

Population trends of Black Ducks and Canada Geese within the Low-level Flight Training area in Labrador

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Background

- Low-level military jet aircraft training conducted in Labrador-northeastern Quebec since 1981.
- Current training conducted under authority of 1986 Multinational Agreement between Canada and NATO allies.
- Low-level Flight Training Area encompasses approximately 100,000 km².
- 5000-6000 flights/year over 28-31 weeks.

Background cont'd

- Environmental Impact Statement issued in 1995.
- Effect of jet aircraft noise on waterfowl identified as an important environmental issue.
- Concerns raised during public hearings prompted initiation of study in 1994.

Background cont'd

- Aircraft disturbance could effect:
 - Physical response: change in behaviour, induced movement (fly or swim)
 - Physiological response: Elevated heart rate, elevated cortisone levels.
- Potential effects:
 - Avoidance of preferred habitats.
 - Increased energy expenditure and compromised energy budget.
 - Reduced reproductive success.
 - Reduced population size

Background con't

- Sensitization: Response rate increases
- Habituation: Adaptive mechanism whereby organism minimizes or ceases response.

Assumptions

- Populations within control and treatment areas were not exposed to different pressures outside the study areas.
- Negative effects of aircraft on recruitment would be reflected in reduced breeding population size.
- Negative effects on breeding and natal area fidelity would be reflected in breeding population size.

Study Design

- Three 100 km² plots located in each of two treatments (high frequency and before-after plots) and one control.
- Before-after plots located outside training area in 1994 but were included within training area when boundary was realigned in 1995.
- Test for existence of trends within treatments and differences in trends between treatments.

Population Surveys

- Helicopter surveys flown at 30-50 knots at approximately 30m AGL.
- Two observers and navigator/observer/recorder.
- Surveys conducted at approximately same phenological period each year.

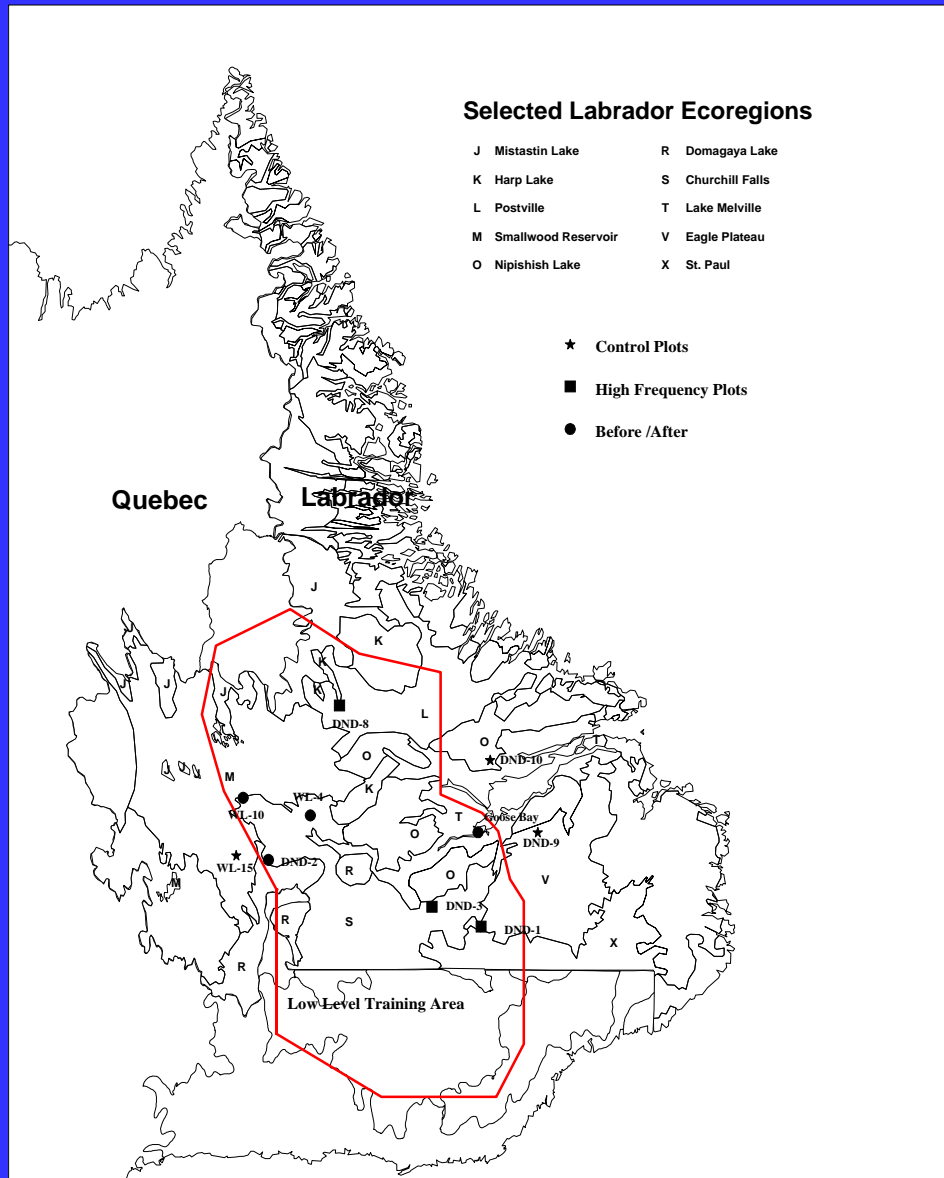


Figure 1. Location of waterfowl breeding pair study plots surveyed in relation to the Low-level Flight Training Area and Ecoregions of Labrador.

Overflights

- Only flights below 1000 ft (300m) AGL.
- 90% of all flights below 300m AGL.
- High frequency plots = 3.526/day.
- Before-after plots = 0.086/day or 1 flight every 12 days.
- Control plots = 0.0095/day or 1 flight every 105 days.

Data Analysis

- Two-way analysis of variance for within plot and across year population trends.
- Repeated measures analysis for differences in treatment x linear trend.
- Regression analysis for relationship between overflights in year (t) versus population change between year (t) and year (t+1).
- Power analysis to assess capacity of data to detect change.

Figure 2. Average and standard deviation of Black Duck counts on individual high frequency, before-after and control plots, 1994-00.

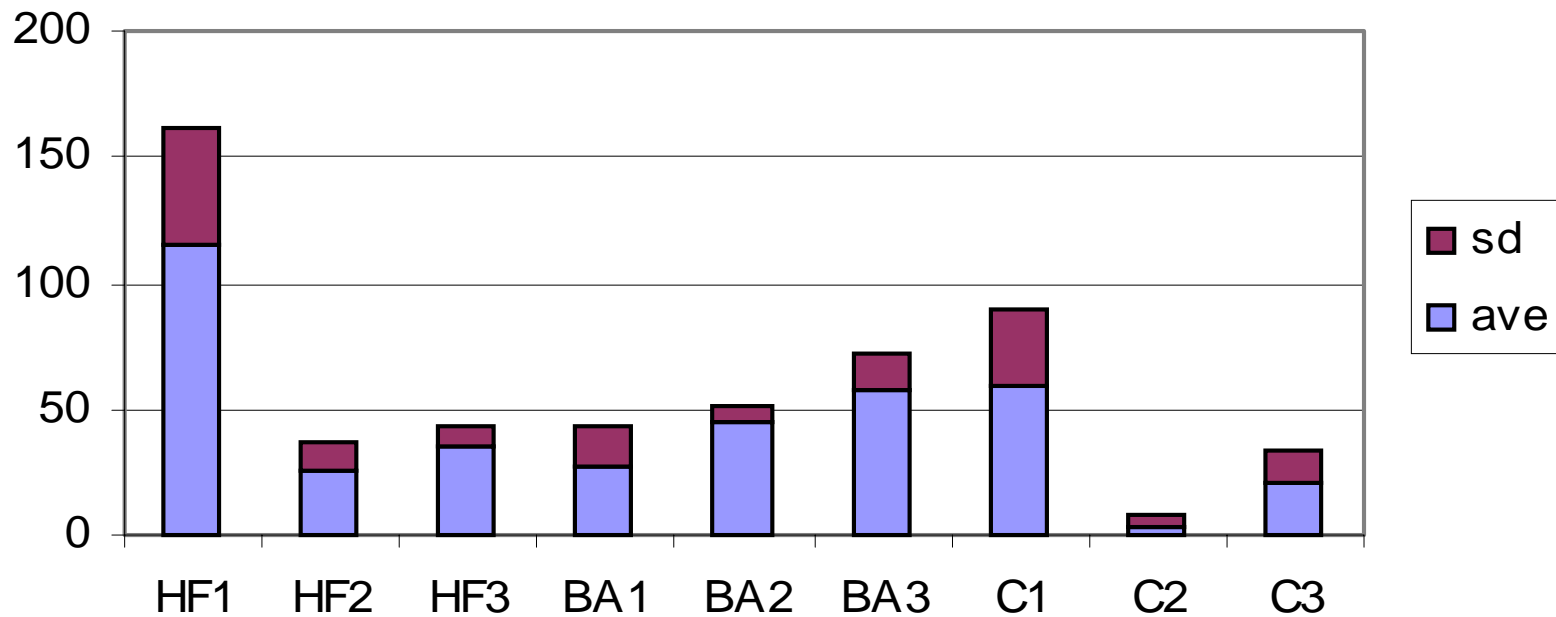


Figure 3. Average and standard deviation of Canada Goose counts on individual high frequency, before-after and control plots, 1994-00.

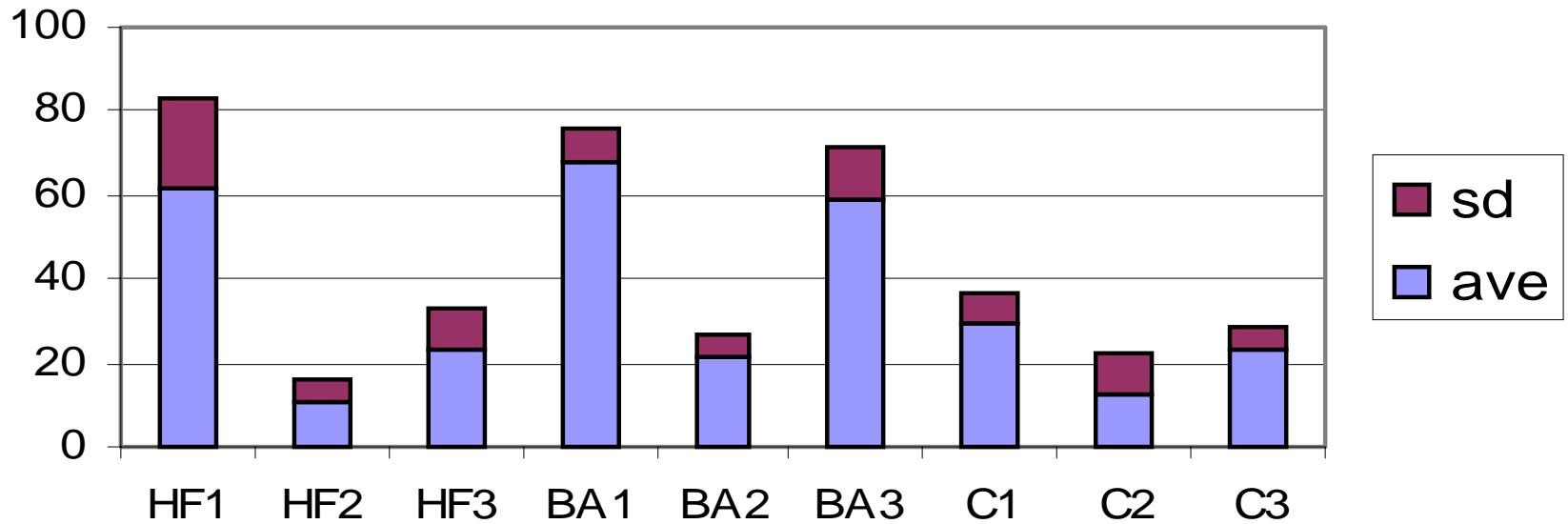


Figure 4. Indicated breeding population of black ducks on high frequency plots.

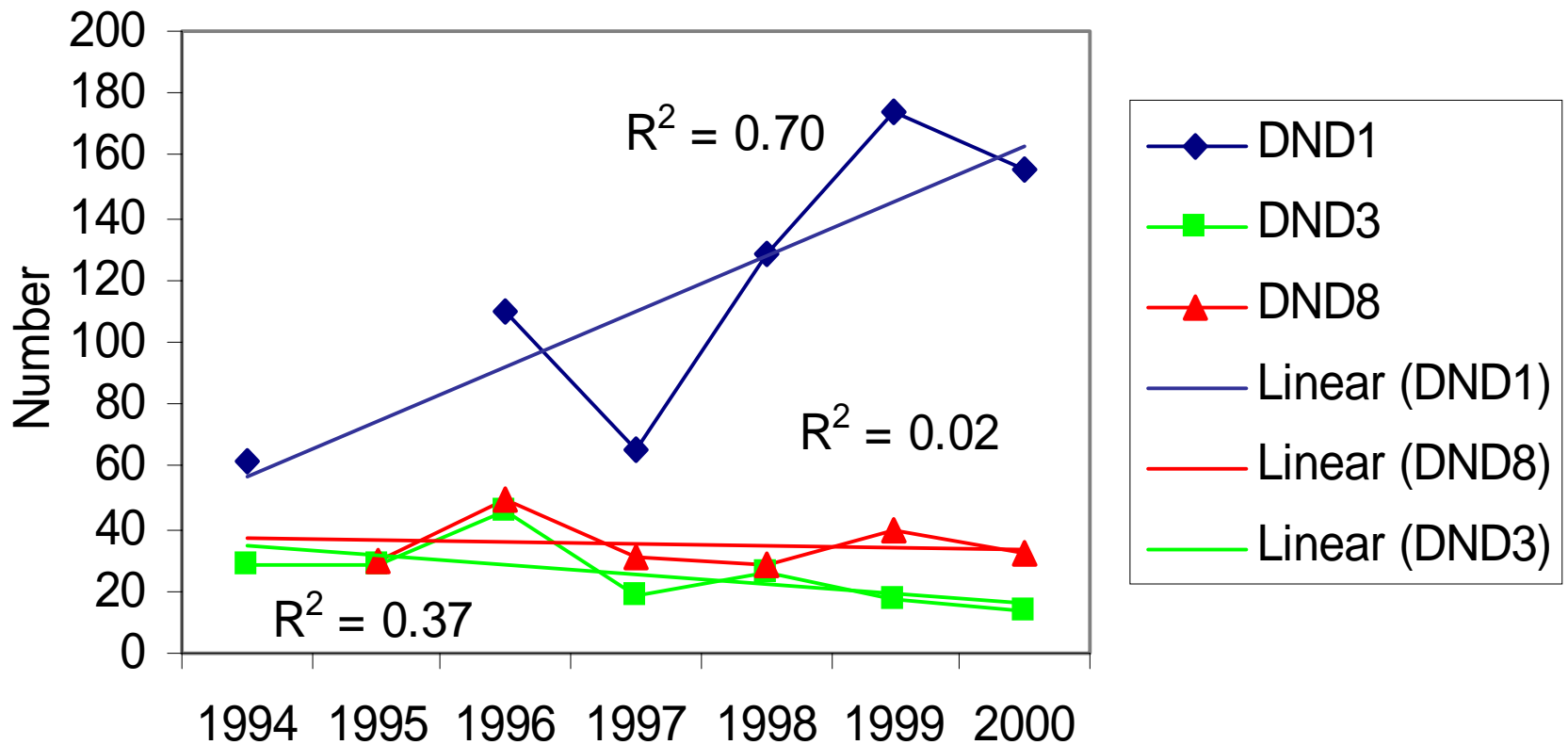


Figure 5. Indicated breeding population of black ducks on before-after plots.

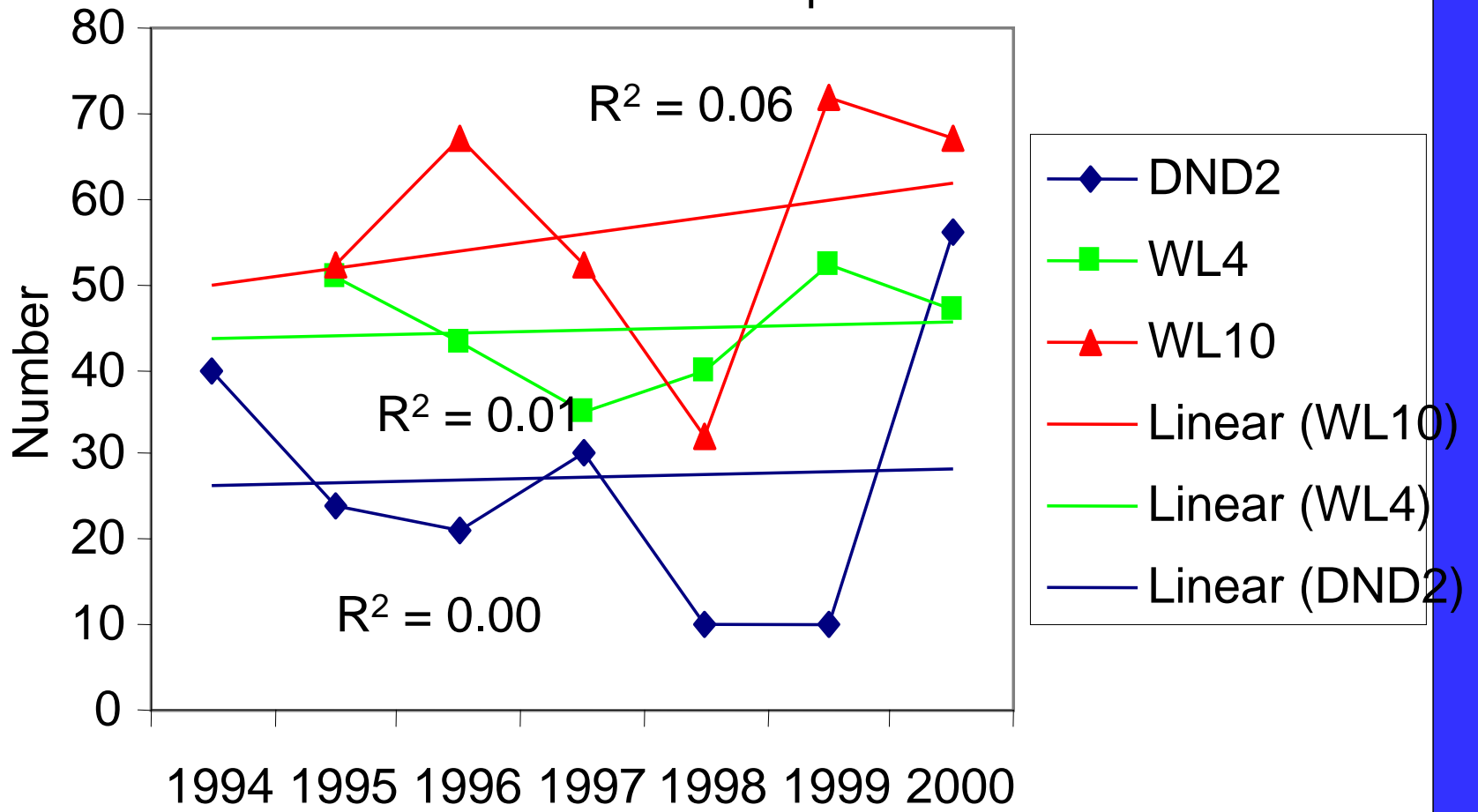


Figure 6. Indicated breeding population of black ducks on control plots.

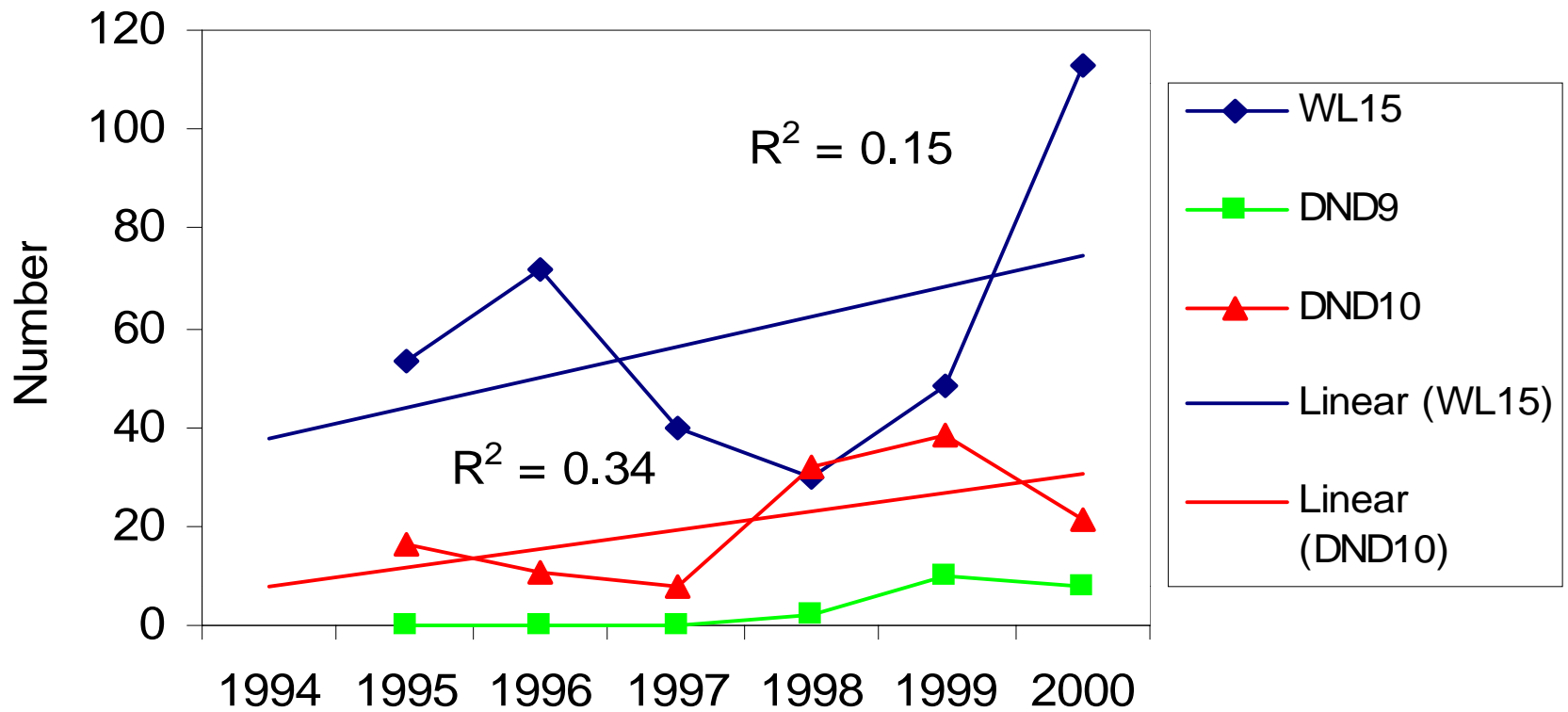


Figure 7. Indicated population of Canada Geese on high frequency plots.

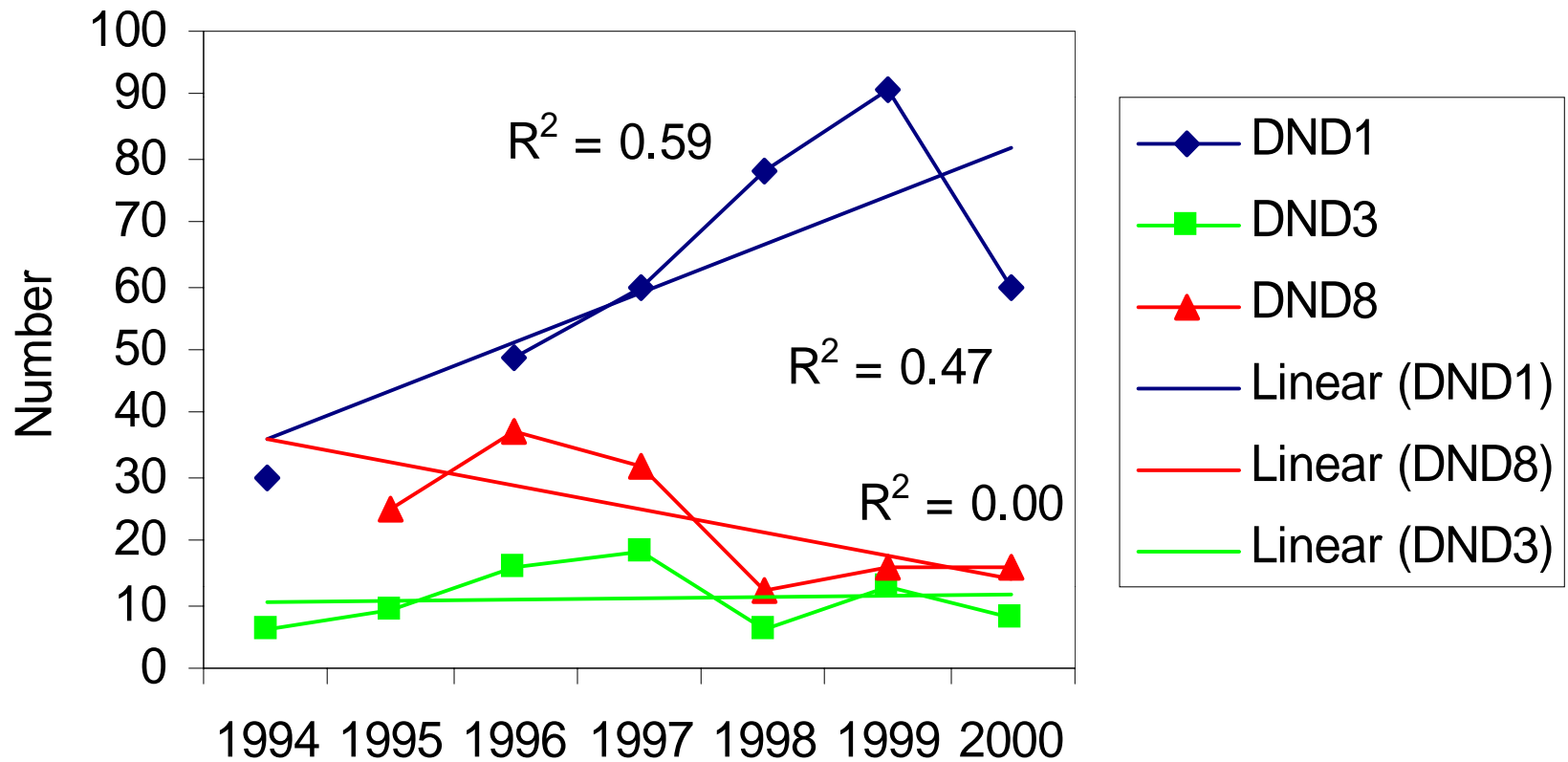


Figure 8. Indicated population of Canada Geese on before-after plots.

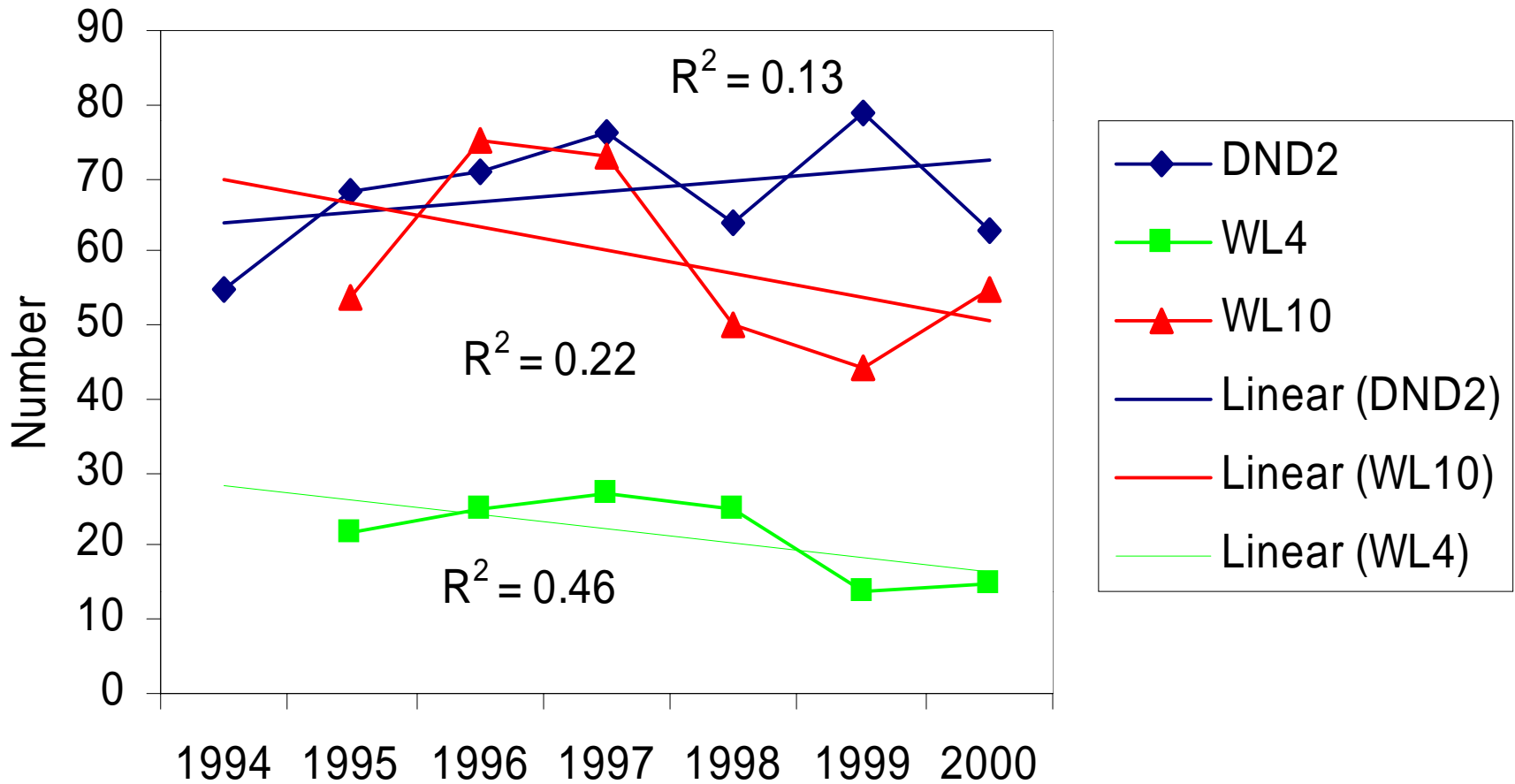


Figure 9. Indicated population of Canada Geese on control plots.

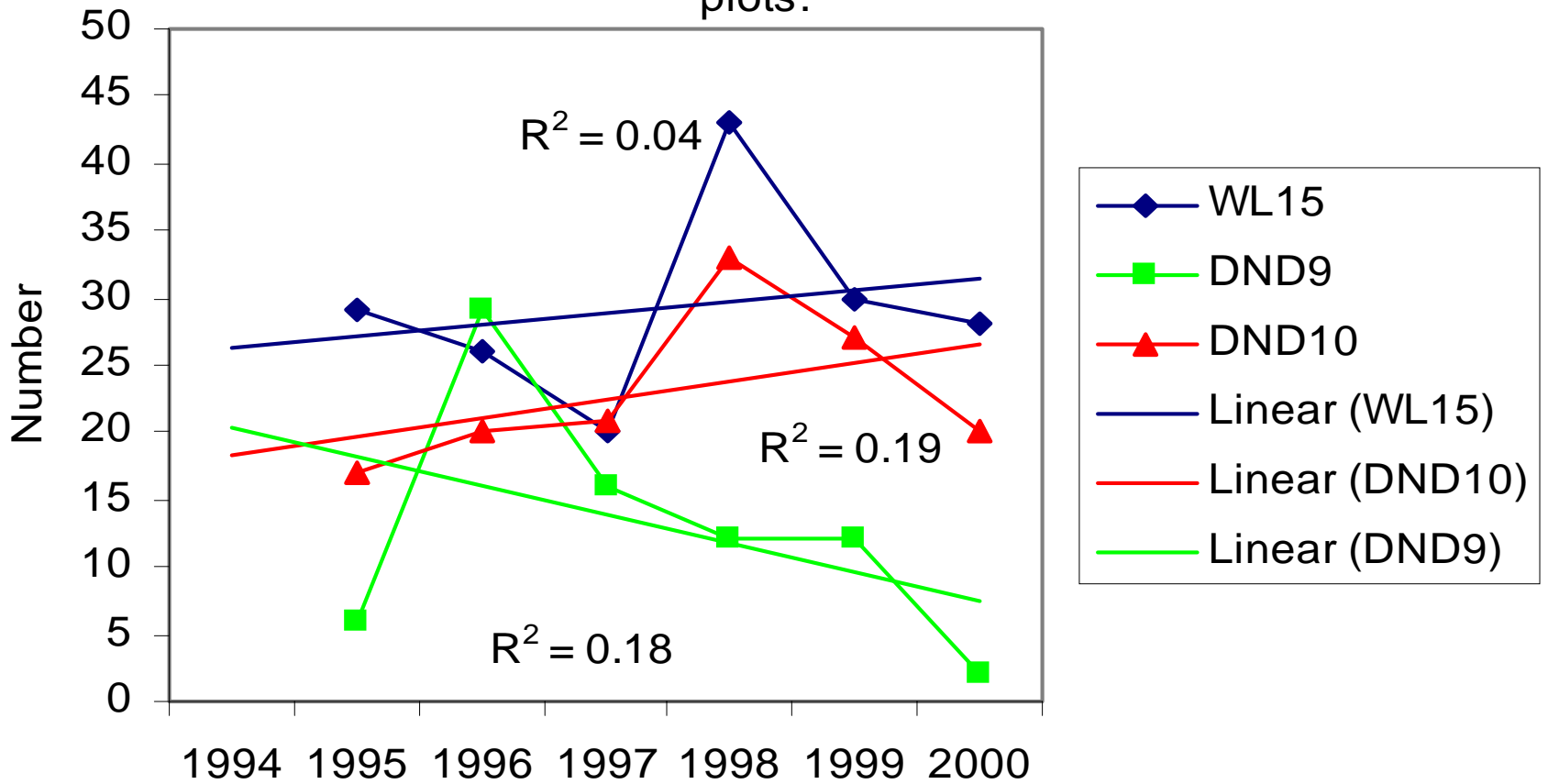
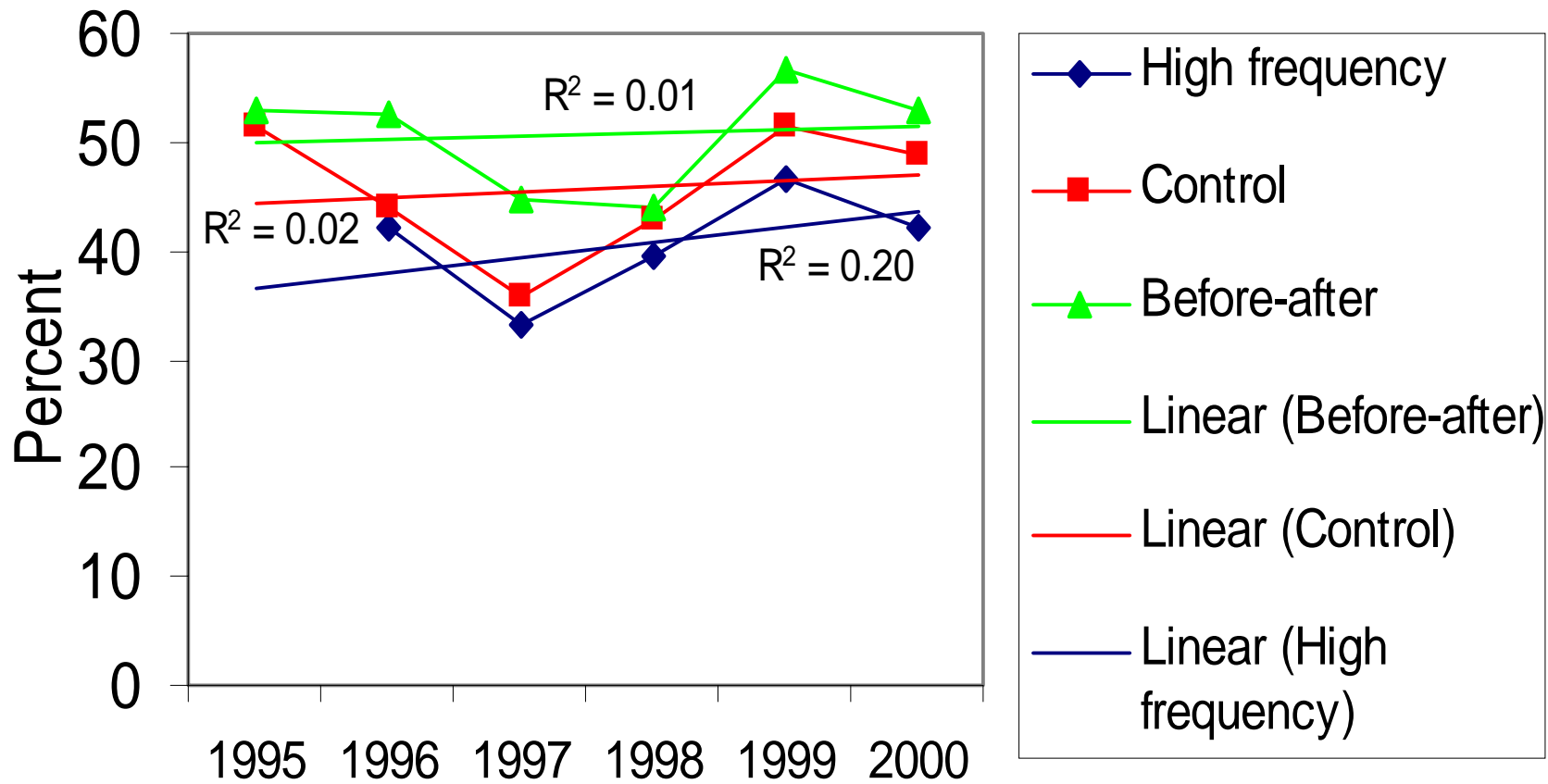


Figure 10. Dabblers as a percent of total ducks on high frequency, control and before-after plots.



Within Treatment and Across Year (p values)

		Plot	Year	Trend
Blk	BA	0.00	0.23	0.80
	C	0.02	0.63	0.24
	HF	0.00	0.44	0.63
CG	BA	0.00	0.12	0.03
	C	0.13	0.37	0.64
	HF	0.00	0.40	0.26

Estimates of Linear Trend-- Canada Goose

Treatment	Slope	p-value
BA	-0.20	0.03
C	-0.01	0.64
HF	-0.02	0.26

Treatment x Linear (p-values)

Species	Linear Trend	Treatment x Linear
Black Duck	0.17	0.13
Canada Goose	0.05	0.86

Estimates of Linear Trend for Treatment x Linear

Species	Treatment	Slope	p-value
Black Duck	Control	0.04	0.03
Canada Goose	Overall	-0.02	0.05

Power to detect trend differences of 5%

Species	Trend	6 Years	7 Years
Black Duck	5%	0.78	0.91
Canada Goose	5%	1.00	0.98

Summary

- Canada Geese showed a significant negative decrease on the before-after plots.
- Relationship to low-level jet activity specious as number of overflights were 41 times higher on high frequency plots.
- Canada Goose trends did differ across treatments.

Summary cont'd

- Overall Canada Goose numbers declined significantly.
- Black Ducks showed no significant differences in trends across treatments.
- Black Ducks linear trend for treatment x linear effect was significantly positive on the control plots.

Summary con't

- Good power to detect differences in population trends across treatments.

Conclusion

- Breeding population trends of Canada Geese and Black Ducks did not differ between overflown and non-overflown areas.
- Relative trend differences less than 5% would not have been detected.

Recommendations

- Increased precision could be achieved if plots were located in habitats with comparable breeding population densities.
- Increased precision can be achieved by continuation of surveys, e.g. two consecutive years at three year intervals.

Recommendations cont'd

- Increased precision could be achieved with:
 - a. Control and treatment plots in homogeneous habitats.
 - b. 7-10 plots in overflow and non-overflow areas.
 - c. Directed overflights for 5+ years.
 - d. BACI design.

Acknowledgements

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