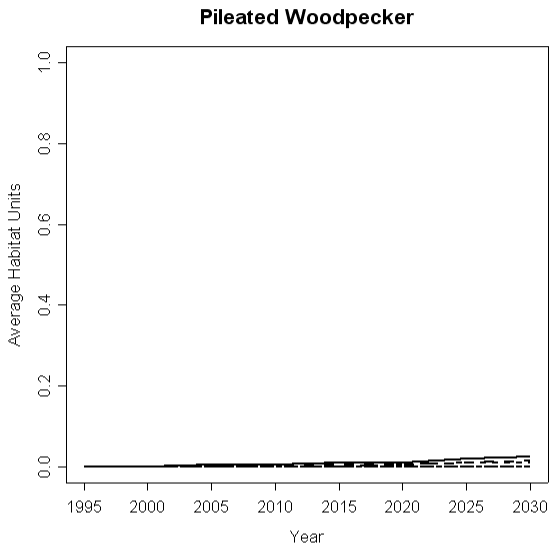
Okanogan - Moderate Risk Stands: Wildlife HSI with Regeneration

Okanogan - Moderate Risk Stands: HSI with regeneration



Okanogan - Moderate Risk Stands: Wildlife CRB1 without Regeneration

Okanogan - Moderate Risk Stands: CRB without regeneration

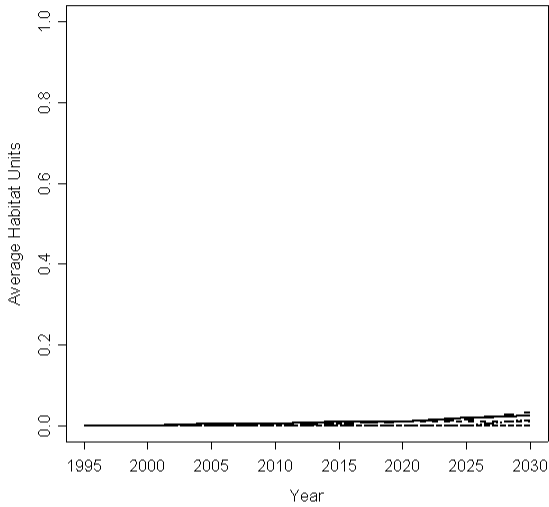


Okanogan - Moderate Risk Stands: Wildlife Source Habitat with Regeneration

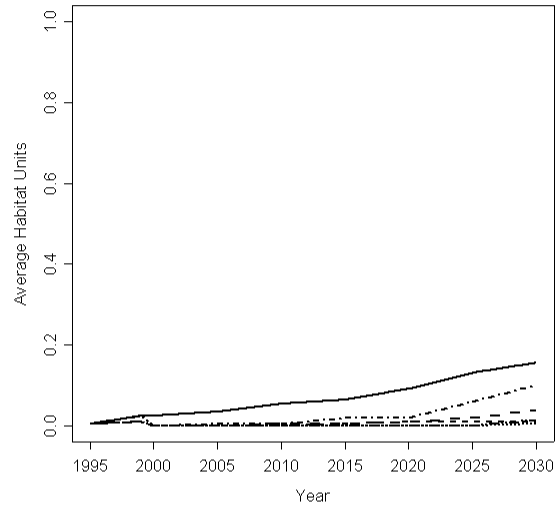
Okanogan - Moderate Risk Stands: CRB with regeneration



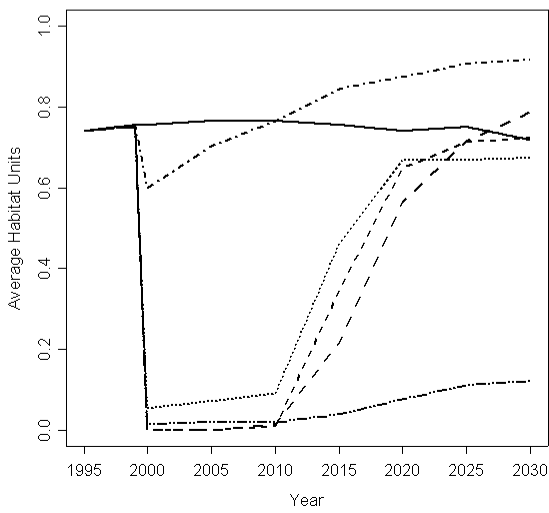
Pileated Woodpecker



Northern Flying Squirrel

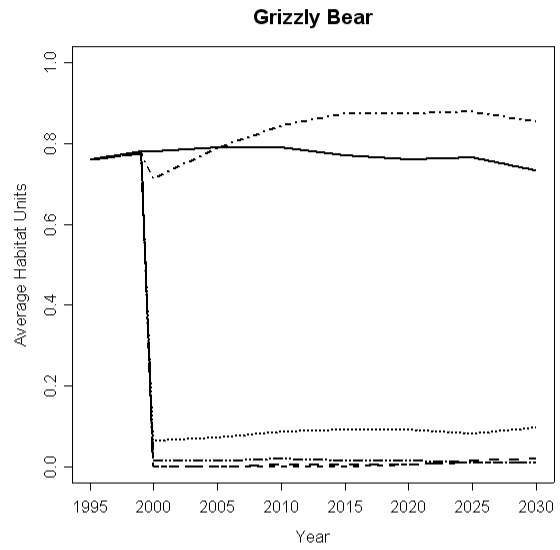
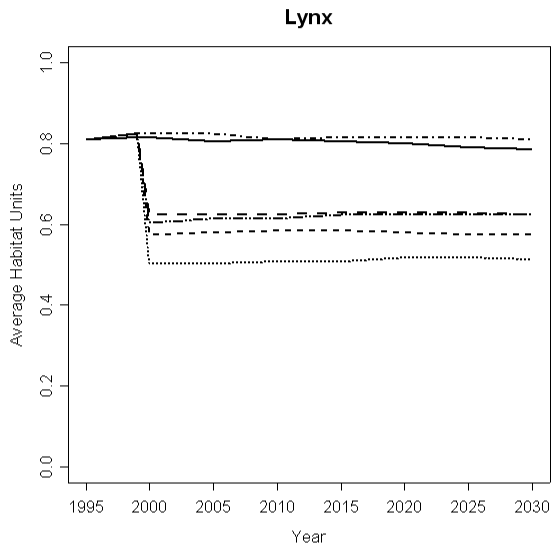


Townsend's Big-eared Bat



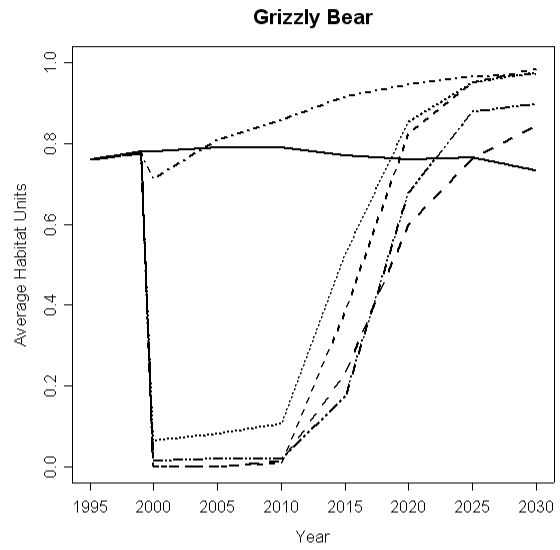
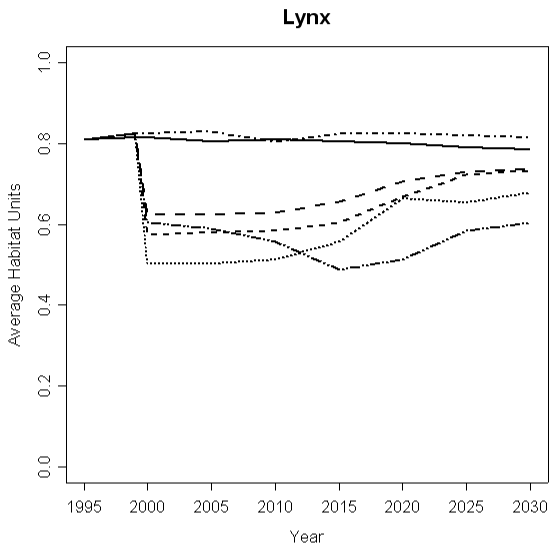
Okanogan - Moderate Risk Stands: Wildlife Source Habitat without Regeneration

Okanogan - Moderate Risk Stands: CRB without regeneration



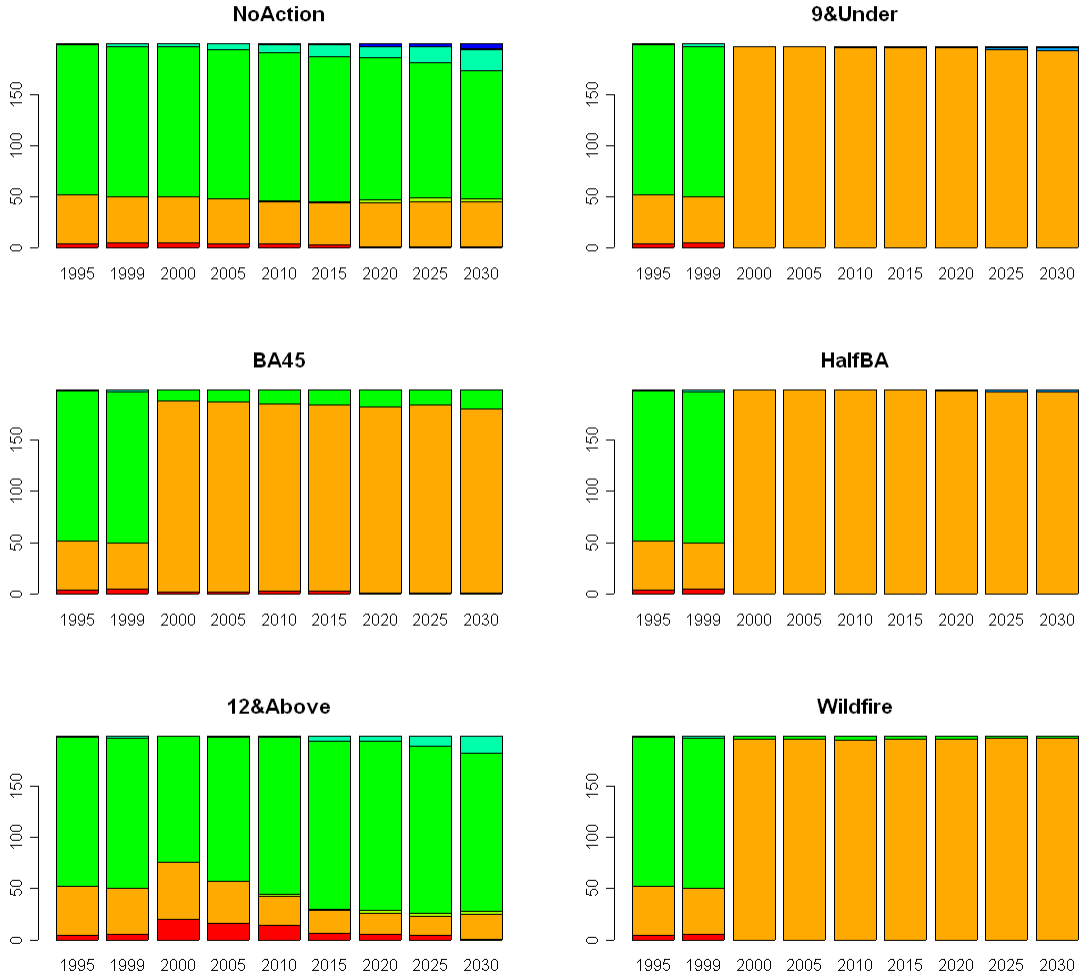
Okanogan - Moderate Risk Stands: Wildlife Source Habitat with Regeneration

Okanogan - Moderate Risk Stands: CRB with regeneration



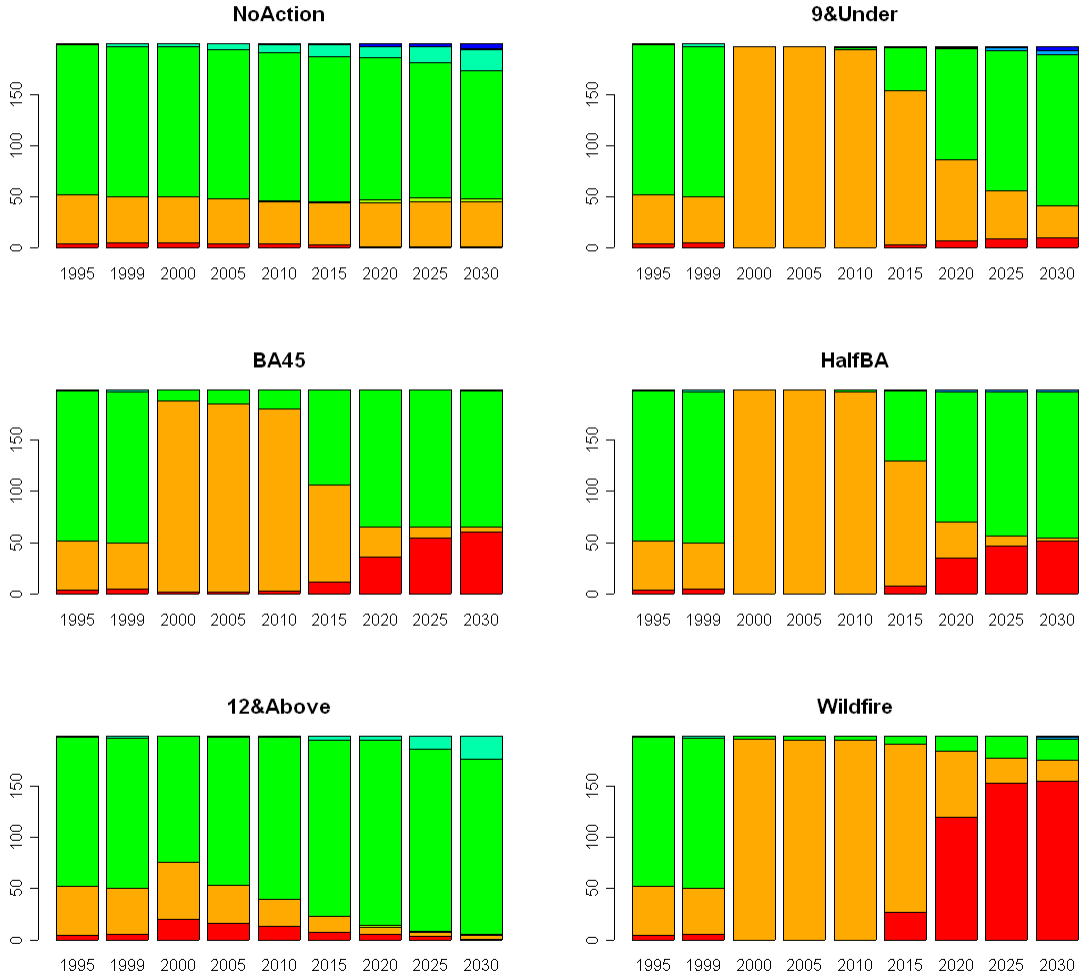
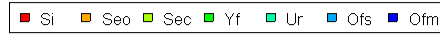
Okanogan – Moderate Risk Stands: Source Habitat (ICBEMP) Classification without Regeneration

Okanogan - Moderate Risk Stands: ICBEMP Classification without regeneration



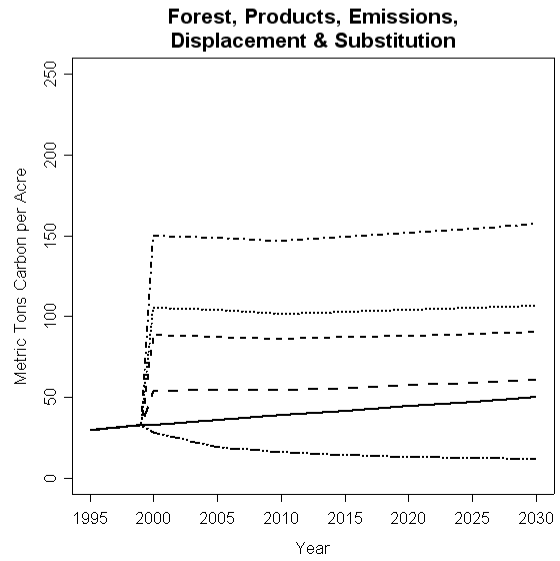
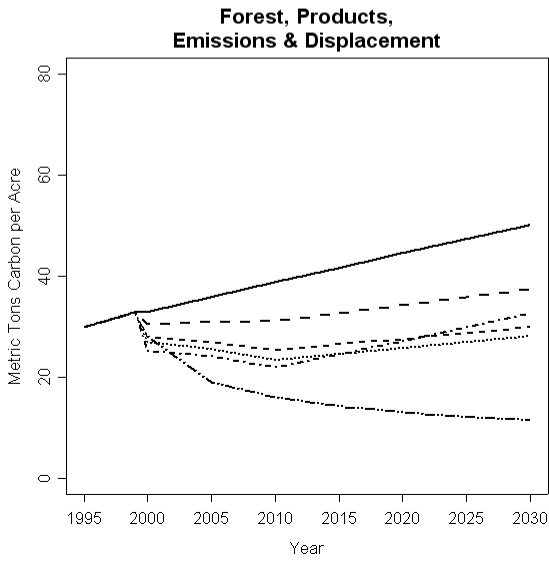
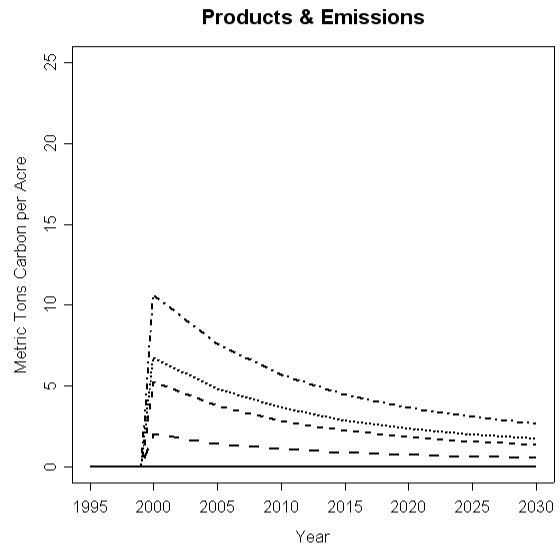
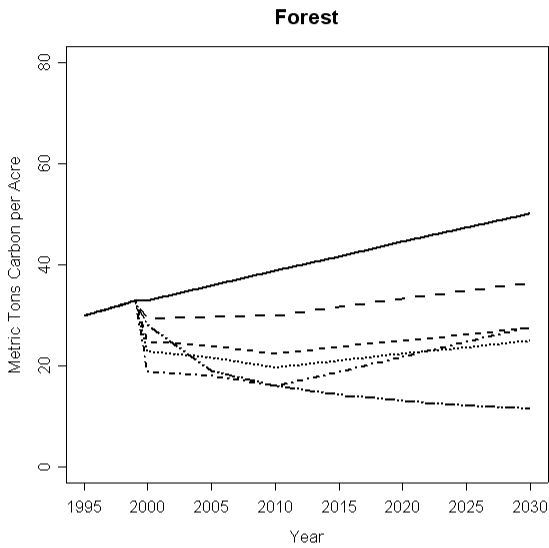
Okanogan – Moderate Risk Stands: Source Habitat (ICBEMP) Classification with Regeneration

Okanogan - Moderate Risk Stands: ICBEMP Classification with regeneration



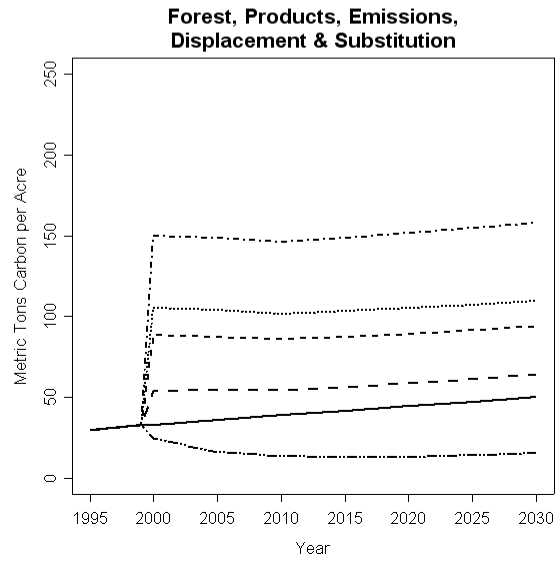
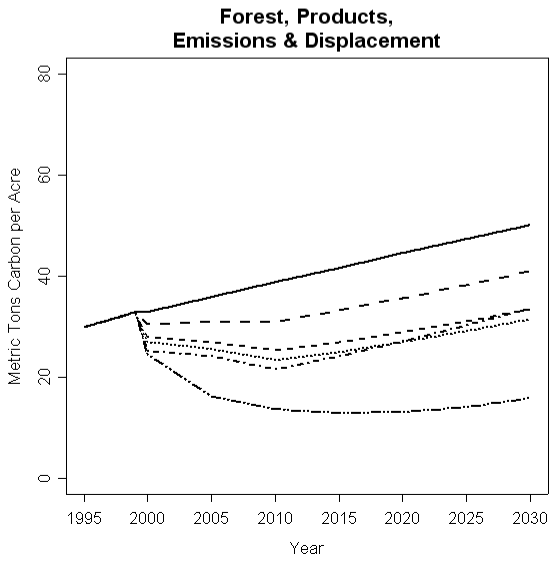
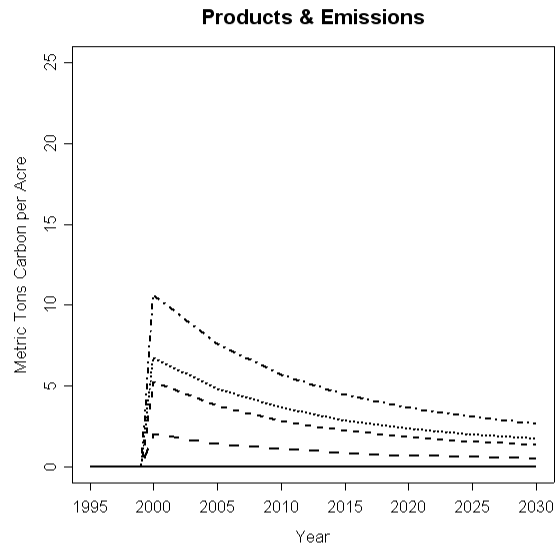
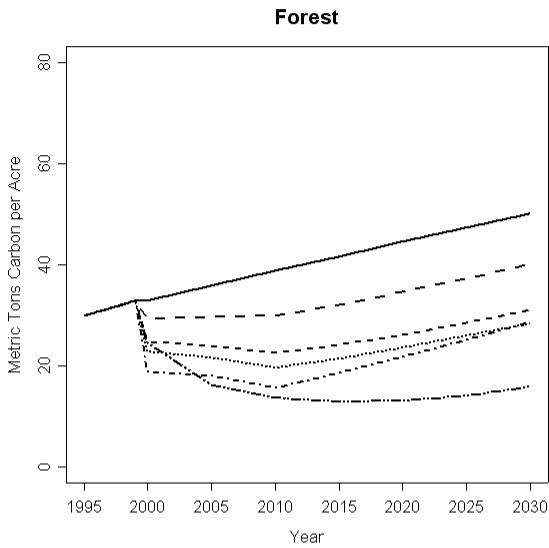
Okanogan - High & Moderate Risk Stands: Carbon without regeneration

Okanogan - High & Moderate Risk Stands: Carbon without regeneration



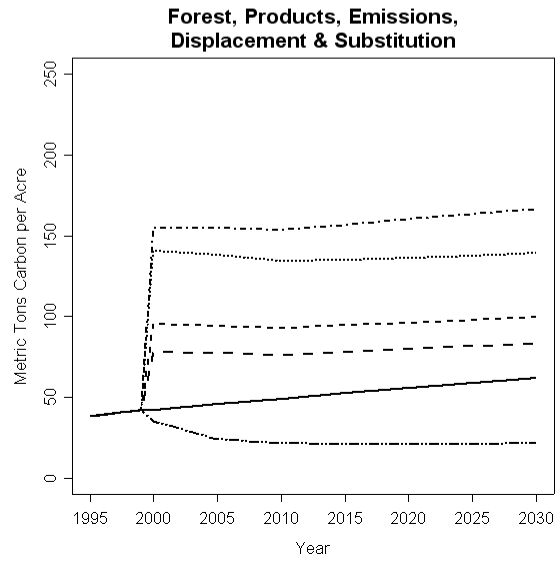
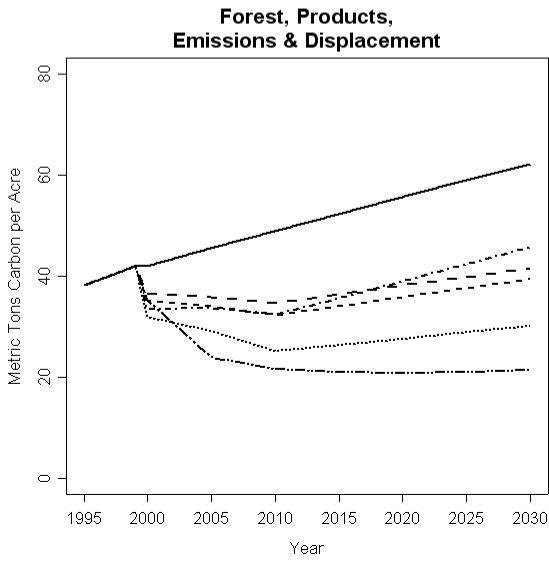
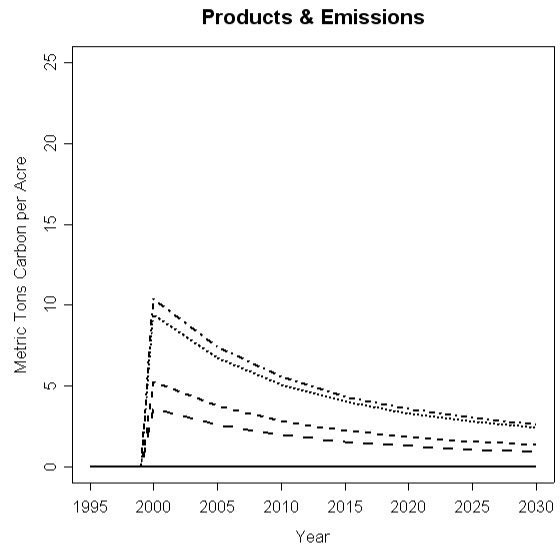
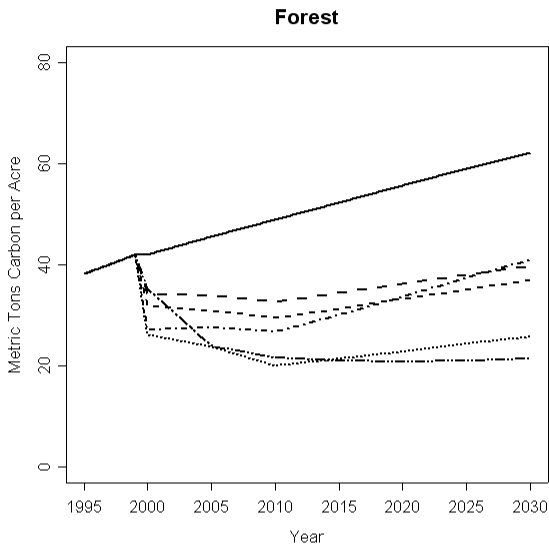
Okanogan – High & Moderate Risk Stands: Carbon with regeneration

Okanogan - High & Moderate Risk Stands: Carbon with regeneration



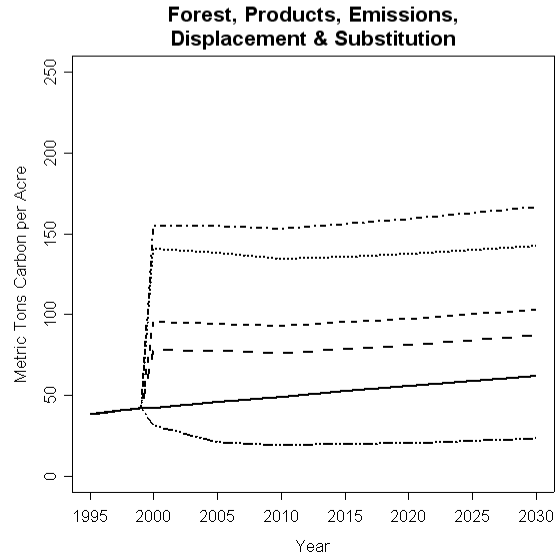
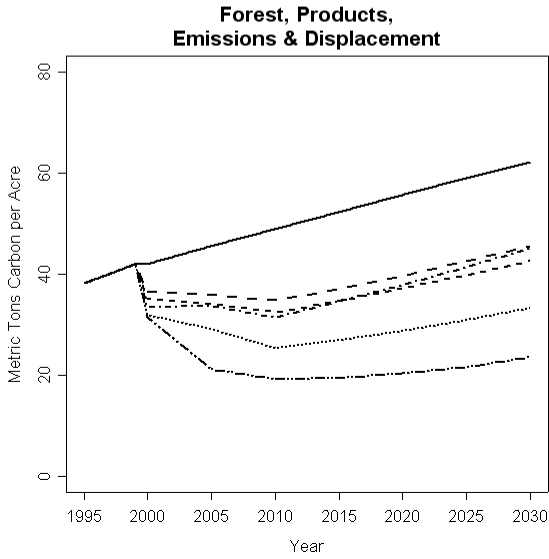
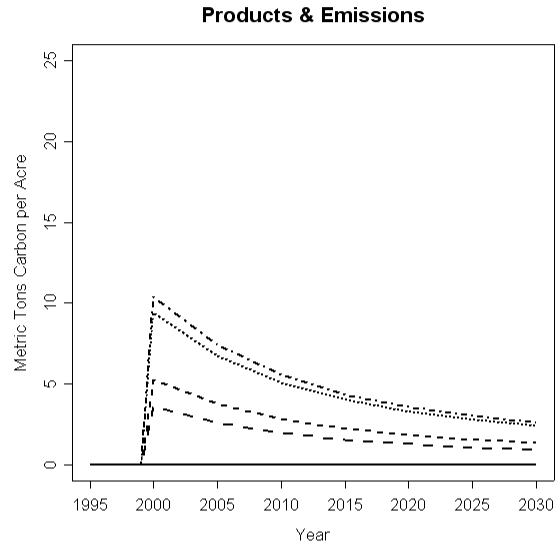
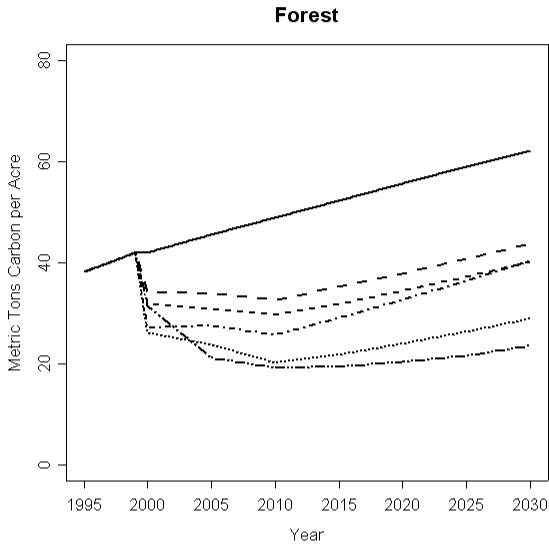
Okanogan - High Risk Stands: Carbon without regeneration

Okanogan - High Risk Stands: Carbon without regeneration



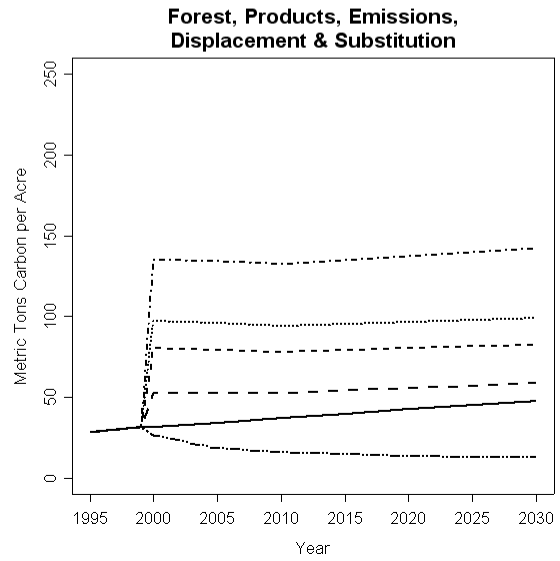
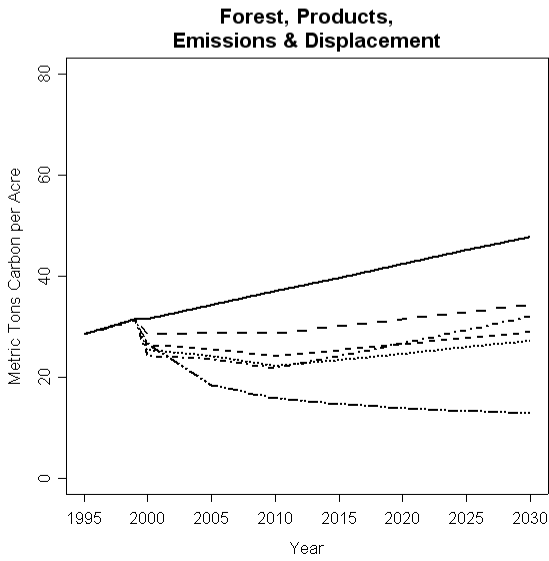
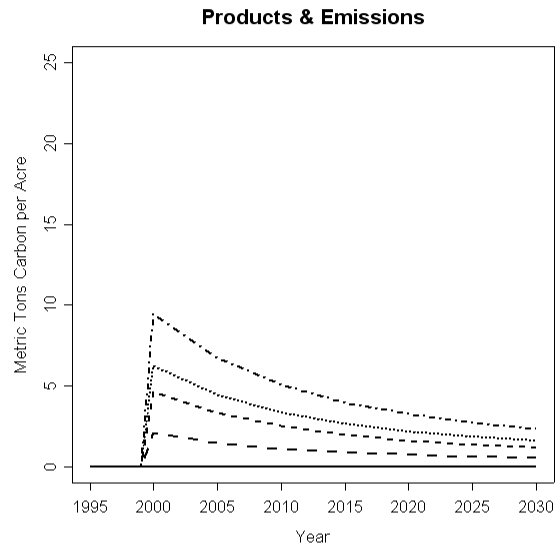
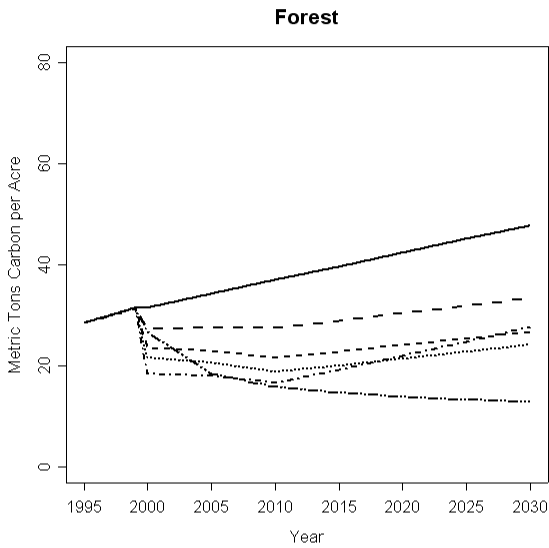
Okanogan - High Risk Stands: Carbon with regeneration

Okanogan - High Risk Stands: Carbon with regeneration



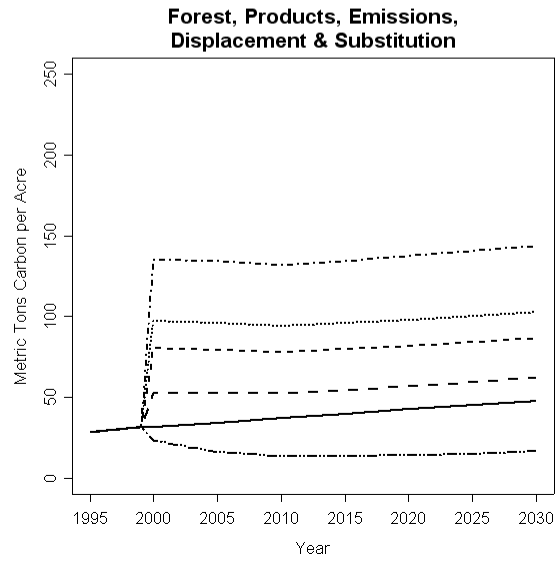
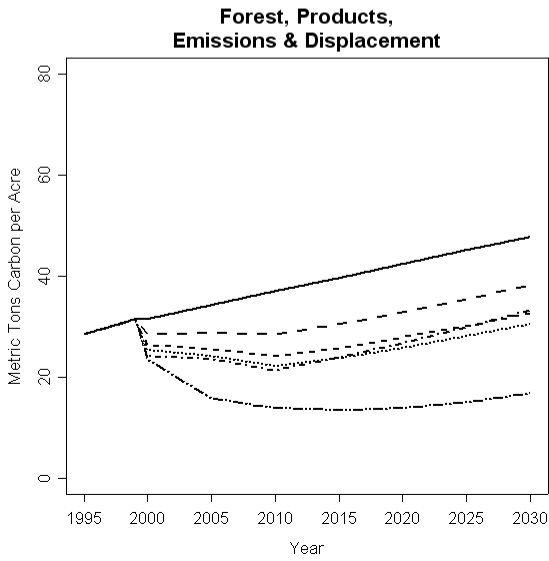
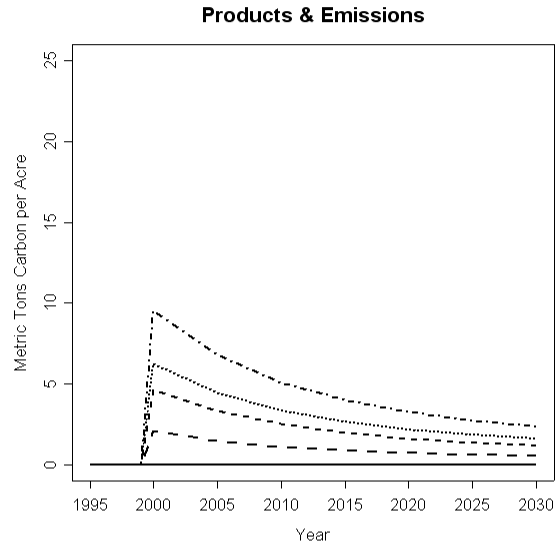
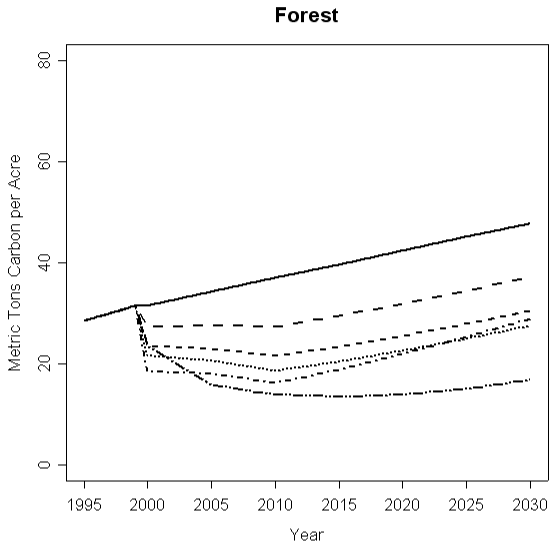
Okanogan - Moderate Risk Stands: Carbon without regeneration

Okanogan - Moderate Risk Stands: Carbon without regeneration



Okanogan - Moderate Risk Stands: Carbon with regeneration

Okanogan - Moderate Risk Stands: Carbon with regeneration



APPENDIX D. WILDLIFE MODELS

LIST OF EQUATIONS AND FIGURES

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Habitat Suitability Indices (HSI)

USDI Fish and Wildlife Service

Northern Goshawk Nesting Habitat Model – Okanogan and Fremont National Forests

VARIABLE 1 (Fremont only):

Aspect (ASP) SI =

If $0^\circ \leq \text{ASP} < 90^\circ$, or $270^\circ < \text{ASP} \leq 360$, then = 1

Else = 0.5

VARIABLE 2:

Okanogan:

Basal Area (BA) SI =

If $\text{BA} \geq 240$, then = 1

If $80 \leq \text{BA} < 240$, then = $(0.0063 * \text{BA}) - 0.5$

Else = 0.0

Fremont:

Basal Area (BA) SI =

If $\text{BA} \geq 220$, then = 1

If $60 \leq \text{BA} < 220$, then = $(0.0063 * \text{BA}) - 0.375$

Else = 0.0

VARIABLE 3:

Quadratic Mean Diameter (QMD) SI =

If $\text{QMD} \geq 16$, then = 1

If $4 \leq \text{QMD} < 16$, then = $(0.0833 * \text{QMD}) - 0.3333$

Else = 0.0

OKANOGAN MODEL:

$$\text{HSI} = (\text{V2} \times \text{V3})^{1/2}$$

FREMONT MODEL:

$$\text{HSI} = (\text{V1} \times \text{V2} \times \text{V3})^{1/3}$$

Lewis' Woodpecker HSI Model (Modified† From Original USFWS Model) – Okanogan and Fremont National Forests

VARIABLE 1:

Canopy Cover (CC) SI =

If $CC < 30$, then = 1

If $30 \leq CC < 75$, then = $-(0.0222 * CC) + 1.6667$

Else = 0.0

VARIABLE 2:

*Snag Density (SNAGS) SI =

If $SNAGS \geq 1$, then = 1

If $SNAGS < 1$, then = SNAGS

* Number of snags (SNAGS) ≥ 12 inches dbh and ≥ 30 feet tall per acre

HSI MODEL:

$HSI = \text{MIN}(V1; V2)$

† NOTE: The original USFWS model (Sousa 1982) included 'percent shrub cover' as a variable. LMS does not have the ability to project shrub cover over time so this variable was removed from the model. In general, percent shrub cover is inversely related to canopy cover therefore an assumption was made that a shrub cover variable was not mandatory in this model given that canopy cover is included.

White-Headed Woodpecker HSI Model – Okanogan and Fremont National Forests

VARIABLE 1:

Aspect (ASP) SI =

If $90^\circ \leq \text{ASP} \leq 270^\circ$, then = 1

Else = 0.5

VARIABLE 2:

Canopy Cover (CC) SI =

If $\text{CC} \leq 60$, then = 1

If $60 < \text{CC} < 70$, then = $-(0.1 * \text{CC}) + 7.0$

Else = 0.0

VARIABLE 3:

*Snag Density (SNAGS) SI =

If $\text{SNAGS} \geq 1$, then = 1

If $\text{SNAGS} < 1$, then = SNAGS

* Number of snags (SNAGS) ≥ 18 inches dbh per acre; no minimum height requirement for White-headed Woodpecker.

VARIABLE 4:

**Large PIPO Density (PIPO) SI =

If $\text{PIPO} \geq 30$, then = 1

If $\text{PIPO} < 30$, then = $(0.0267 * \text{PIPO}) + 0.2$

** Number of PIPO ≥ 14 inches dbh per acre

VARIABLE 5:

Number of ***pine species (PINUS) present SI =

If $\text{PINUS} > 1$, then = 1

If $\text{PINUS} = 1$, then = 0.7

If $\text{PINUS} = 0$, then = 0.2

*** Excluding PICO

HSI MODEL:

$$\text{HSI} = (\text{V1} \times \text{V2} \times \text{V3} \times \text{V4}^3 \times \text{V5})^{1/7}$$

Williamson's Sapsucker HSI Model (Modified† From Original USFWS Model) – Okanogan and Fremont National Forests

VARIABLE 1:

Canopy Cover (CC) SI =

If $30 \leq CC \leq 60$, then = 1

If $15 < CC < 30$, then = $(0.0667 * CC) - 1.0$

If $60 < CC < 80$, then = $-(0.05 * CC) + 4.0$

Else = 0.0

VARIABLE 2:

*Snag Density (SNAGS) SI =

If SNAGS ≥ 1.5 , then = 1

If SNAGS < 1.5 , then = $0.6667 * SNAGS$

* Number of "suitable soft snags" (SNAGS) ≥ 12 inches dbh (18 inches for PIPO) and ≥ 15 feet tall per acre

HSI MODEL:

$$HSI = (V1 \times V2)^{1/2}$$

† NOTE: The original USFWS model (Sousa 1983) included two aspen variables (percent of area composed of aspen, average DBH of overstory aspen trees). However, use of aspen for nesting is almost exclusively seen in the Rocky Mountains - with conifers being more common in the Pacific Northwest (Crockett 1975, Sousa 1983). Therefore, the aspen variables were removed from the model.

Species Source Habitat Matrices

USDA Forest Service

Interior Columbia Basin Ecosystem Management Project (ICBEMP)

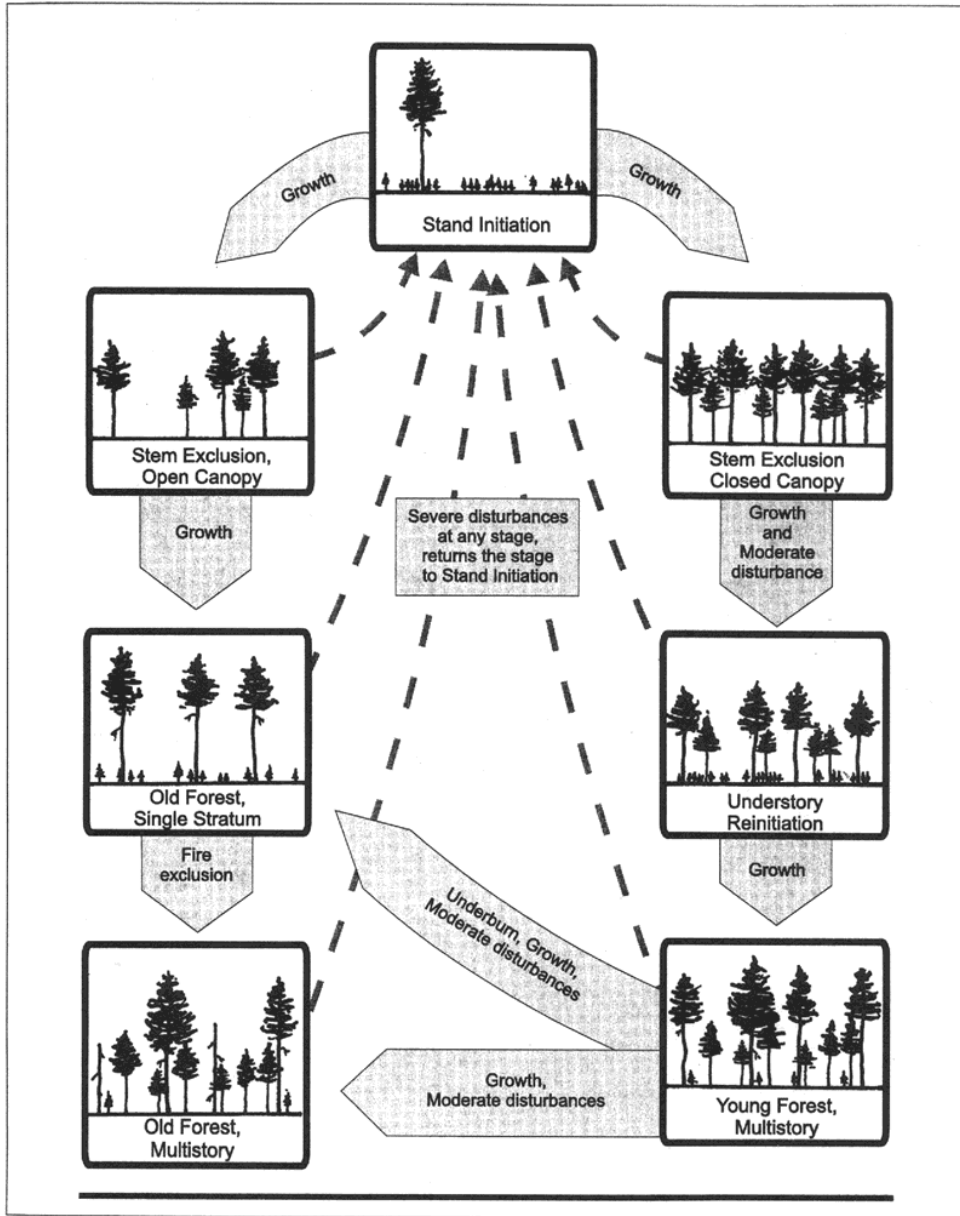


Figure 3—Illustration of forest structural stages defined in table 3 and in Hann and others (1997) that were used as part of methods to determine species relations with source habitats for 91 broad-scale species of focus.

Structural stages defined for assessing the structural features of macrovegetation across the interior Columbia basin, as adapted from Hann et al. (1997).

Structural stage	Structural stage code	Description ^a
Stand initiation	Si	$LgT_{cc} < 30\%$ and $SS_{cc} \geq 10\%$ and $[(PT_{cc} + SmT_{cc} + MedT_{cc} < 20\%)$ or $(PT_{cc} + SmT_{cc} + MedT_{cc} \leq 60\%$ and $PT_{cc} + SmT_{cc} + MedT_{cc} \geq 20\%$ and $SmT_{cc} + MedT_{cc} < 10\%)]$
Stem-exclusion open canopy	Seo	$LgT_{cc} < 30\%$ and $SS_{cc} < 10\%$ and $PT_{cc} + SmT_{cc} + MedT_{cc} \leq 70\%$
Stem-exclusion closed canopy	Sec	$LgT_{cc} < 30\%$ and $SS_{cc} < 10\%$ and $PT_{cc} + SmT_{cc} + MedT_{cc} > 70\%$
Understory reinitiation	Ur	$LgT_{cc} < 30\%$ and $SS_{cc} \geq 10\%$ and $PT_{cc} + SmT_{cc} + MedT_{cc} > 60\%$
Managed young multi-story	MYf	$LgT_{cc} < 30\%$ and $SS_{cc} \geq 10\%$ and $PT_{cc} + SmT_{cc} + MedT_{cc} \leq 60\%$ and $SmT_{cc} \geq 10\%$ or $MedT_{cc} \geq 10\%$. Has undergone some form of silvicultural treatment, salvage, or roading; contain relatively few large snags and trees (>53.2 cm d.b.h.)
Unmanaged young multi-story	UYf	$LgT_{cc} < 30\%$ and $SS_{cc} \geq 10\%$ and $PT_{cc} + SmT_{cc} + MedT_{cc} \leq 60\%$ and $SmT_{cc} \geq 10\%$ or $MedT_{cc} \geq 10\%$. Has not undergone active forms of management; contain relatively higher densities of large snags and trees (>53.2 cm d.b.h.)
Old multi-story	Ofm	$LgT_{cc} \geq 30\%$ and $SS_{cc} + PT_{cc} + SmT_{cc} + MedT_{cc} > 20\%$
Old single story	Ofs	$LgT_{cc} \geq 30\%$ and $SS_{cc} + PT_{cc} + SmT_{cc} + MedT_{cc} \leq 20\%$

For assessments in this investigation, it is assumed that all young forest – multi-story stands fall into the managed young forest – multi-story classification due to past, or proposed future, management activities.

Species	Pacific silver fir-mountain hemlock								Grand fir-white fir								Red fir							
	OFM	OFS	UR	UYF	MYF	SEC	SEO	SI	OFM	OFS	UR	UYF	MYF	SEC	SEO	SI	OFM	OFS	UR	UYF	MYF	SEC	SEO	SI
Grizzly Bear	1	1*	1	1	1			1	1	1	1	1	1			1	1	1*	1	1	1			1
Canada Lynx									1		1	1	1			1								
Northern Flying Squirrel	1	1*	1	1					1	1	1	1					1	1*	1	1				
Pileated Woodpecker	1	1*							1	1														
Townsend's Big-eared Bat	1	1*	1	1	1				1	1	1	1	1				1	1*	1	1	1			

Species	Interior ponderosa pine								Interior Douglas-fir								Western larch							
	OFM	OFS	UR	UYF	MYF	SEC	SEO	SI	OFM	OFS	UR	UYF	MYF	SEC	SEO	SI	OFM	OFS	UR	UYF	MYF	SEC	SEO	SI
Grizzly Bear	1	1	1	1	1			1	1	1	1	1	1			1	1	1	1	1	1	1		1
Canada Lynx									1		1	1	1	1	1*	1	1		1	1	1	1		1
Northern Flying Squirrel	1	1		1					1	1	1	1					1	1	1	1				
Pileated Woodpecker									1	1							1	1						
Townsend's Big-eared Bat	1	1	1	1	1				1	1	1	1	1				1	1	1	1	1			

Species	Lodgepole pine								Engelmann spruce-subalpine fir								Western white pine							
	OFM	OFS	UR	UYF	MYF	SEC	SEO	SI	OFM	OFS	UR	UYF	MYF	SEC	SEO	SI	OFM	OFS	UR	UYF	MYF	SEC	SEO	SI
Grizzly Bear	1	1	1	1	1			1	1	1*	1	1	1			1	1	1	1	1	1	1		1
Canada Lynx	1		1	1	1			1	1		1	1	1	1	1*	1	1		1	1	1	1	1*	1
Northern Flying Squirrel	1	1	1	1					1	1*	1	1					1	1	1	1				
Pileated Woodpecker									1	1*							1	1						
Townsend's Big-eared Bat	1	1	1	1	1												1	1	1	1	1			

Species	Sierra Nevada mixed conifer								Western redcedar-western hemlock								Mountain hemlock							
	OFM	OFS	UR	UYF	MYF	SEC	SEO	SI	OFM	OFS	UR	UYF	MYF	SEC	SEO	SI	OFM	OFS	UR	UYF	MYF	SEC	SEO	SI
Grizzly Bear									1	1	1	1	1			1	1	1	1	1	1	1		1
Canada Lynx									1		1	1	1											
Northern Flying Squirrel	1	1	1	1					1	1	1	1					1	1	1	1				
Pileated Woodpecker	1	1							1	1														
Townsend's Big-eared Bat	1	1	1	1	1				1	1	1	1	1				1	1	1	1	1			

Structural stage codes[†]:

- OFM - Old forest multi-story
- OFS - Old forest single story
- UR - Understory reinitiation
- UYF - Unmanaged young forest multi-story
- MYF - Managed young forest multi-story
- SEC - Stem exclusion closed canopy
- SEO - Stem exclusion open canopy
- SI - Stand initiation

* Data for this habitat was omitted from Wisdom et al. (2000b). Designation of source habitat here is an assumption based on habitat use patterns for the species.

† Structural stages from Wisdom et al. (2000a).

APPENDIX E. EQUIPMENT INVESTMENT AND OPERATIONS COSTS

Source	Machine Type	Make and model	\$/hr	\$ Investment
Jertsen,02		John Deere 490, Fab tek processing head, tilt trailer		\$87,000
	Stroke Delimber			\$300,000
Coulter,02	Ground	ATV Forwarding Arch		\$1,500
	Cut to length harvester	Timberjack Harvester and 1210 Forwarder		\$900,000
	Mastication head	Fecon Bullhog mounted on ASV		40-60,000
	Mastication head	HD420B Mastication Head mounted on excavator		\$168,900
Keatly,02	Feller Buncher	Timbco T-445C w/Quadco 22" head	\$110	
	Chain Saw	Stihl .044	\$27	
	Cut to length harvester	Valmet 500T w/Valmet 965 dangle head	\$131	
	Excavator	Kobelco Mark IV SK200LC w/Keto 500 dangle head	\$104	
	Forwarder	Valmet 892	\$113	
	Grapple Skidder	CAT 518C w/swing grapple	\$69	
Shepard,02	timco and track		\$120	
Zapel, 02	Single grip harvesters head		\$312	\$700,000
	Rubber tired single grip harvesters head		\$188	\$300,000
	Cut to length harvester	Valmet 500-T track model	\$250	\$400,000
	Forwarder used for thinning		\$150	\$200,000
	Excavator for road building or loading		\$100	\$150,000