

Altamont Pass 2005 -2007 Bird Fatality Study

Altamont Pass Avian Monitoring Team:

- University of California at Santa Cruz
Predatory Bird Research Group
- BioResource Consultants Inc,
- Jones & Stokes, Inc.

Overview

I. Introduction

II. Fatality Summary

- Survey Results
- Adjusted Mortality
- Comparison to Baseline Values

III. Bird Use and Fatality Seasonality

IV. The Winter Shutdown Experiment

V. The American Kestrel/Burrowing Owl Scavenger Removal Experiment

Survey Area

1,596 Birds

6 Bats

633 Raptors

963 Nonraptors

Raptors		Nonraptors	
Common name	Total Fatalities	Common name	Total Fatalities
Red-tailed hawk	229	Rock pigeon	300
Burrowing owl	150	Western meadowlark	194
Barn owl	95	European Starling	183
American Kestrel	56	Mourning dove	31
Golden eagle	49	Unidentified small bird	27
Great-horned owl	20	Common raven	23
Turkey vulture	8	Unidentified gull	21
Unidentified buteo	8	Loggerhead shrike	17
Unidentified raptor	5	Horned Lark	16
Ferruginous hawk	3	Red-winged blackbird	15
Northern harrier	3	Unidentified blackbird	15
Prairie falcon	3	Brewer's blackbird	13
Red-shouldered hawk	1	Unidentified medium bird	13
Swainson's hawk	1	Mallard	12
Unidentified owl	1	Unidentified large bird	12
White-tailed kite	1	Unidentified passerine	10

Appendix A: Field Methods

- **Altamont Bird Fatality Field Survey Methods**
- **Determination of Cause of Death**
- **Glossary of Terms**

Fatality Record Filter

- **Records only within 125 meters of turbine included**
- **Turbine related deaths only + unknowns**
- **“Only bones” records > 90 days since estimated time of death excluded**
- **All WRRS and incidental records within 125 meters included**
- **Records with no avian group classification excluded**

Adjusted Mortality (Ma)

$$Ma = Mu / (R \times p)$$

M_μ is the unadjusted mortality expressed as either the number of fatalities counted per wind turbine per year or the number of fatalities counted per megawatt (MW) of rated capacity per year,

R is the proportion of carcasses remaining of the fatalities that occurred since the last fatality search and is estimated by scavenger removal trials, and

p is the proportion of carcasses found by fatality searches of carcasses remaining during searcher detection trials.

Mortality Adjustment Coefficients

Scavenger Removal Adjustment Values (R)

Search Interval	Small Nonraptors	Large Nonraptors	Small Raptors	Large Raptors	Rock Doves
37 days	0.29	0.53	0.26	0.92	0.79
44 days	0.25	0.50	0.22	0.91	0.76

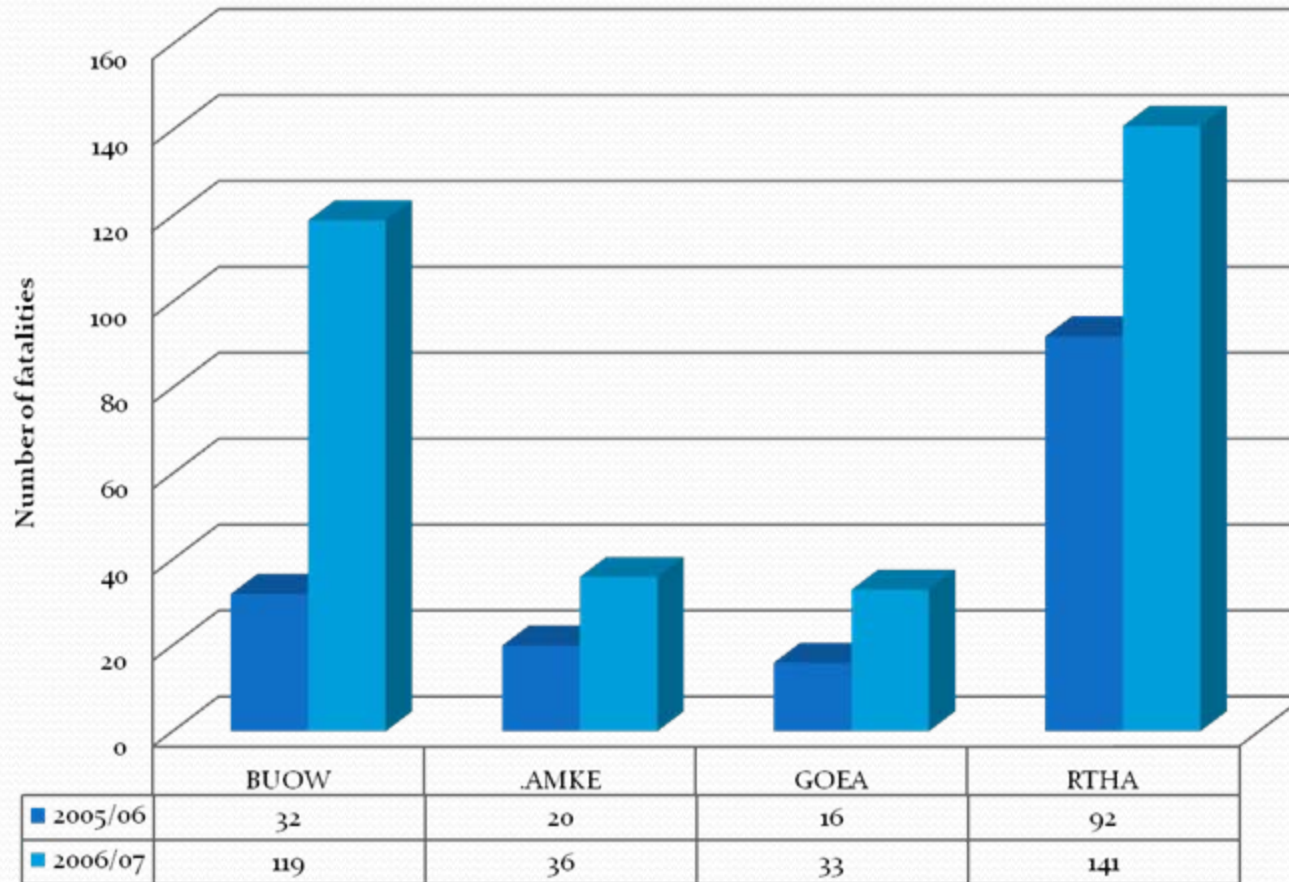
Searcher efficiency Adjustment Values (p)

Large Raptors	Medium Raptors	Small Raptors	Large Nonraptors	Medium Nonraptors	Small Nonraptors
1.00	0.79	0.74	0.80	0.78	0.51

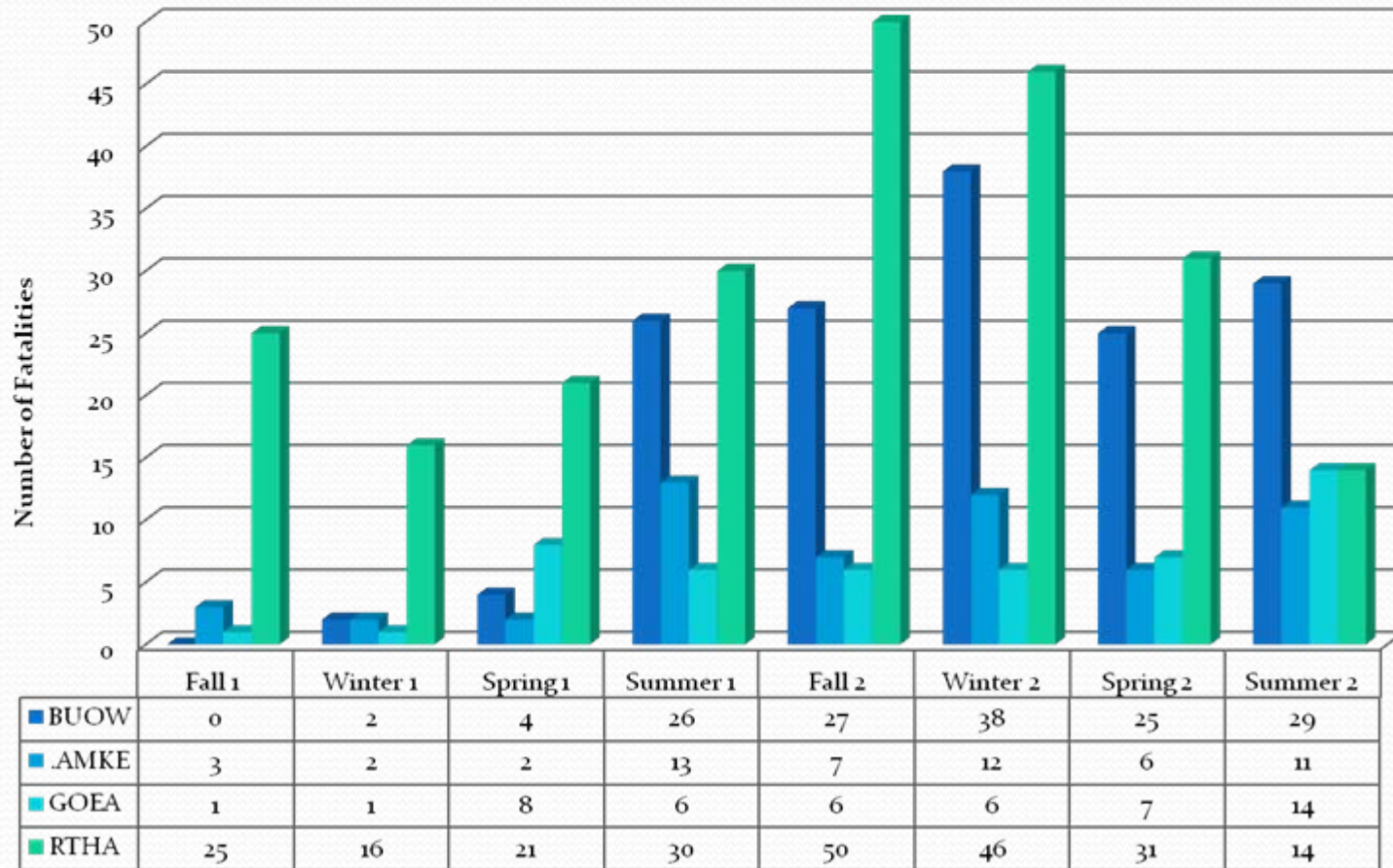
Comparison Of 2005-2007 Bird Fatalities To Baseline Fatality Values

Species	Baseline	2005-2007 Unadjusted	2005-2007 Adjusted	LCI (95%)	UCI (95%)	% of Baseline
RTHA	300	229	327	257	398	109%
GOEA	117	49	57	32	81	49%
AMKE	333	56	442	171	713	133%
BUOW	380	150	1258	902	1613	331%
Combined	1130	484	2084	1362	2805	184%

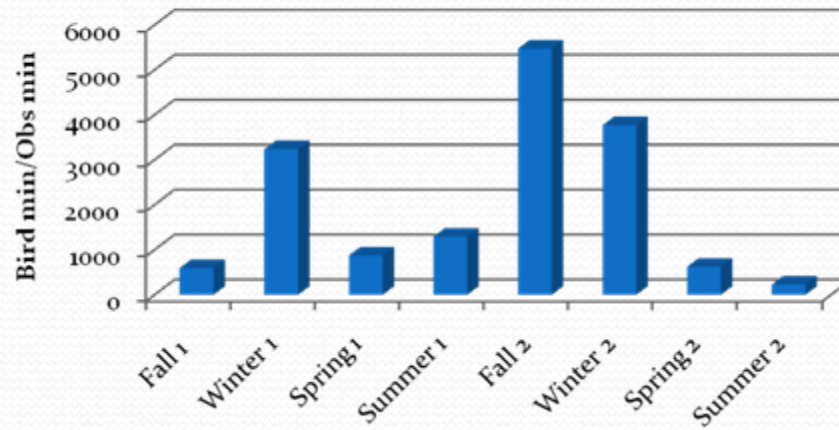
Between Year Comparison of Target Raptor Fatalities



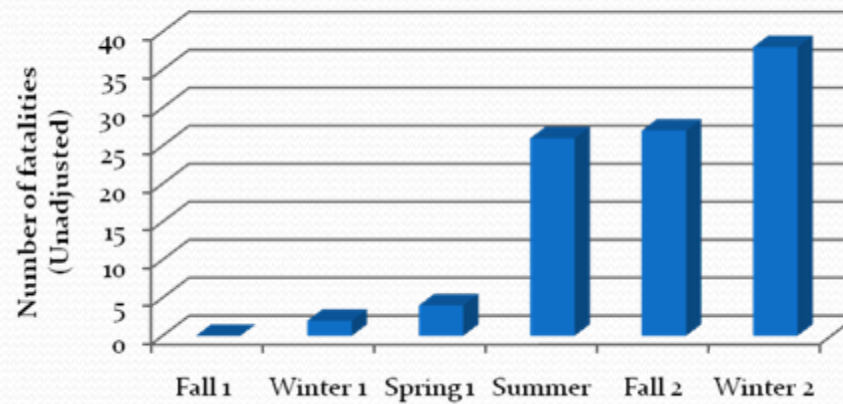
2005-2007 Fatality Records by Season



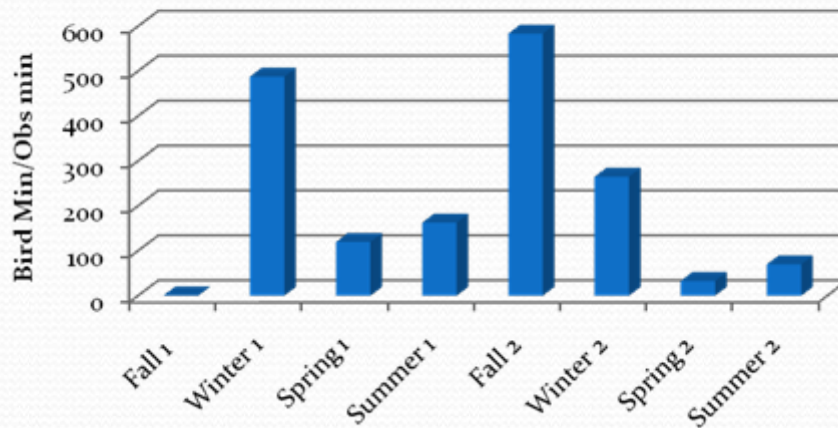
Red-tailed Hawk Bird Use



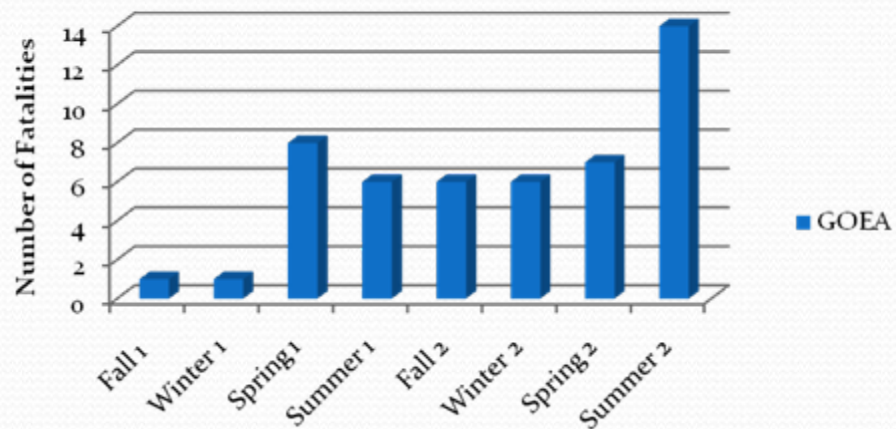
Red-tailed Hawk Fatalities



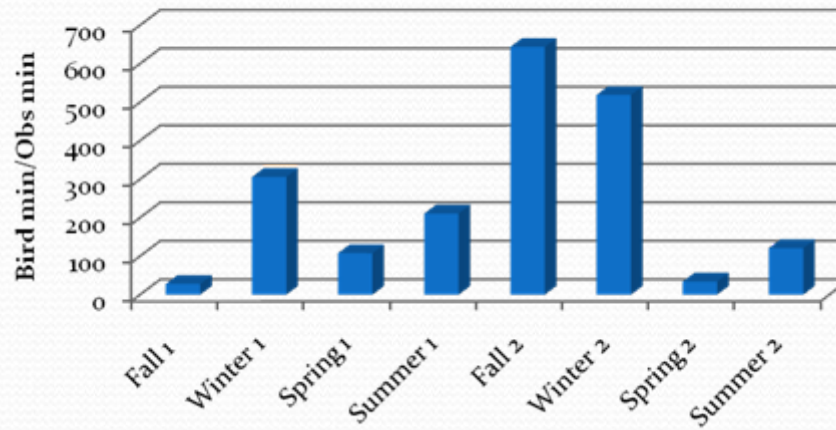
Golden Eagle Bird Use



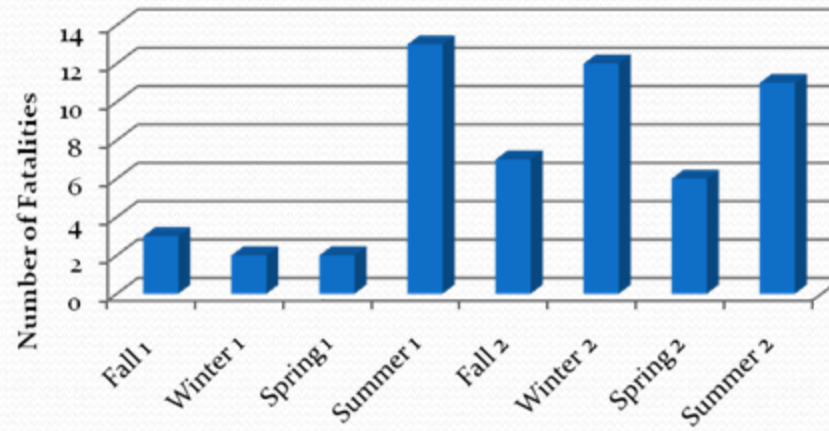
Golden Eagle Fatalities



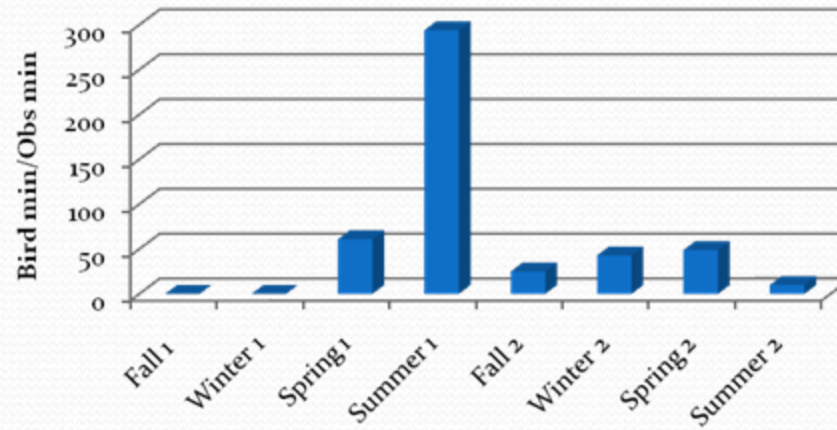
American Kestrel Bird Use



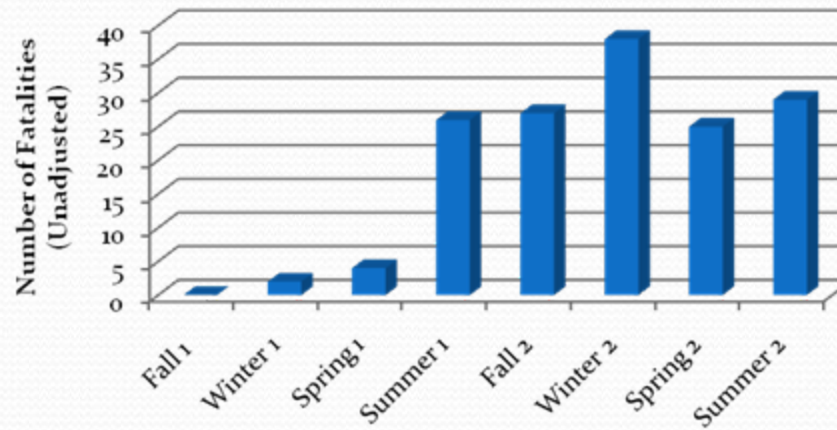
American Kestrel Fatalities



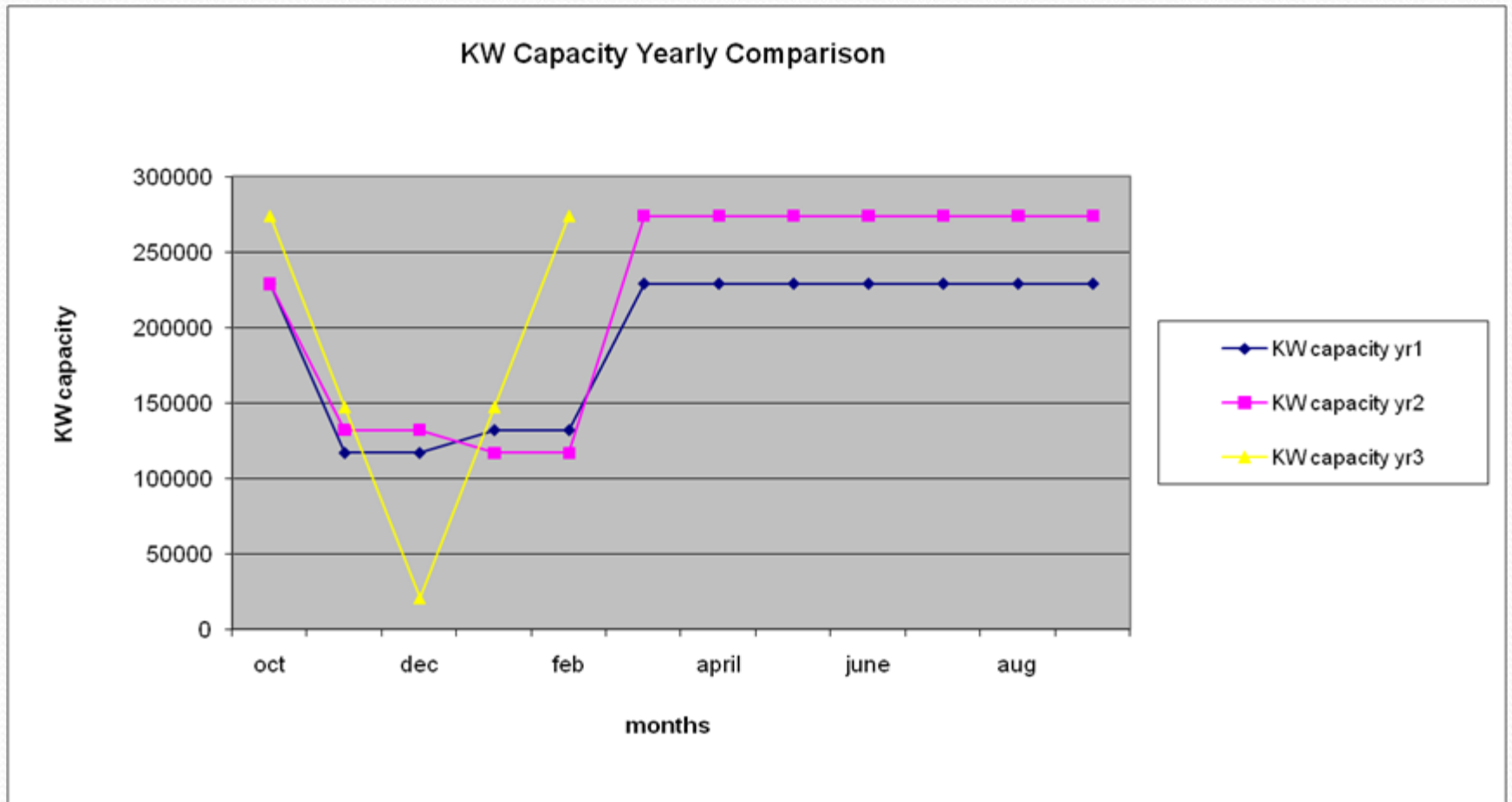
Burrowing Owl Bird Use



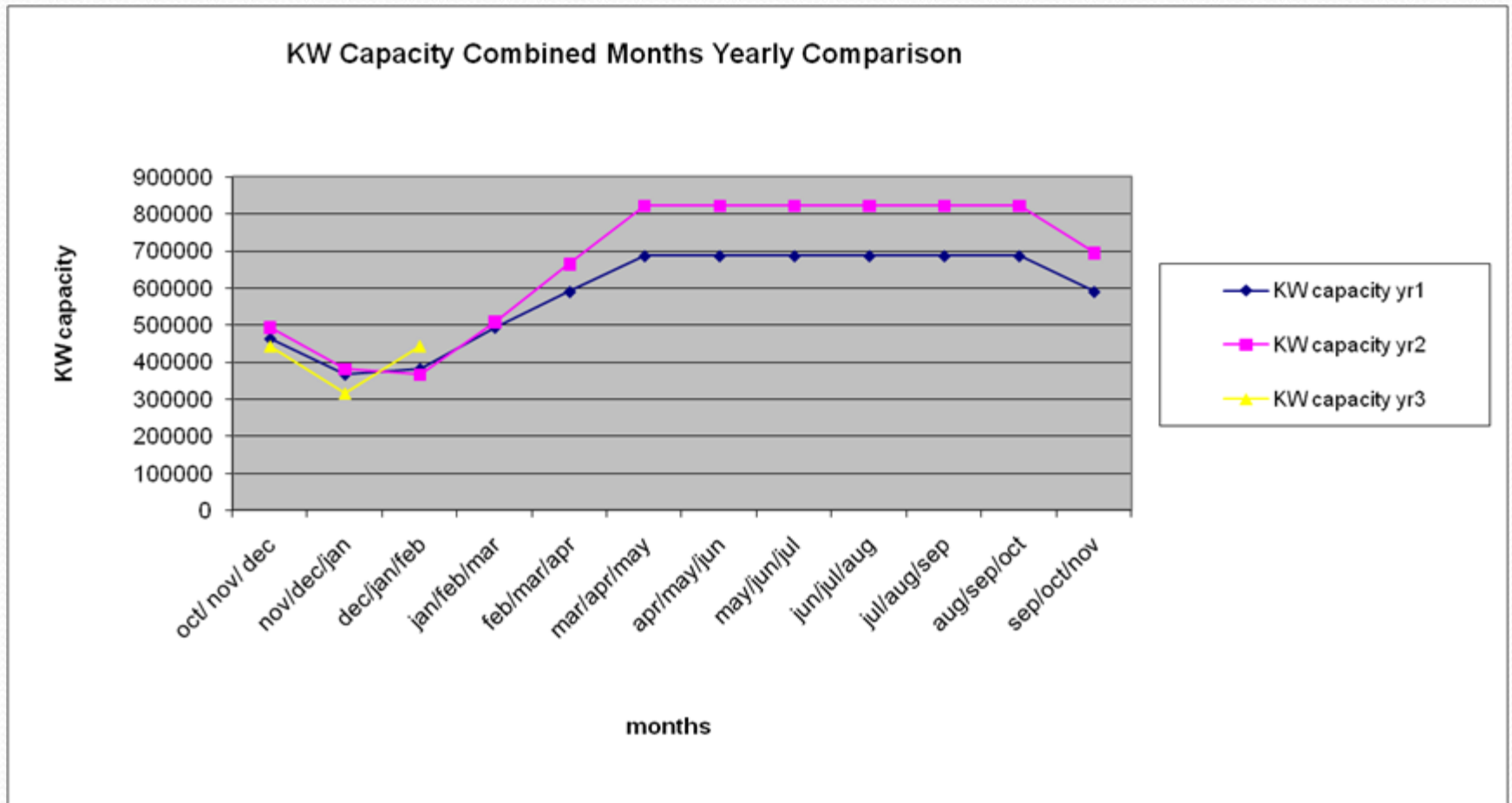
Burrowing Owl Fatalities



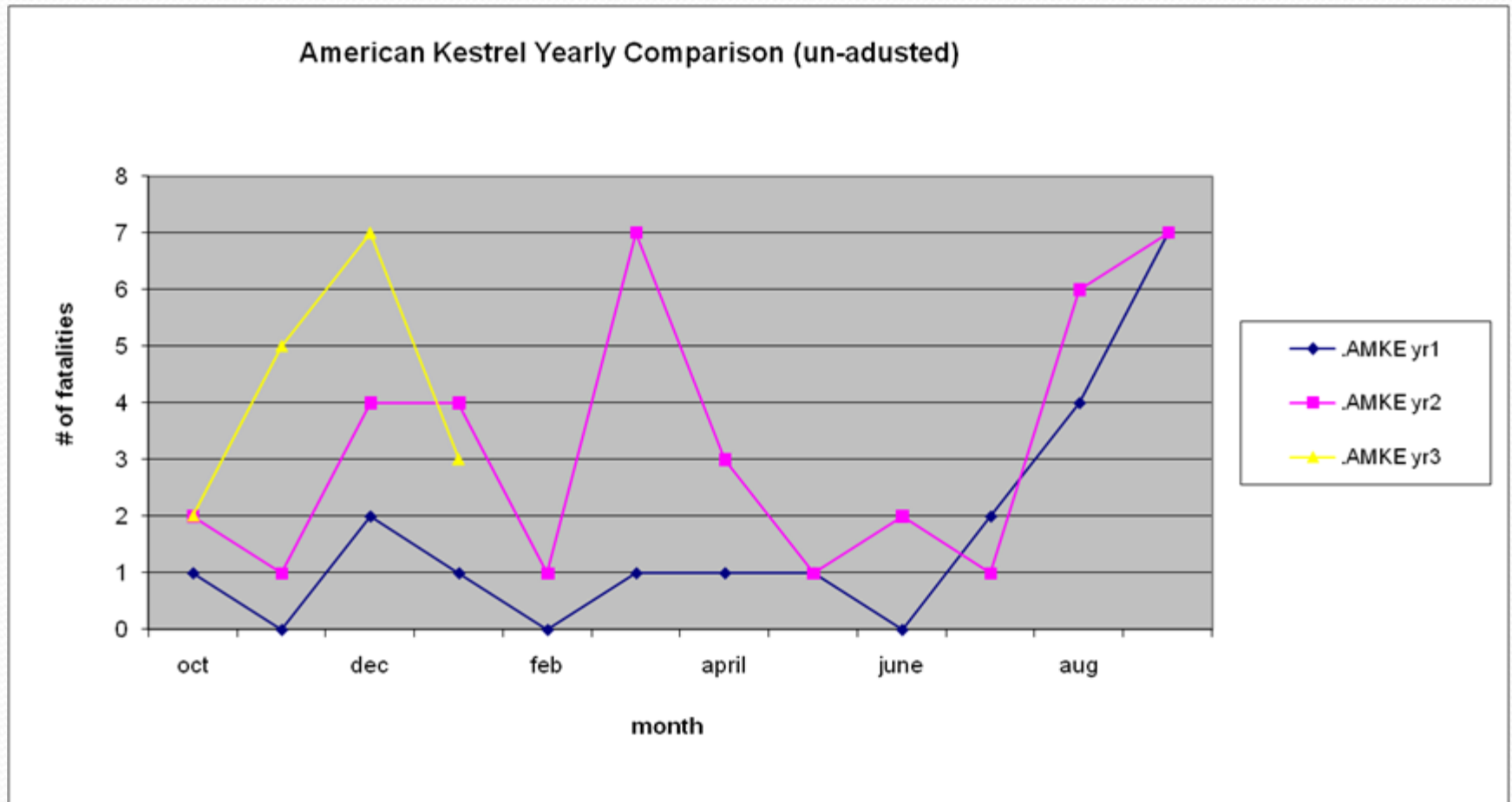
APWRA Turbine Annual Rated Capacity (KW)



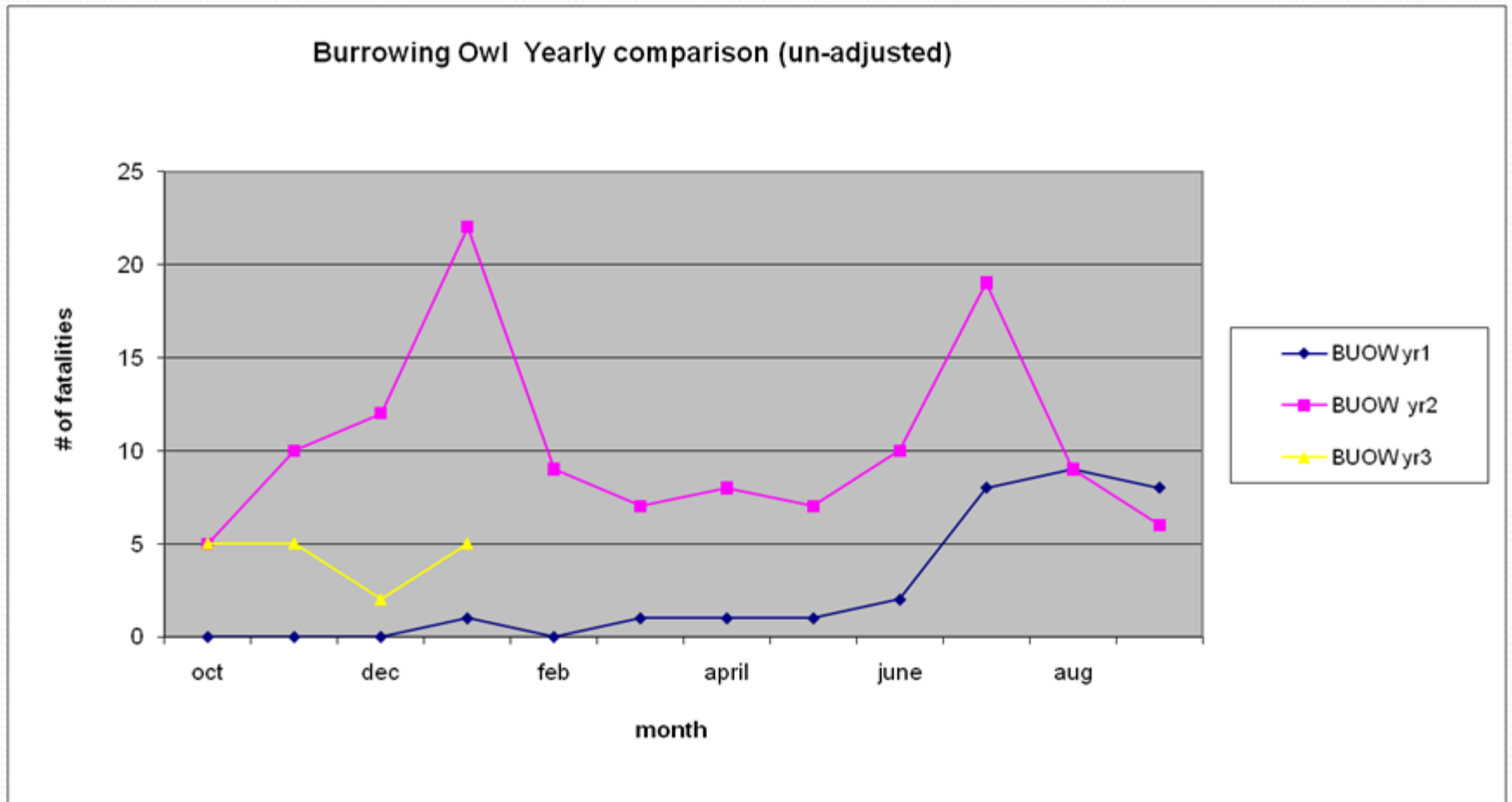
APWRA Rated Capacity: Combined Months Annual Comparison



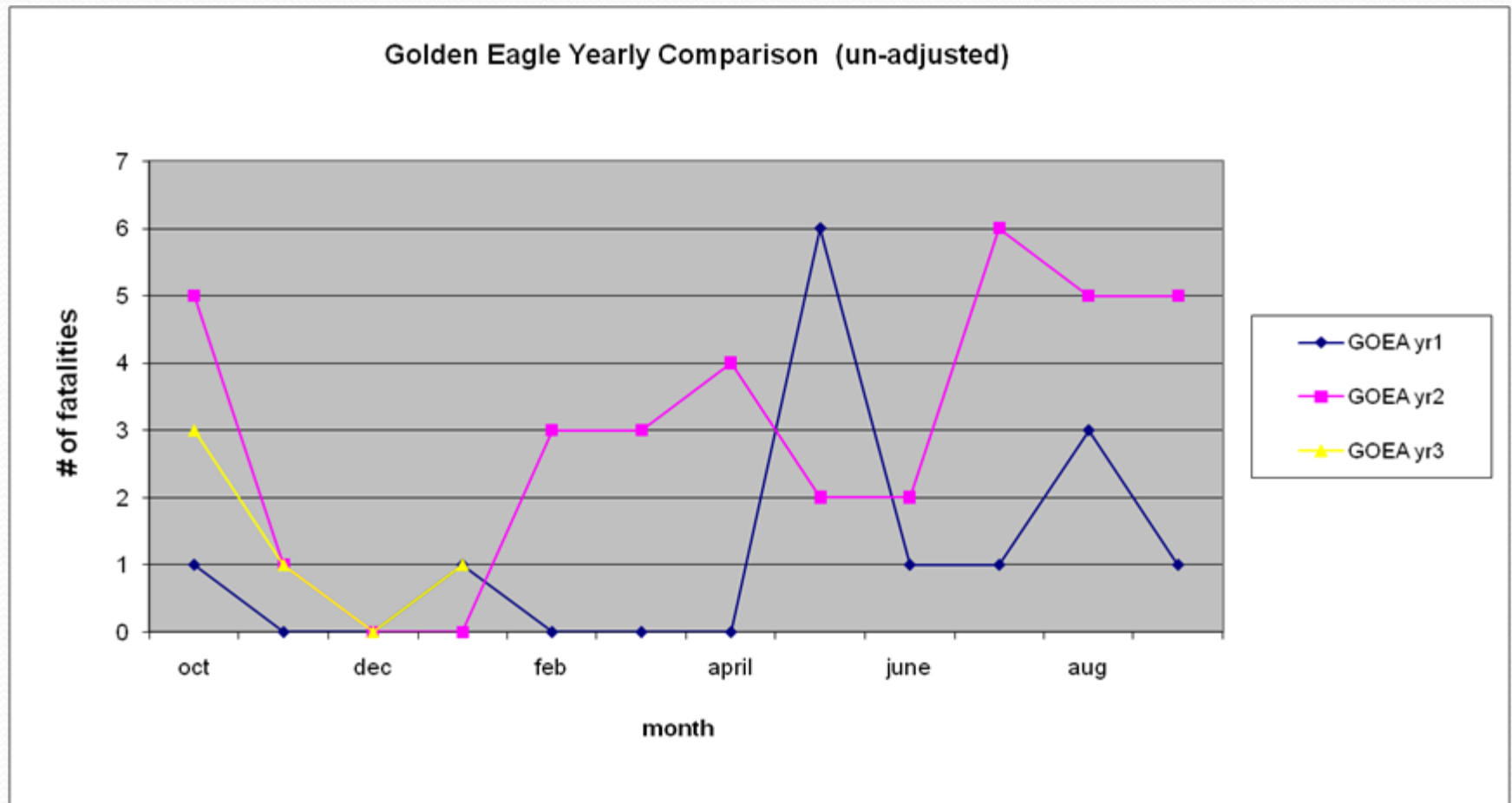
American Kestrel Unadjusted Mortality



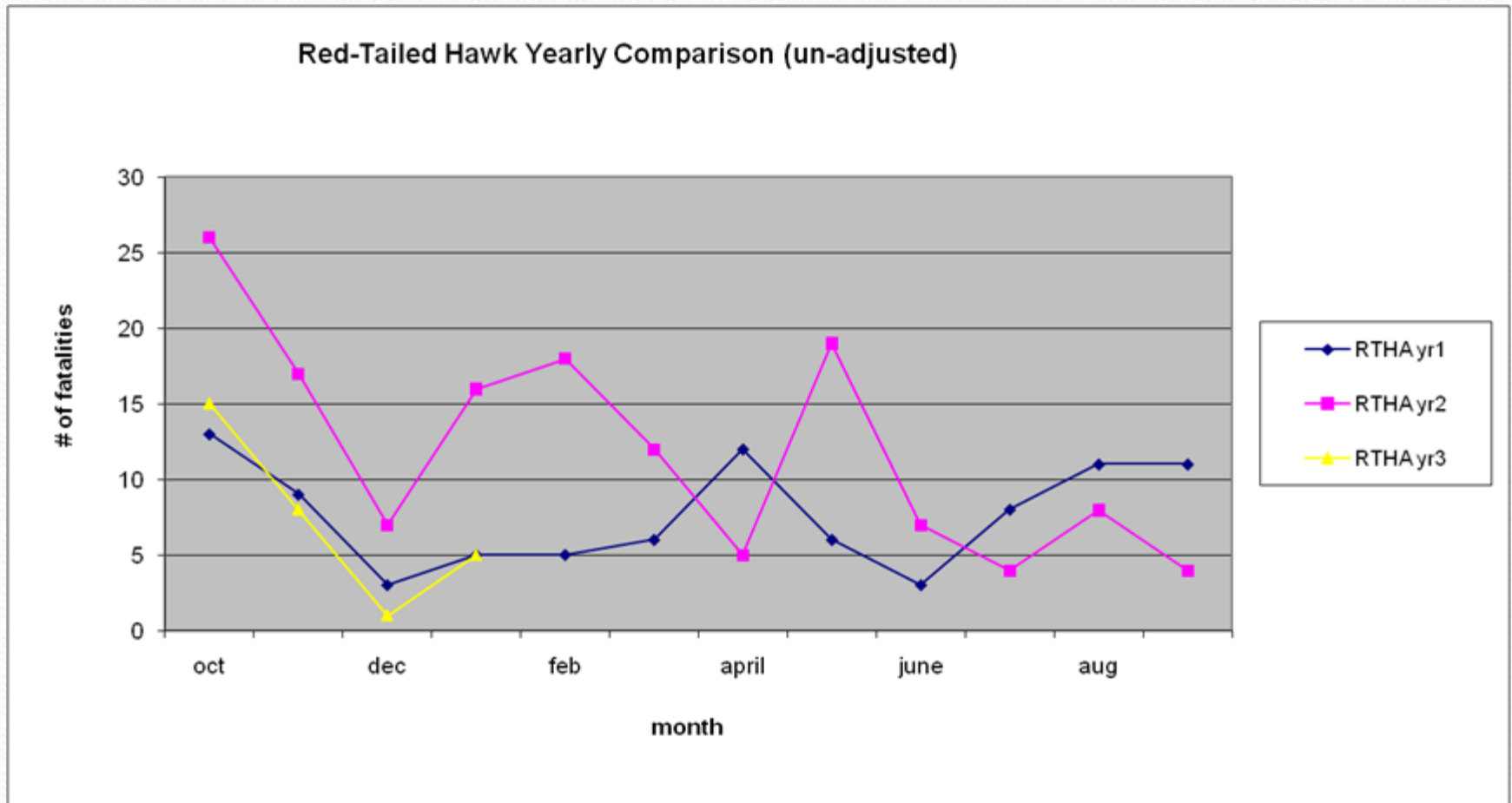
Burrowing Owl Unadjusted Mortality



Golden Eagle Unadjusted Mortality



Red-tailed Hawk Unadjusted Mortality



Meadowlark Unadjusted Mortality

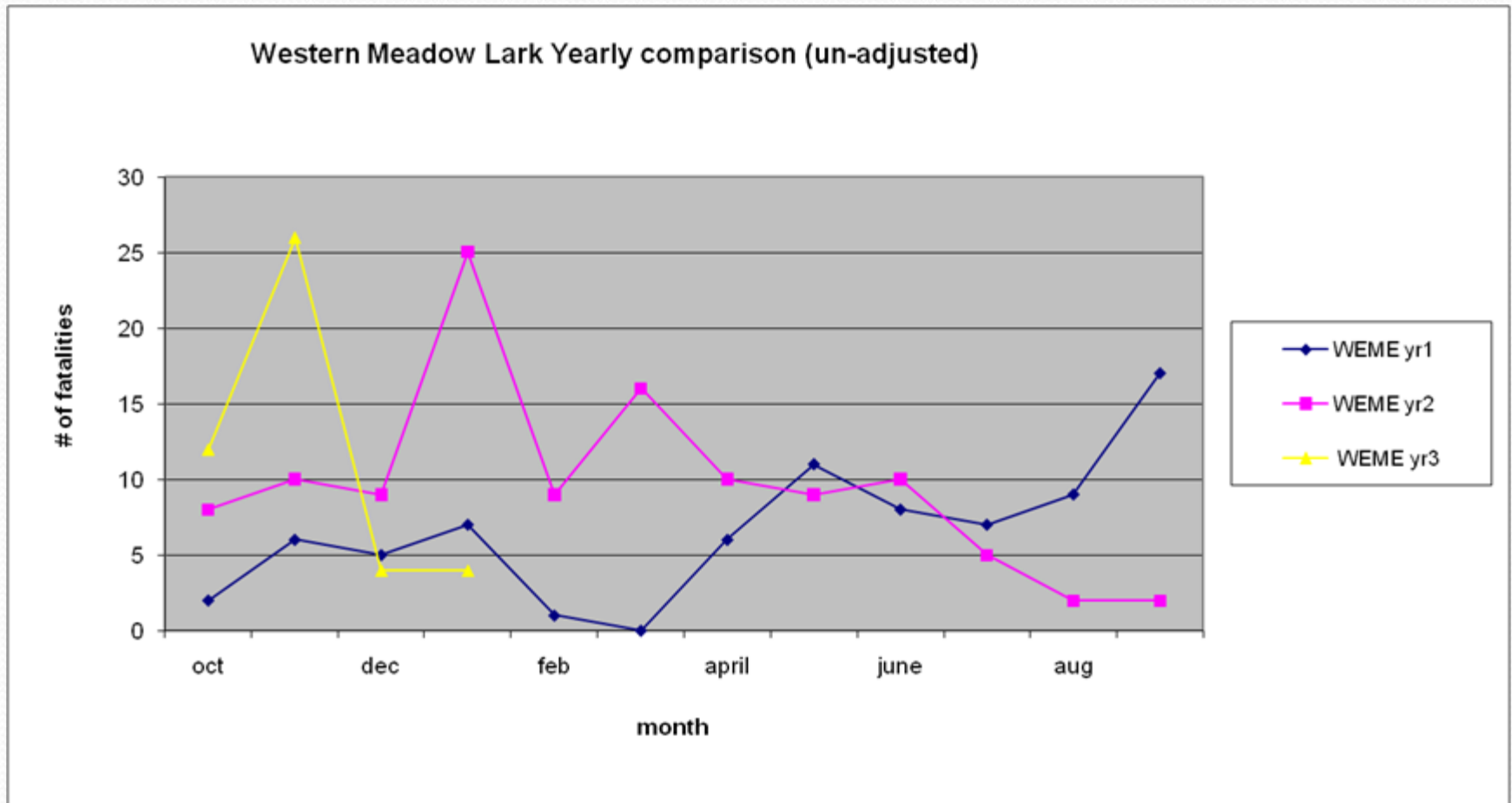


Chart 4a. American Kestrel adjusted mortality Oct. 2005 – Jan. 2008

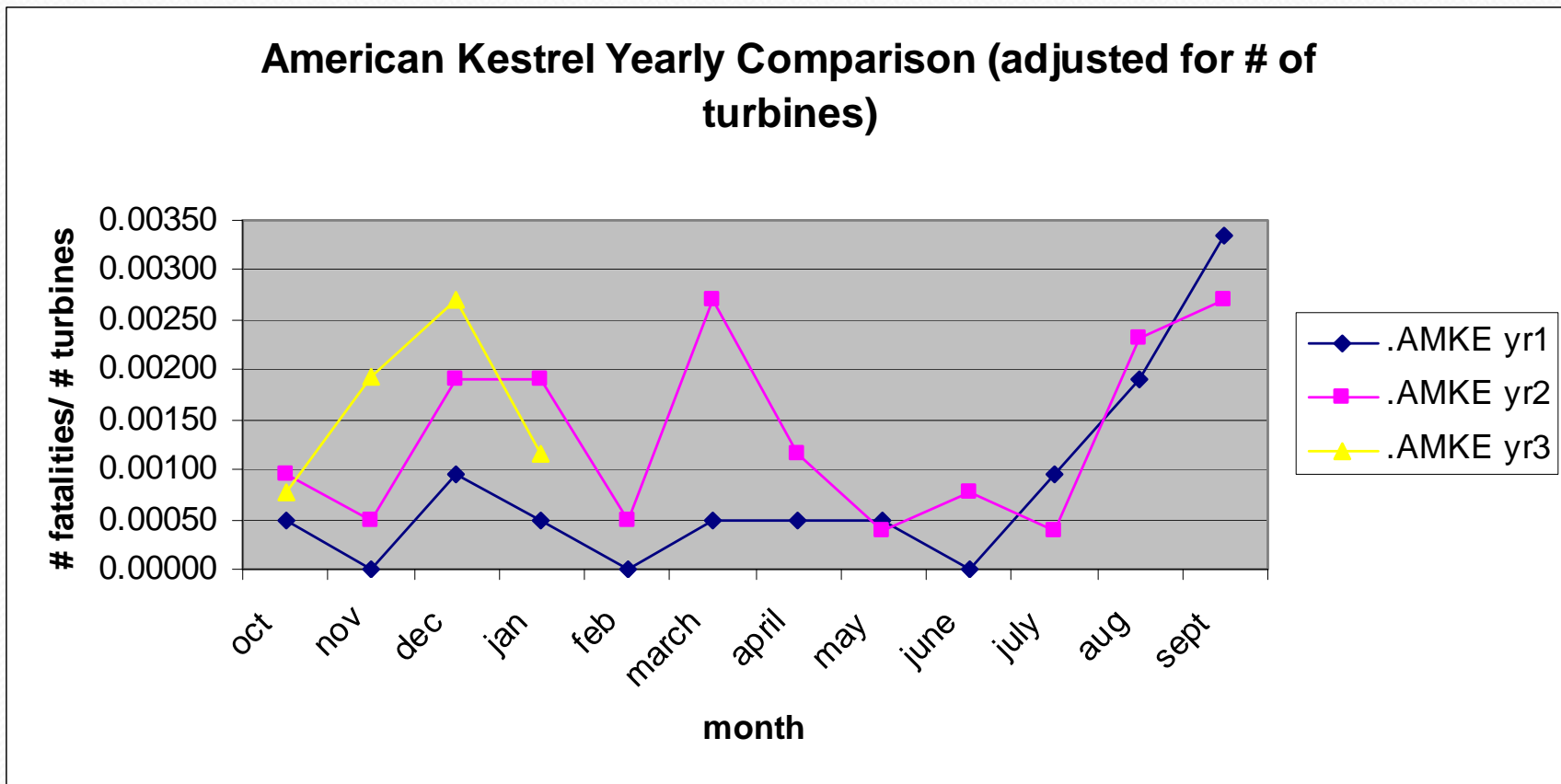


Chart 4b. Burrowing Owl adjusted mortality Oct. 2005 – Jan. 2008

Burrowing Owl Yearly Comparison (adjusted for # of turbines)

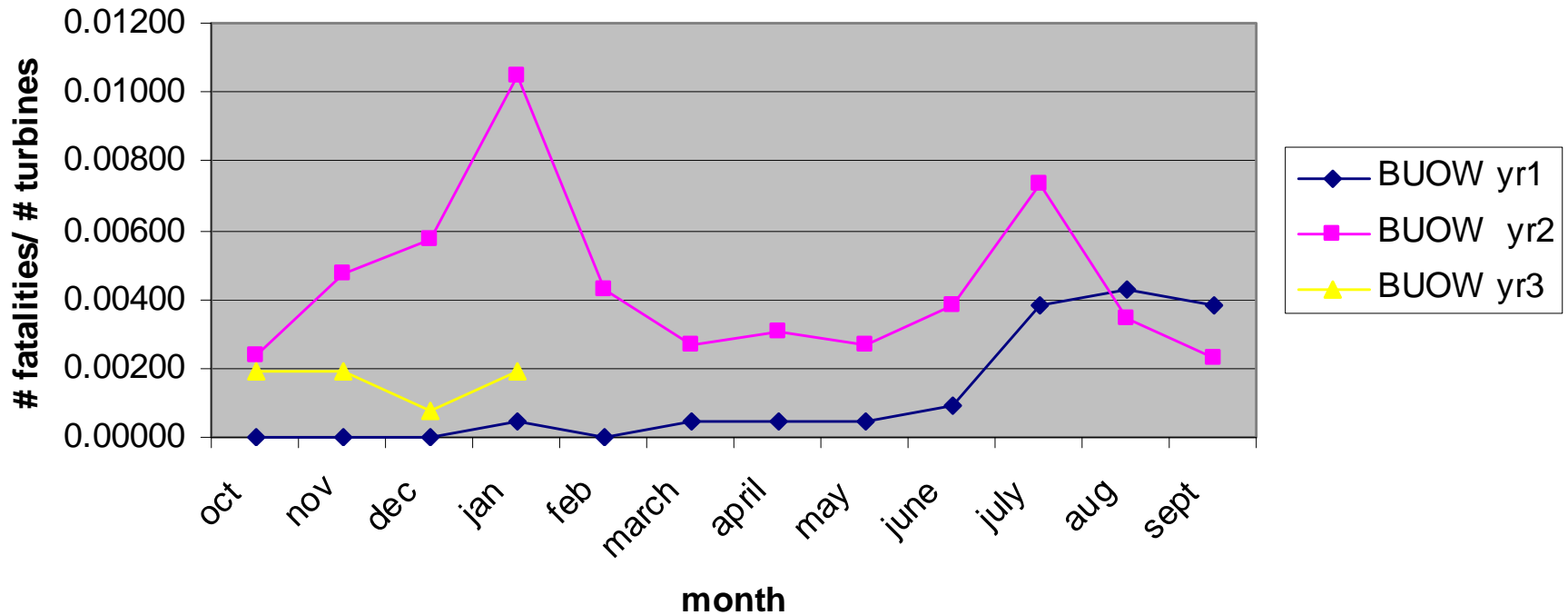


Chart 4c. Golden Eagle adjusted mortality Oct. 2005 – Jan. 2008

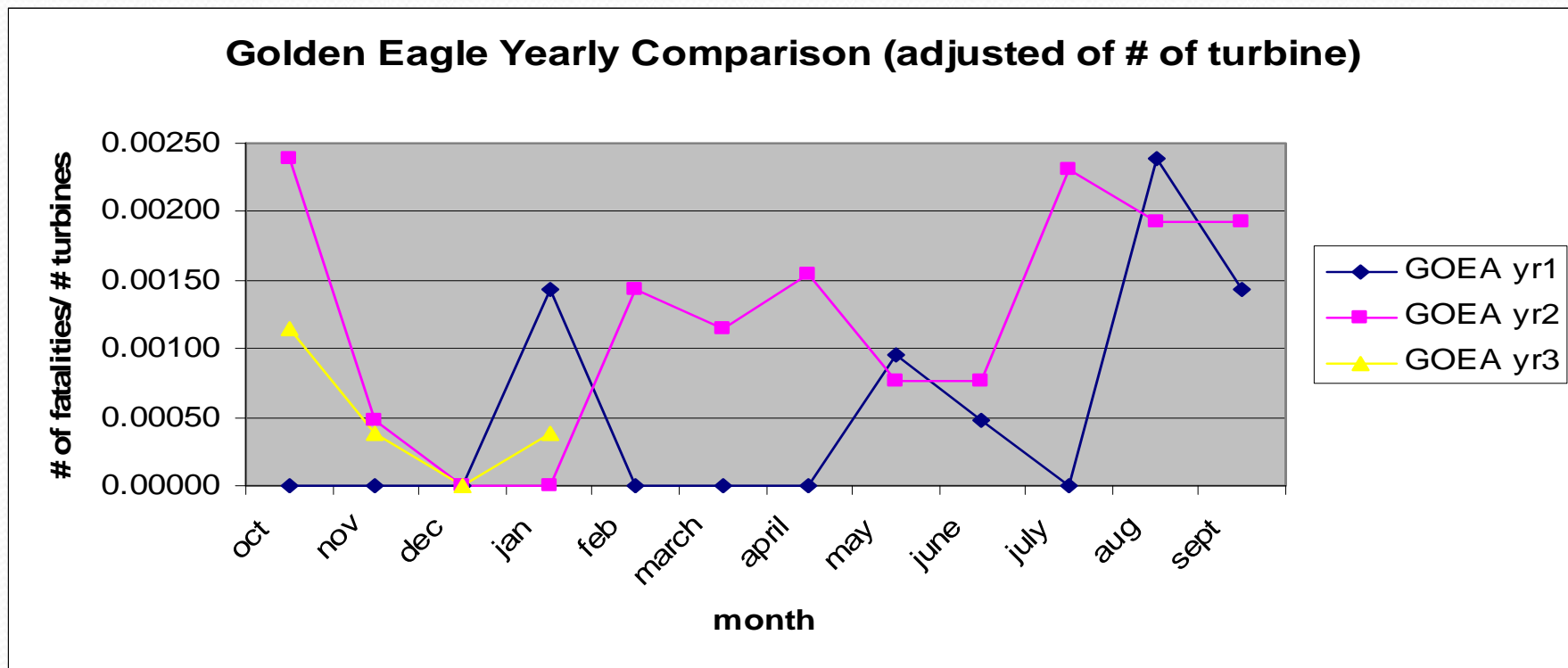


Chart 4d. Red-tailed Hawk adjusted mortality Oct. 2005 – Jan. 2008

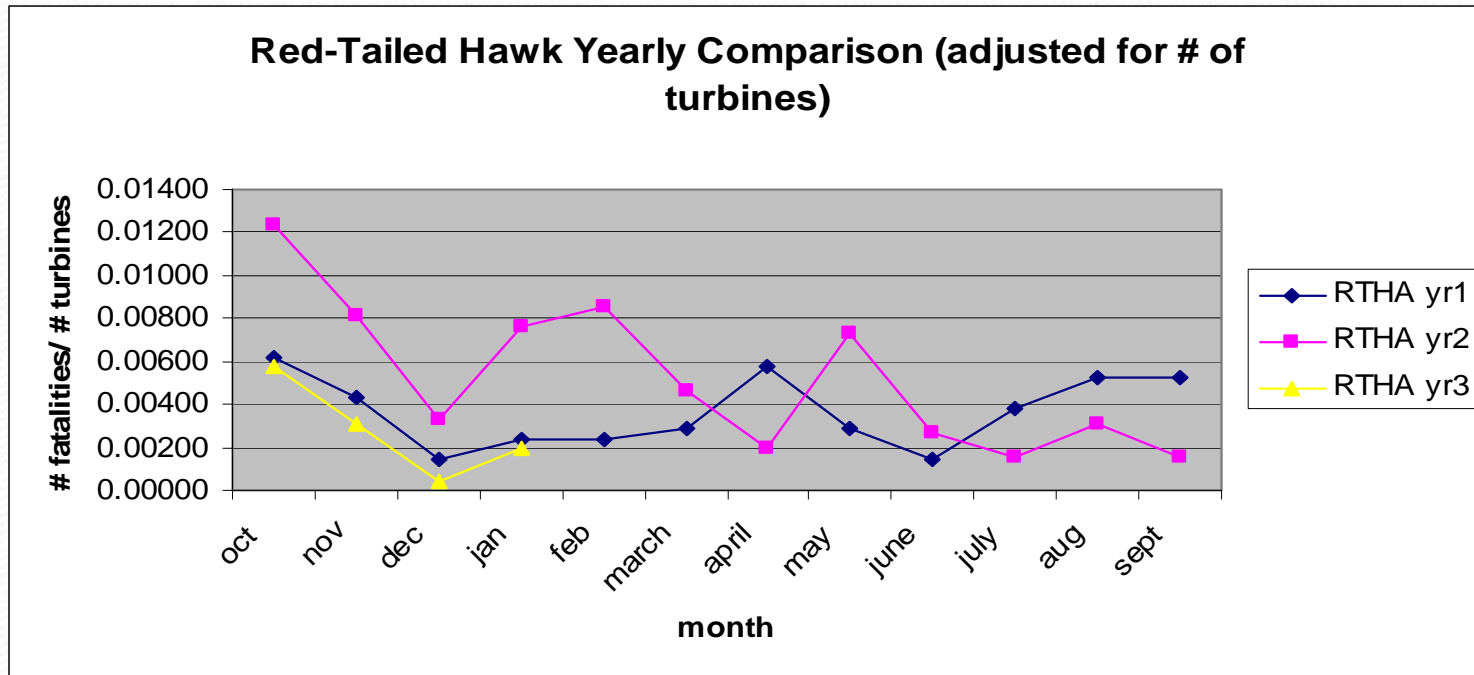
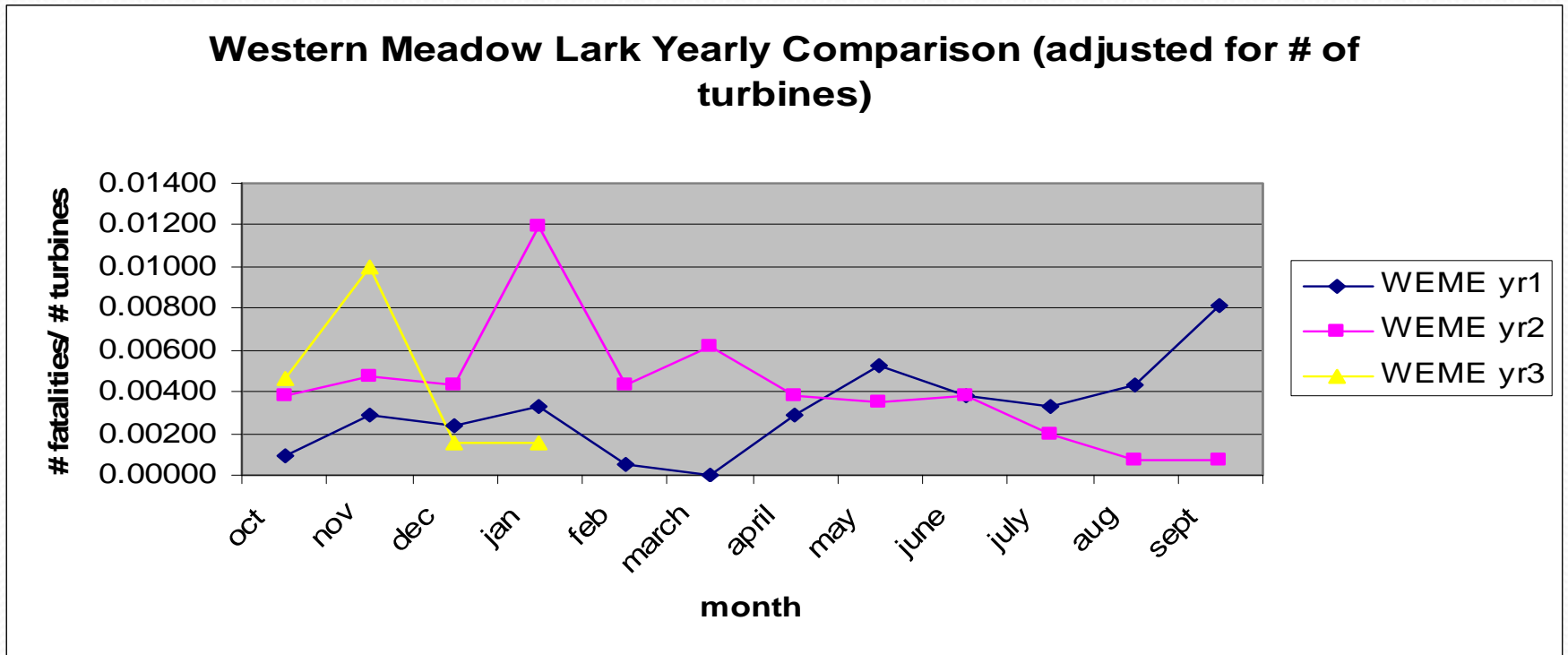
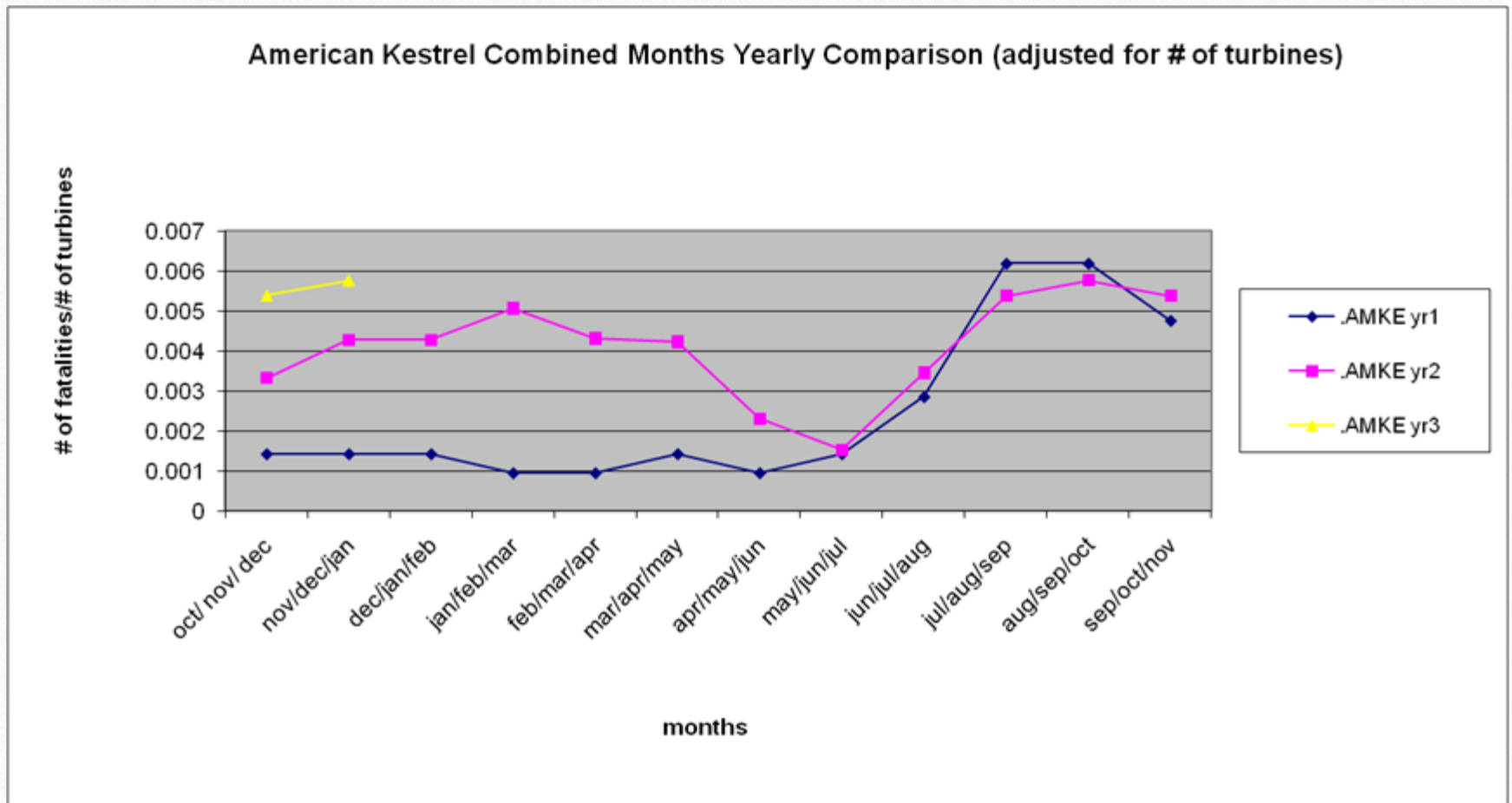


Chart 4e: Western Meadow Lark adjusted mortality Oct. 2005 – Jan. 2008

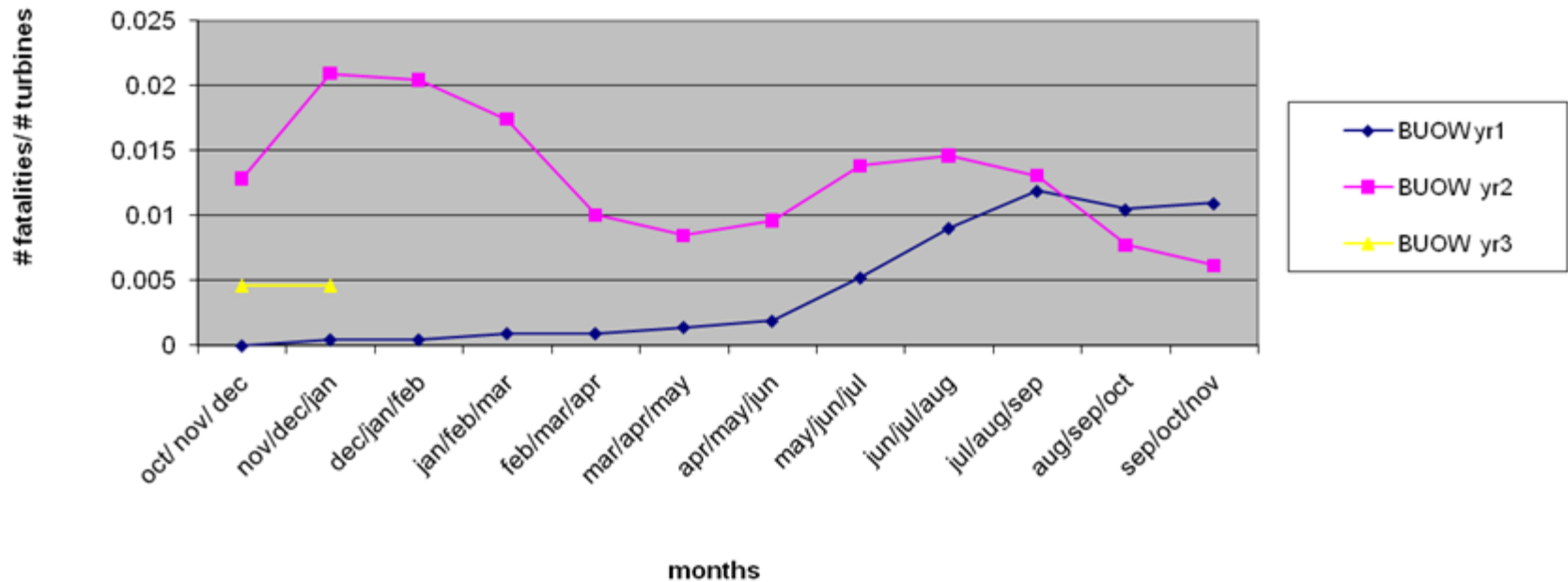


American Kestrel Combined Months Between Year Comparison



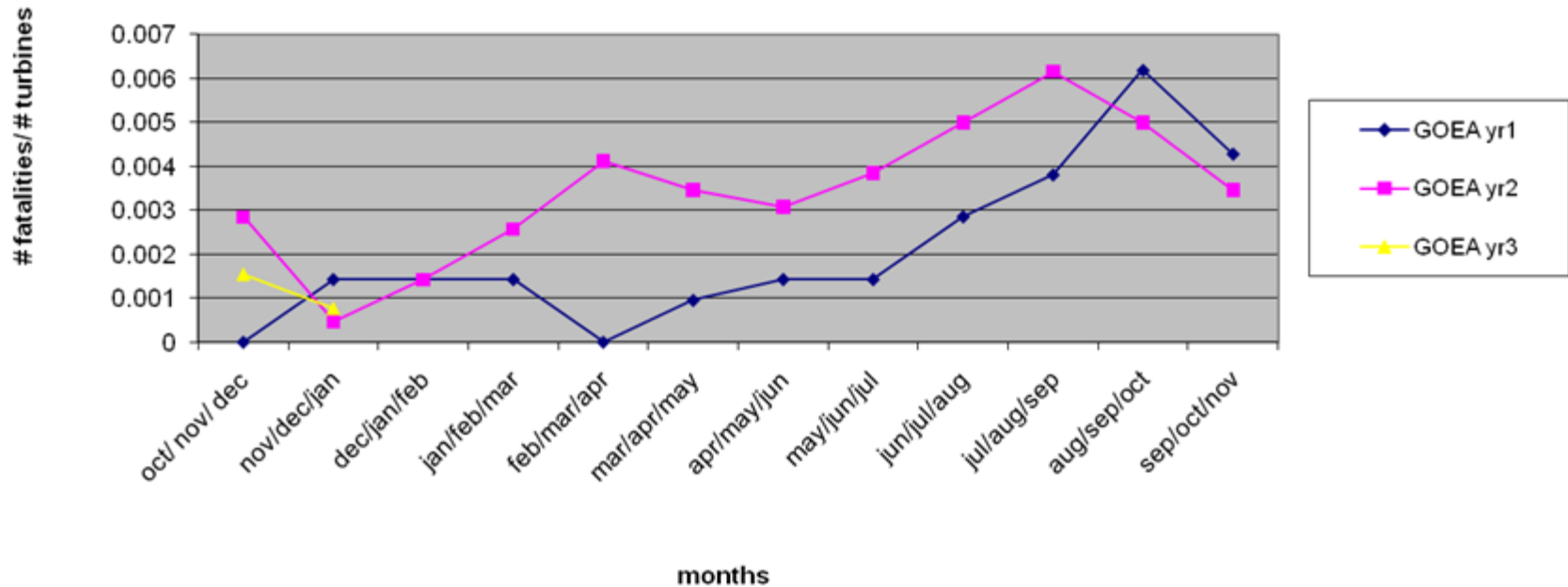
Burrowing Owl Combined Months Between Year Comparison

Burrowing Owl Combined Months Yearly Comparison (adjusted for # of turbines)

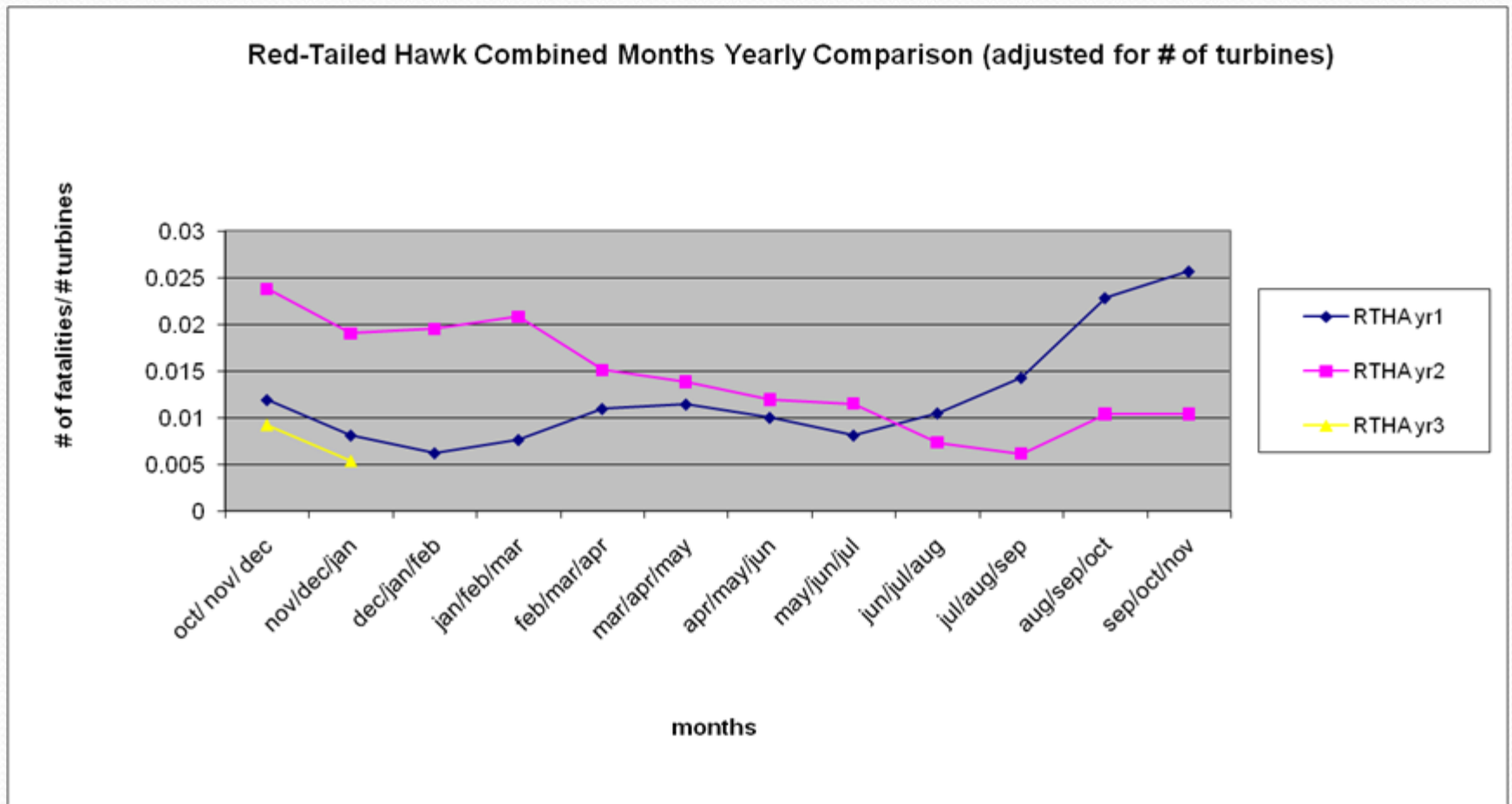


Golden Eagle Combined Months Between Year Comparison

Golden Eagle Combined Months Yearly Comparison (adjusted for # of turbines)



Red-tailed Hawk Combined Months Between Year Comparison



Western Meadowlark Combined Months Between Year Comparison

Western Meadow Lark Combined Months Yearly Comparisons (adusted for # of turbines)

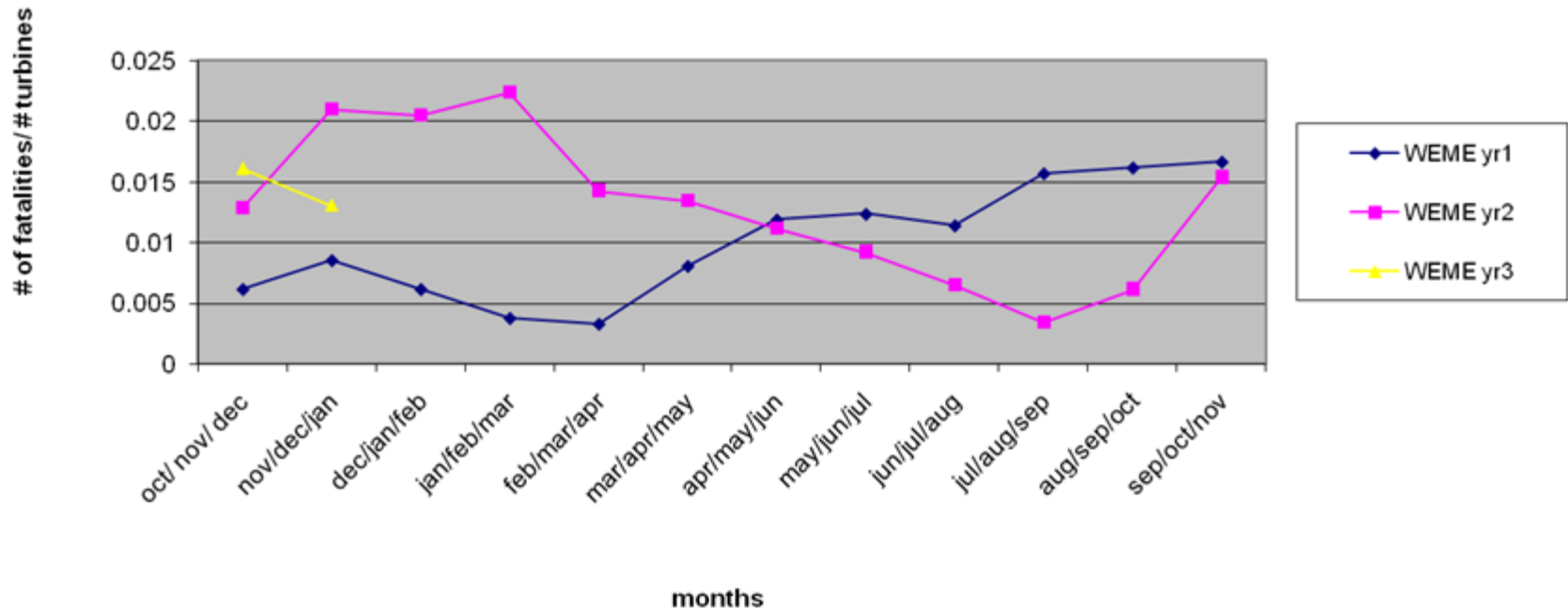
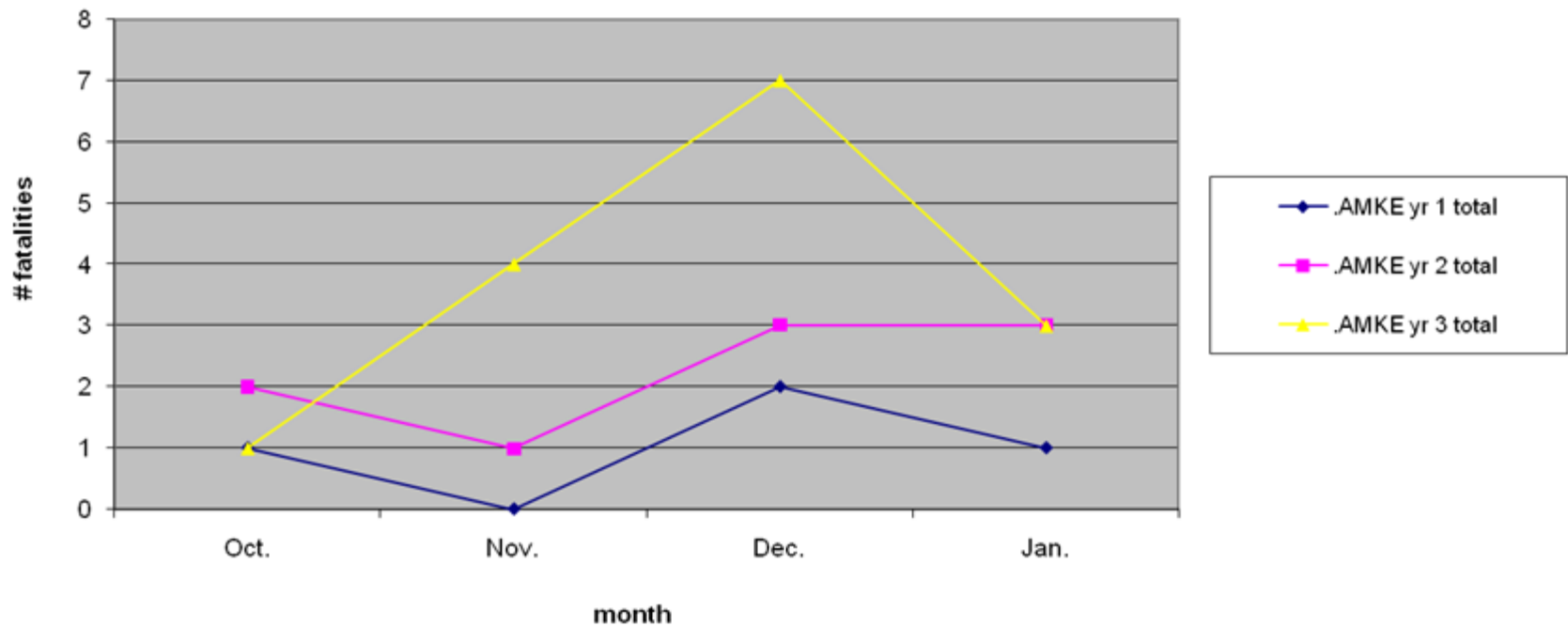


Table 6. Winter Shutdown Comparison, yellow=operational turbine fatality, blue= non-operational turbine fatality, N.=north plots fatalities, S=south plots fatalities

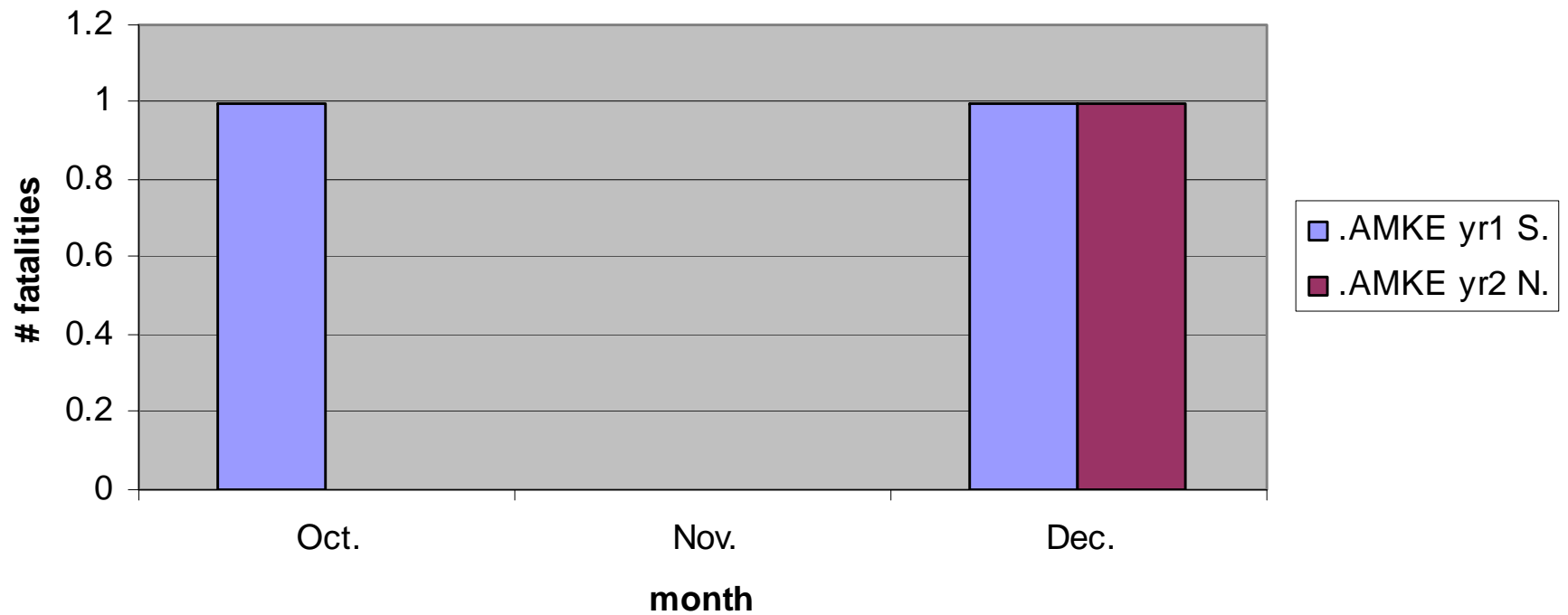
	Oct.	Nov.	Dec.	Jan.
.AMKE yr1 N.	0	0	1	1
.AMKE yr1 S.	1	0	1	0
.AMKE yr1 Diablo	0	0	0	0
.AMKE yr1 total	1	0	2	1
.AMKE yr2 N.	0	0	1	0
.AMKE yr2 S.	2	1	2	3
.AMKE yr2 Diablo	0	0	0	0
.AMKE yr2 total	2	1	3	3
.AMKE yr3 (+)	1	0	0	0
.AMKE yr3 (-)	0	4	7	3
.AMKE yr3 Diablo	0	0	0	0
AMKE yr3 total	1	4	7	3
BUOW yr1 N.	0	0	0	1
BUOW yr1 S.	0	0	0	0
BUOW yr1 Diablo.	0	0	0	0
BUOW yr 1 total	0	0	0	1
BUOW yr2 N.	2	3	5	15
BUOW yr2 S.	3	2	6	5
BUOW yr2 Diablo.	0	2	1	2
BUOW yr 2 total	5	7	12	22
BUOW yr3 . (+)	3	0	0	0
BUOW yr3 .(-)	0	4	2	5
BUOW yr3 Diablo.	2	0	0	0
BUOW yr 3 total	5	4	2	5
WEME yr1 N.	2	0	3	2
WEME yr1 S.	0	2	2	0
WEME yr1 Diablo	0	0	0	0
WEME yr1 total	2	2	5	2
WEME yr2 N.	5	2	5	12
WEME yr2 S.	0	3	2	7
WEME yr2 Diablo	1	2	0	1
WEME yr2 total	6	7	7	20
WEME yr3 (+)	9	2	0	0
WEME yr3 (-)	0	18	3	3
WEME yr3 Diablo	0	0	0	0
WEME yr3 total	9	20	3	3

American Kestrel: Winter Shutdown

American Kestrel Winter Shutdown Comparison

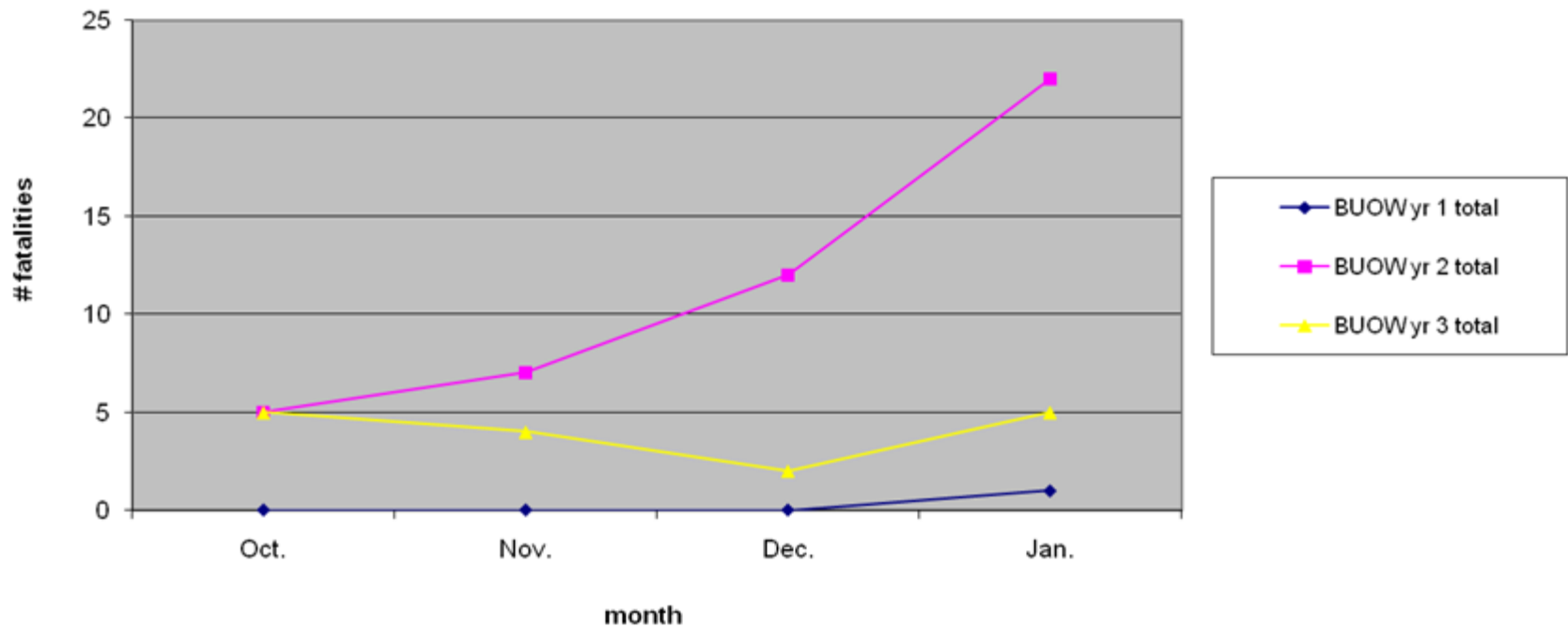


American Kestrel Operational Turbine Mortality

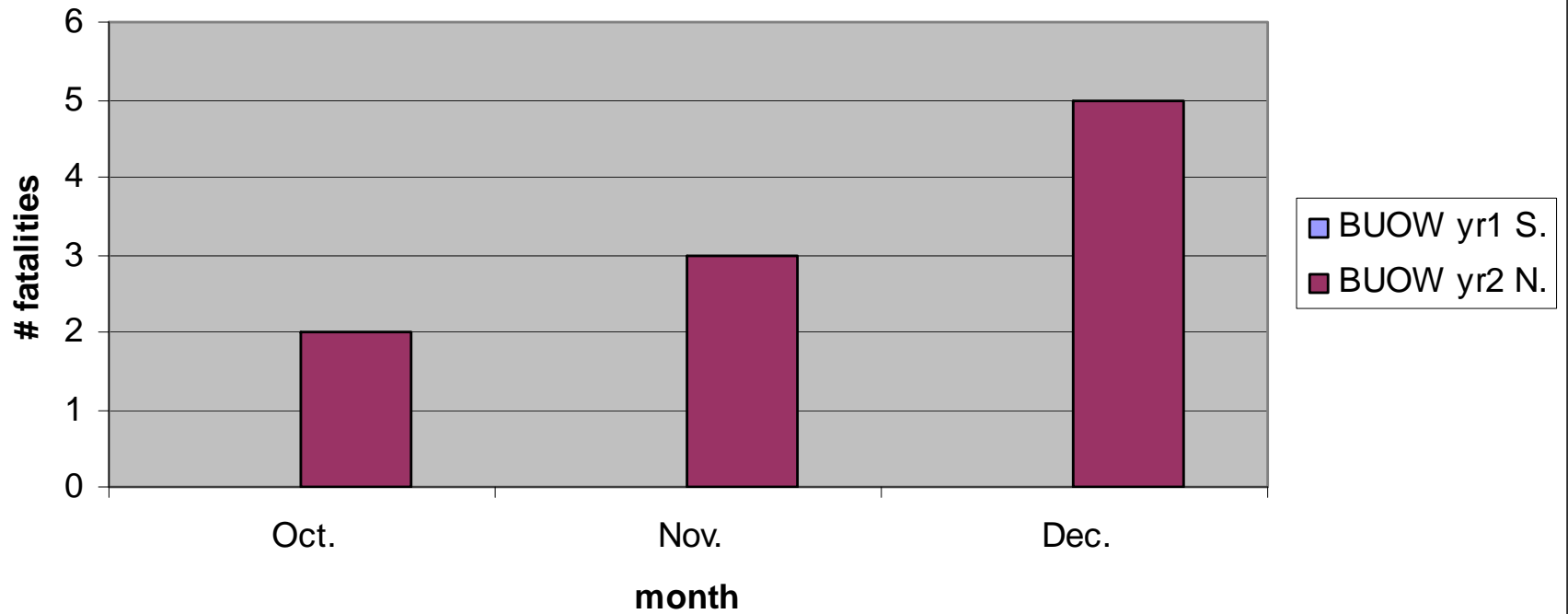


Burrowing Owl: Winter Shutdown

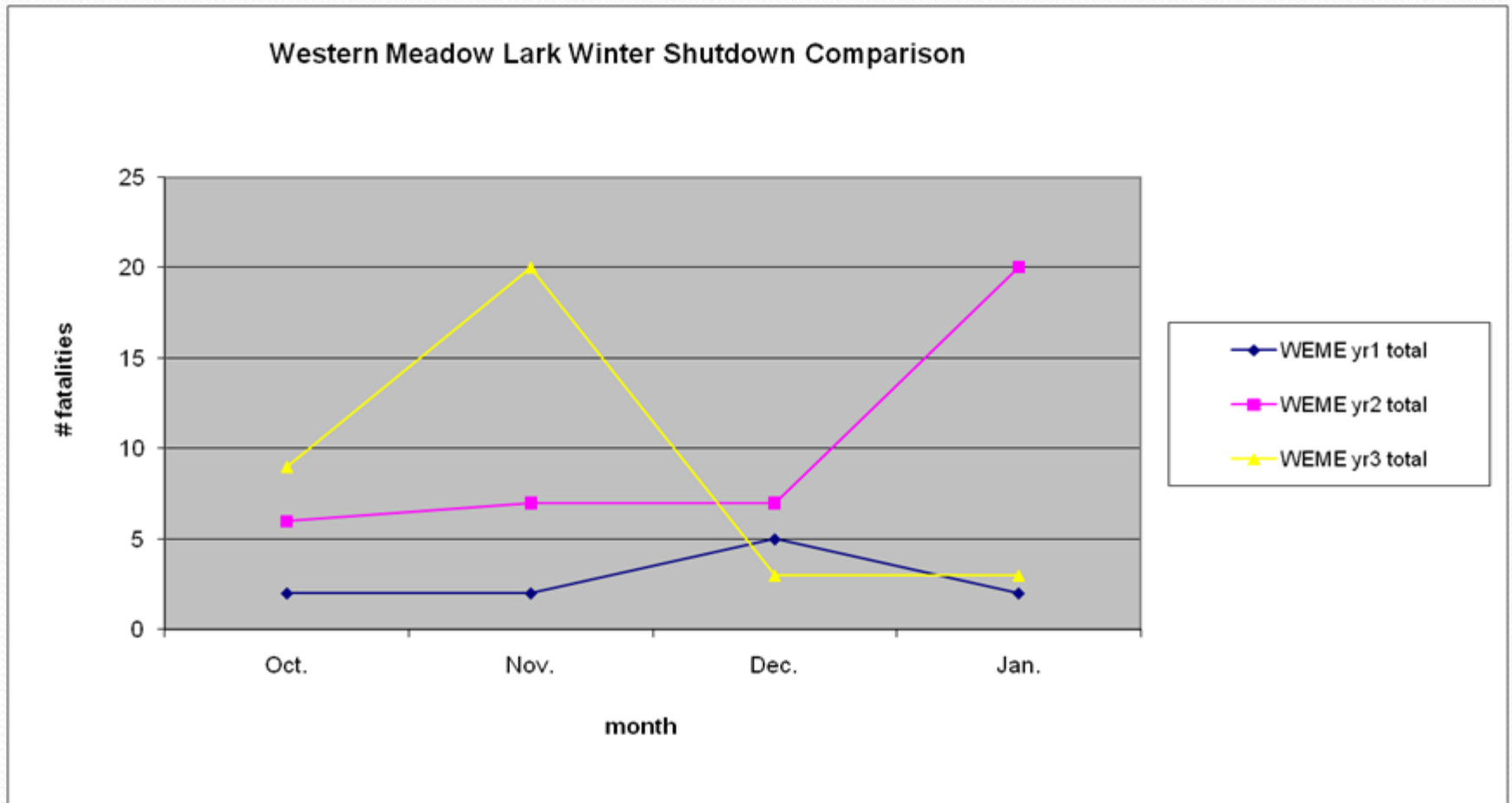
Burrowing Owl Winter Shutdown Comparison



Burrowing Owl Operational Turbine mortality



Western Meadowlark: Winter Shutdown



Western Meadow Lark Operational Turbine Mortality

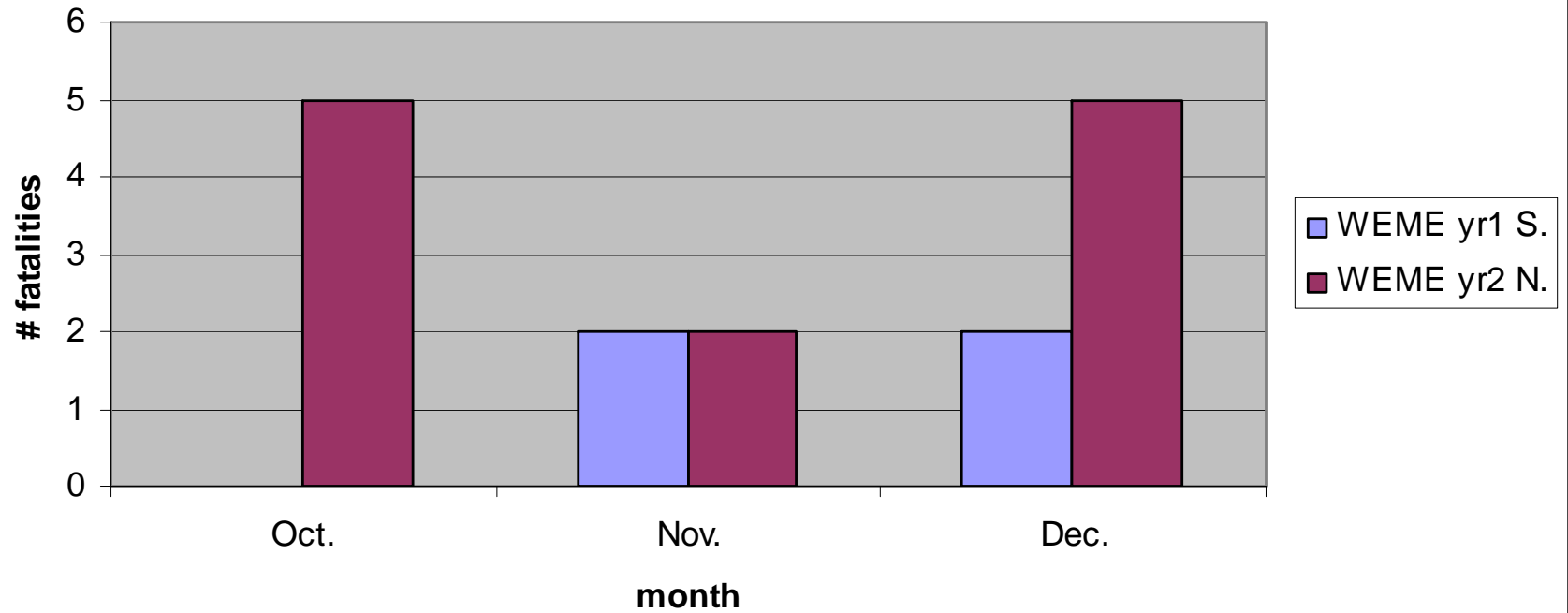
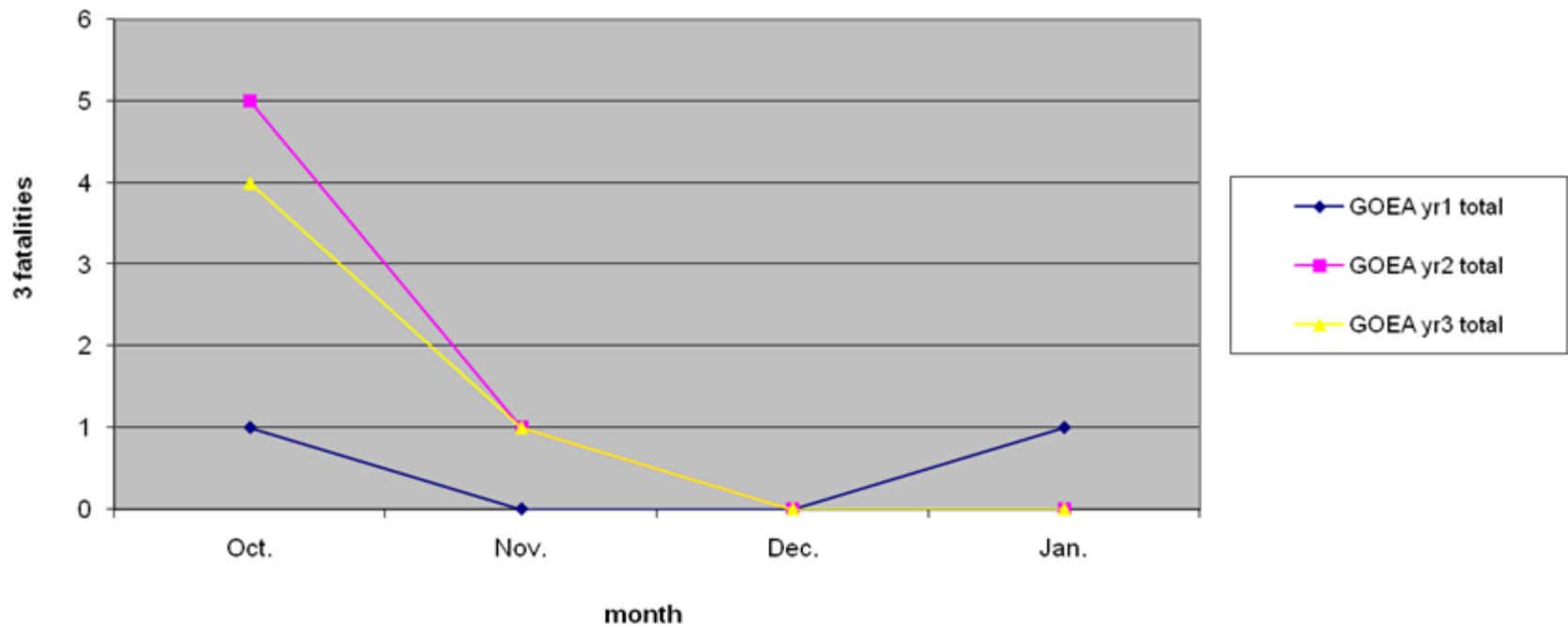


Chart 6a.
American Kestrel
Winter Shutdown
Comparison

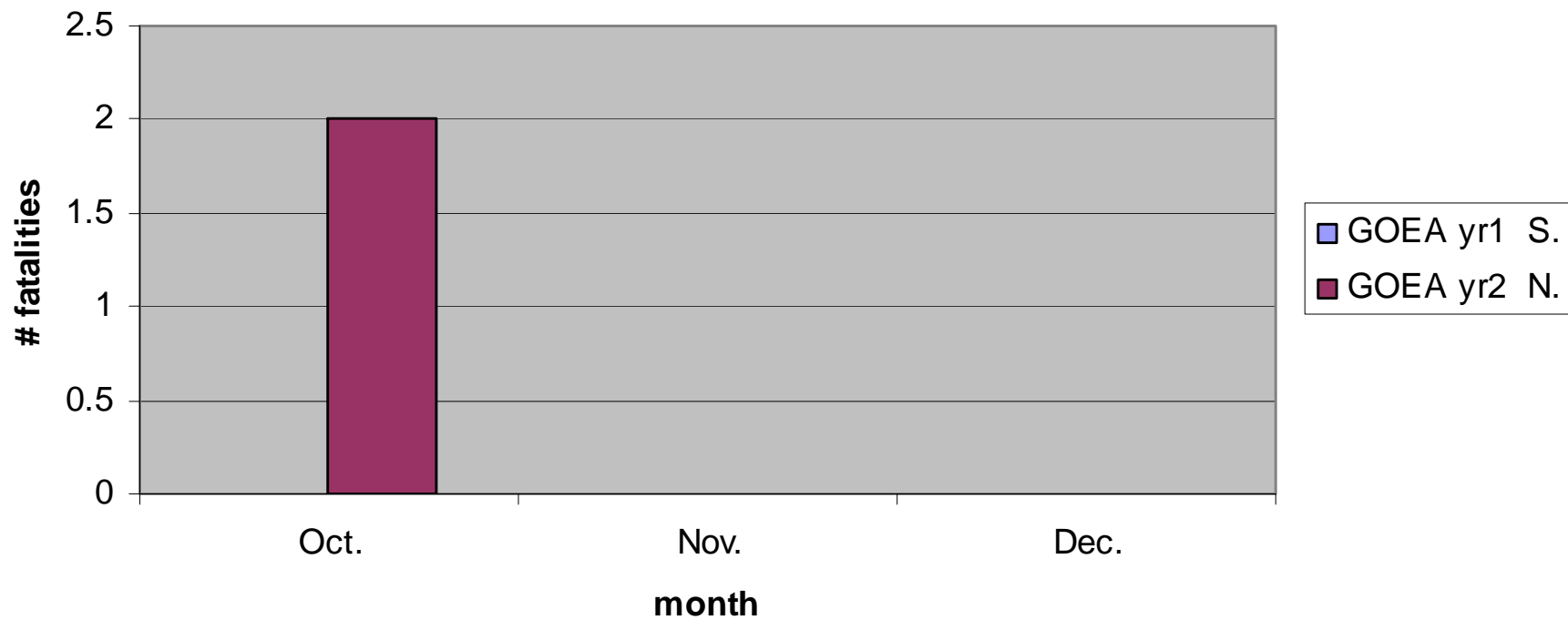
	Oct.	Nov.	Dec.	Jan.
GOEA yr1 N.	1	0	0	1
GOEA yr1 S.	0	0	0	0
GOEA yr1 Diablo	0	0	0	0
GOEA yr1 total	1	0	0	1
GOEA yr2 N.	2	0	0	0
GOEA yr2 S.	3	1	0	0
GOEA yr2 Diablo	0	0	0	0
GOEA yr2 total	5	1	0	0
GOEA yr3 (+)	4	0	0	0
GOEA yr3 (-)	0	1	0	0
GOEA yr3 Diablo	0	0	0	0
GOEA yr3 total	4	1	0	0
RTHA yr1 N.	9	7	0	1
RTHA yr1 S.	3	1	0	4
RTHA yr1 Diablo	1	0	2	0
RTHA yr 1 total	13	8	2	5
RTHA yr2 N.	16	13	3	5
RTHA yr2 S.	10	5	3	11
RTHA yr2 Diablo	0	0	0	0
RTHA yr 2 total	26	18	6	16
RTHA yr3 (+)	11	7	0	3
RTHA yr3 (-)	0	0	0	2
RTHA yr3 Diablo	0	2	1	1
RTHA yr 3 total	11	9	1	6

Golden Eagle: Winter Shutdown

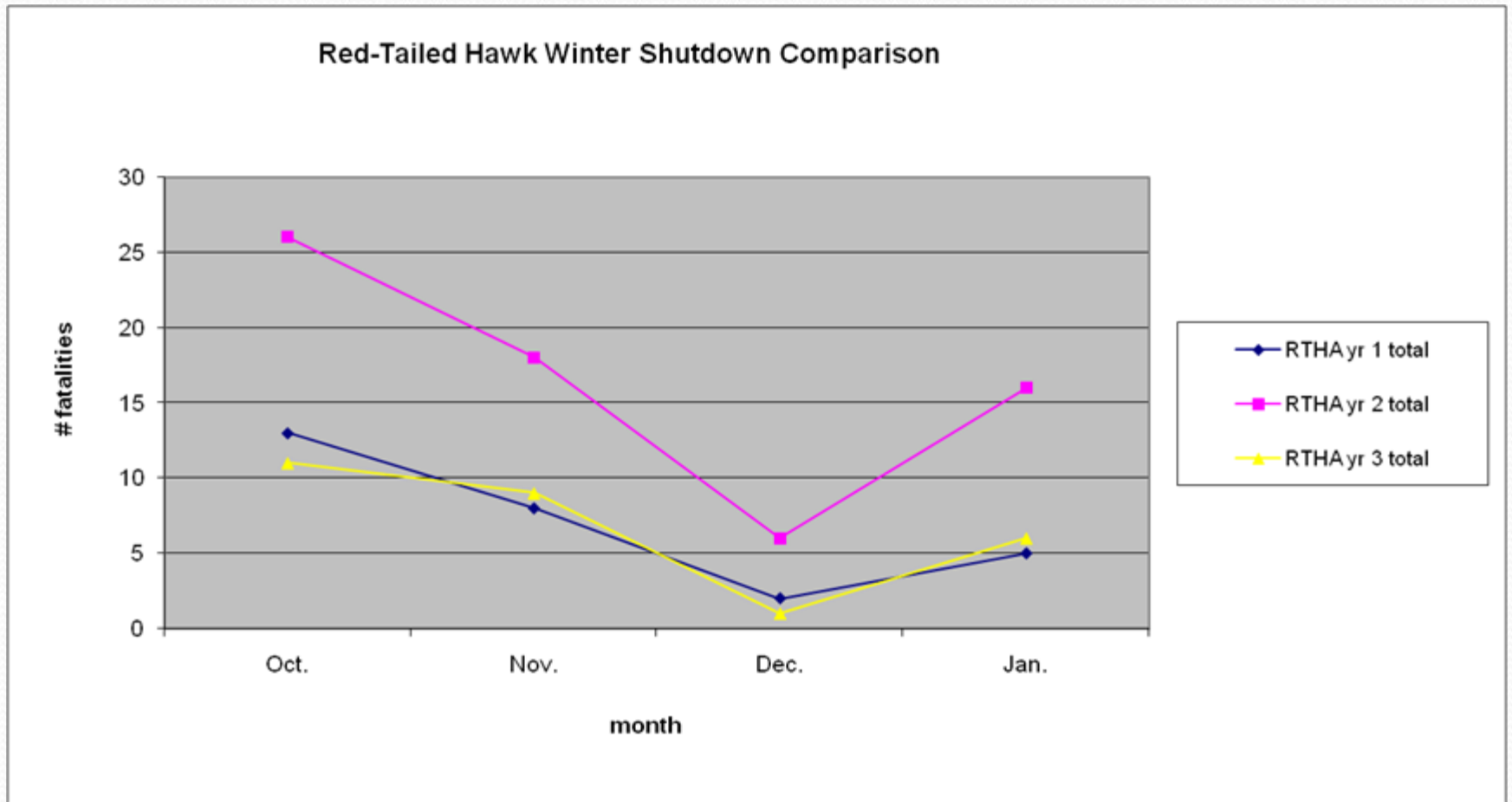
Golden Eagle Winter Shutdown Comparison



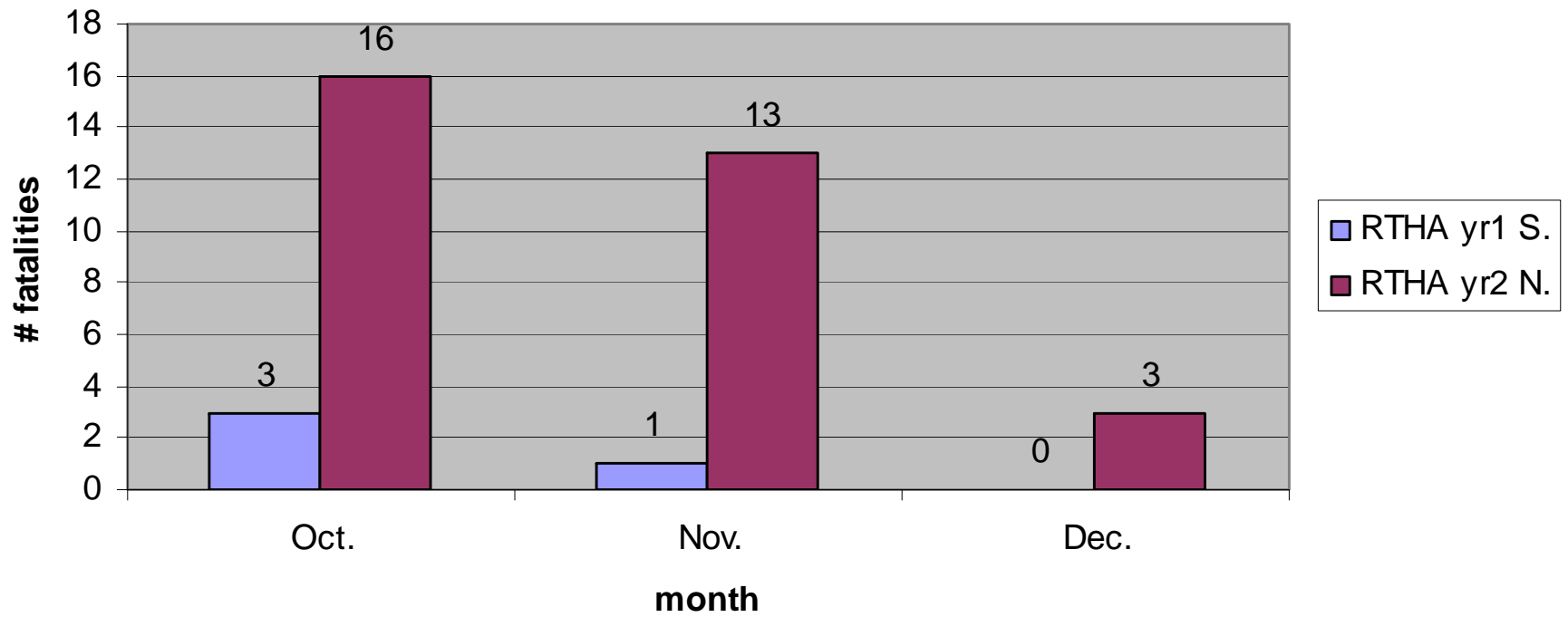
Golden Eagle Functional Turbine Mortality



Red-tailed Hawk: Winter Shutdown



Red-Tailed Hawk Operational turbine Mortality



**Table 8. Universal winter shutdown,
non-operational turbine fatalities**

	At ALL 2600 shutdown turbines	At 2100 (pre-march 2007 addition) shutdown turbines
American Kestrel	15	14
Burrowing Owl	16	15
Golden Eagle	1	1
Red-tailed Hawk	2	2
Western Meadowlark	30	24

American Kestrel-Burrowing Owl
Scavenging Study
Preliminary Report
September – October 2007



Surveys

- Found 86 Fatalities
- Tracked 29
- 10 Complete Carcasses
- 19 Feather spots/bones/flesh

Tracking

- 70% Carcasses scavenged
- Removed 2-10 days (avg. 4d)
- 54% Feather trails: 11-47 days

Tracking (cont'd.)

- Feather and bone fatalities changed little or slowly
- 11% Disappeared in 4-8 days
- 89% persisted for 1-57 days
(Avg 34 d)