Monitoring long-term vegetation changes (1953-2018) in an alpine tundra ecosystem of the Italian Central Alps

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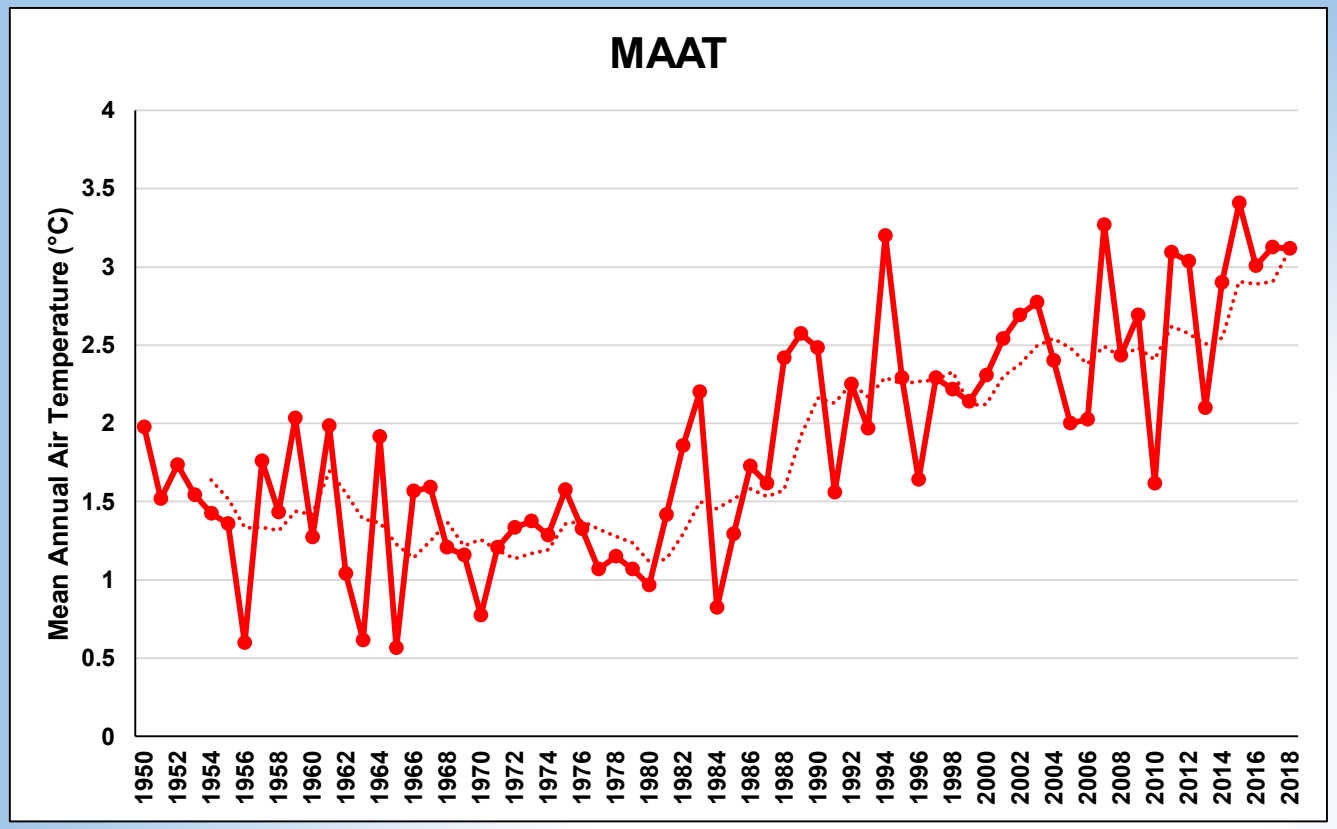
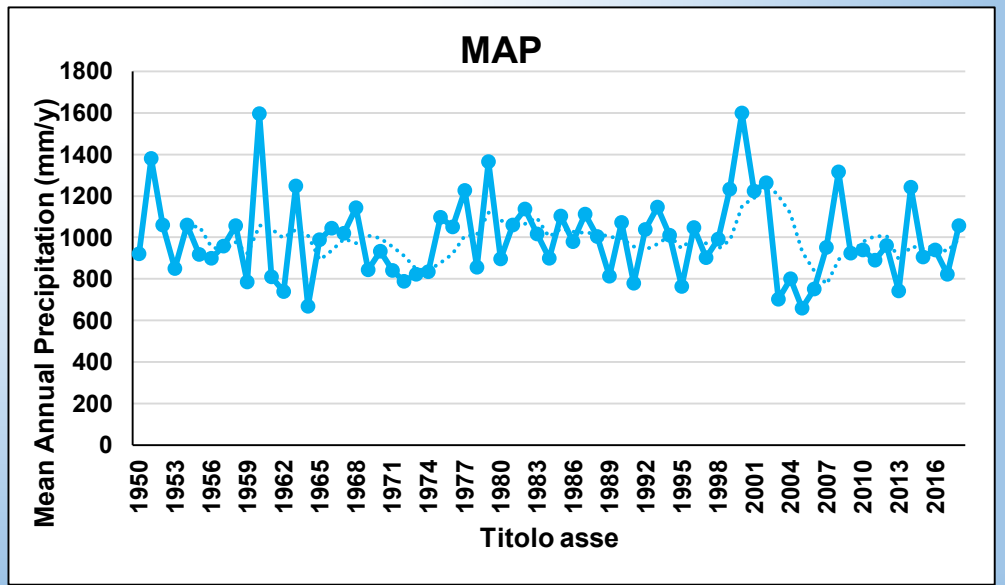
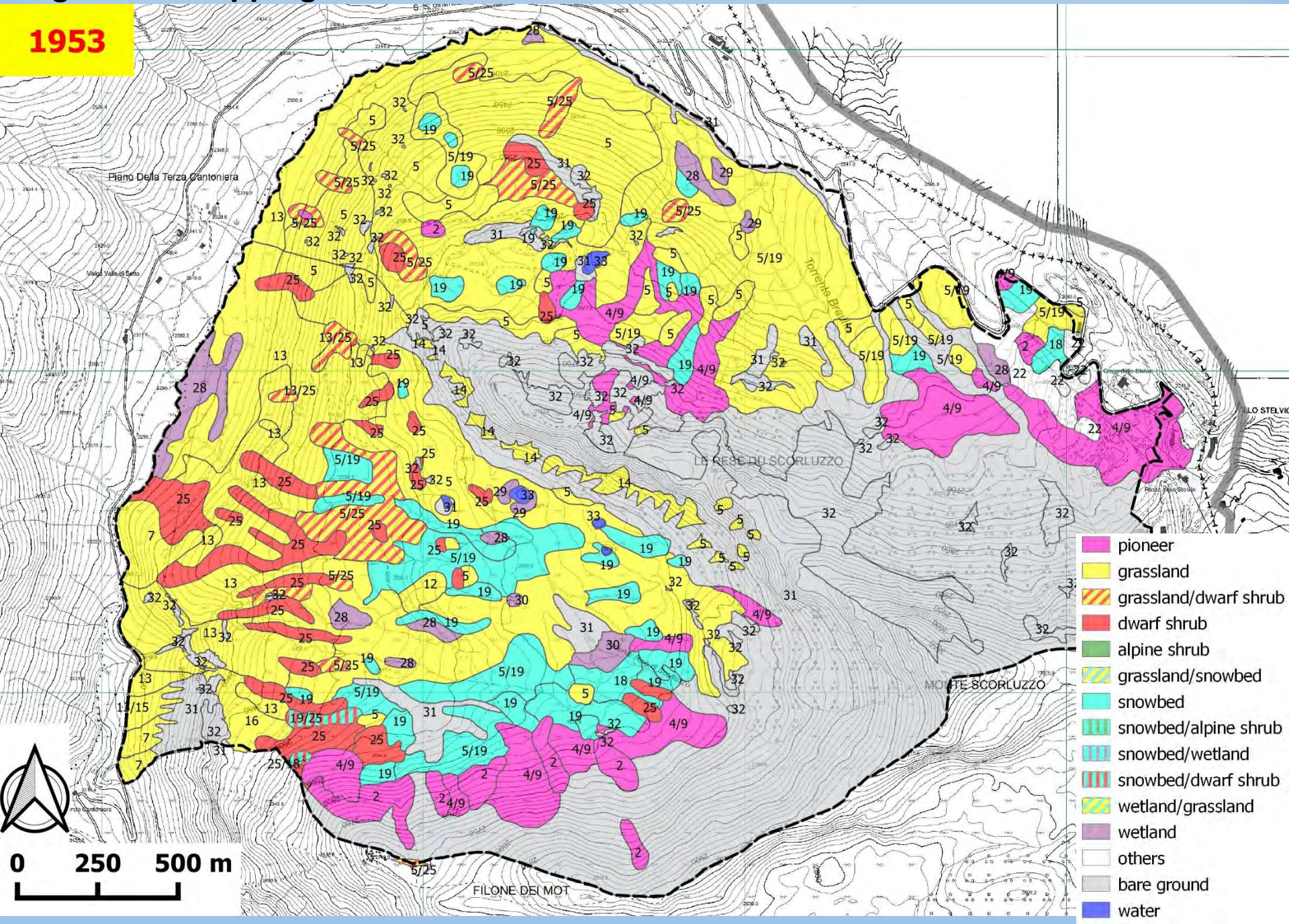
Climate


MAAT
Mean Annual Air Temperature (°C)
4
3.5
3
2.5
2
1.5
1
0.5
0
1950 1952 1954 1956 1958 1960 1962 1964 1966 1968 1970 1972 1974 1976 1978 1980 1982 1984 1986 1988 1990 1992 1994 1996 1998 2000 2002 2004 2006 2008 2010 2012 2014 2016 2018


MAP
Mean Annual Precipitation (mm/y)
1800
1600
1400
1200
1000
800
600
400
200
0
1950 1953 1956 1959 1962 1965 1968 1971 1974 1977 1980 1983 1986 1989 1992 1995 1998 2001 2004 2007 2010 2013 2016
Titolo asse

Vegetation Mapping: CHANGES 1953-2003-2018



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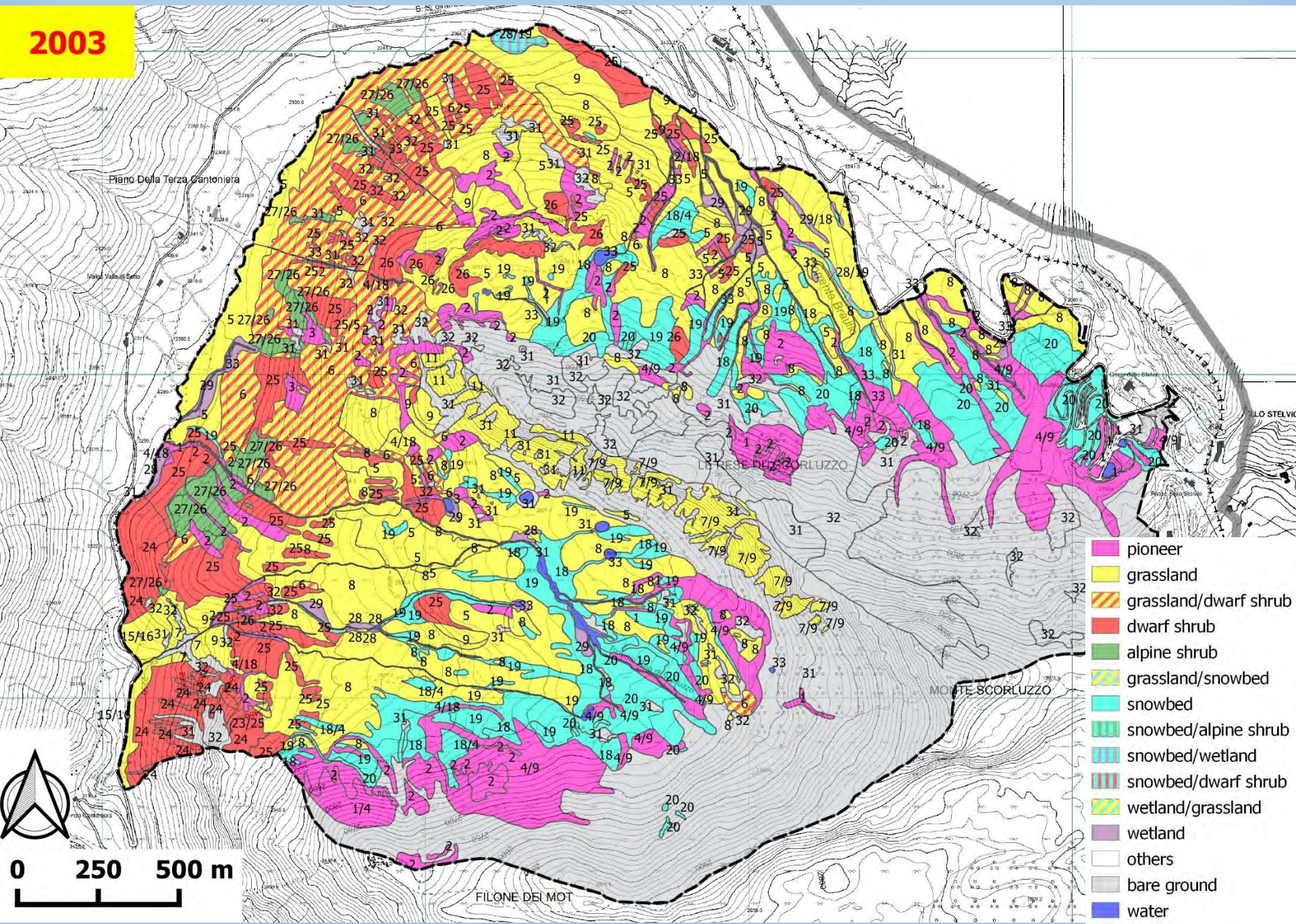
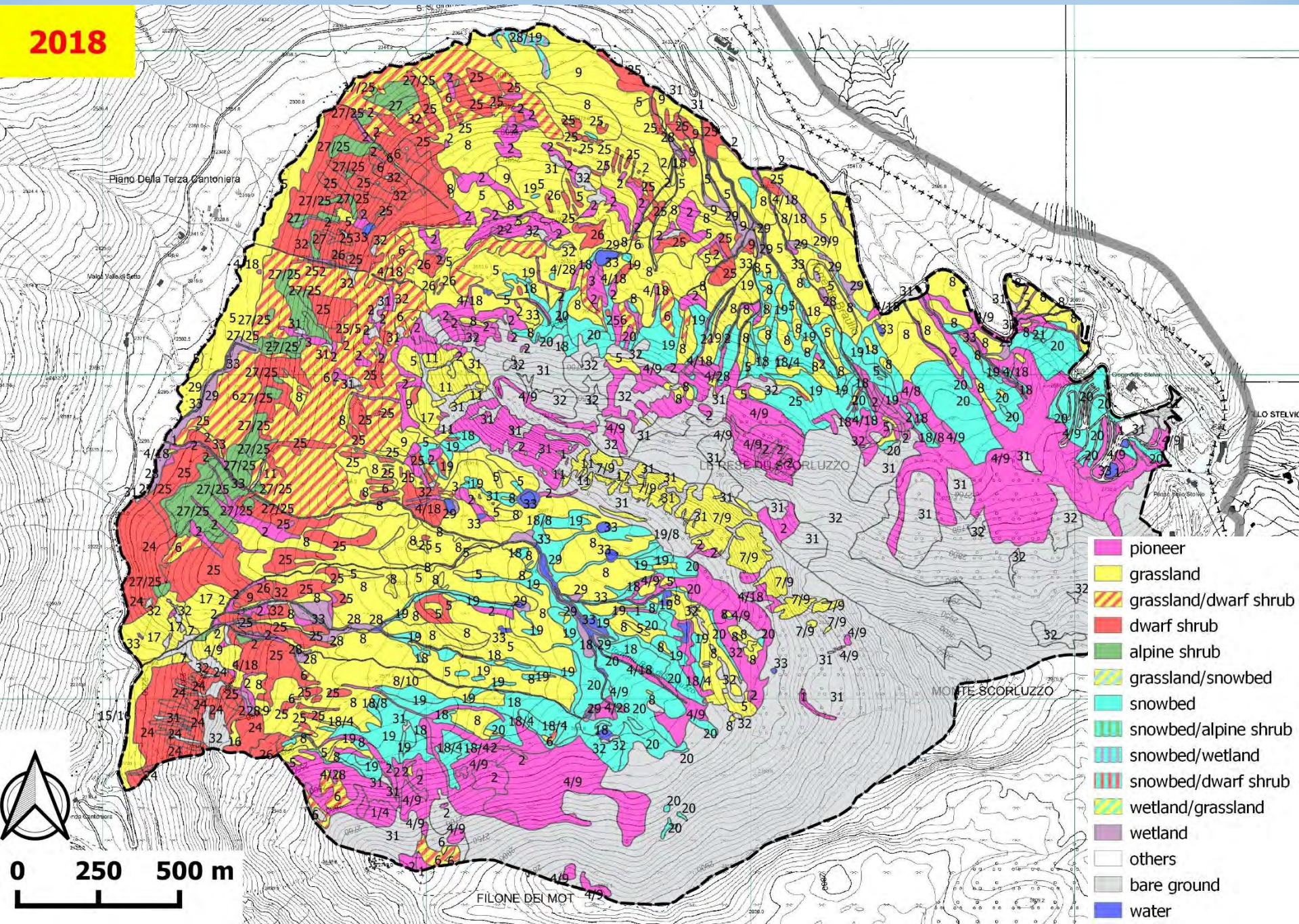


Vegetation Mapping: CHANGES 1953-2003-2018



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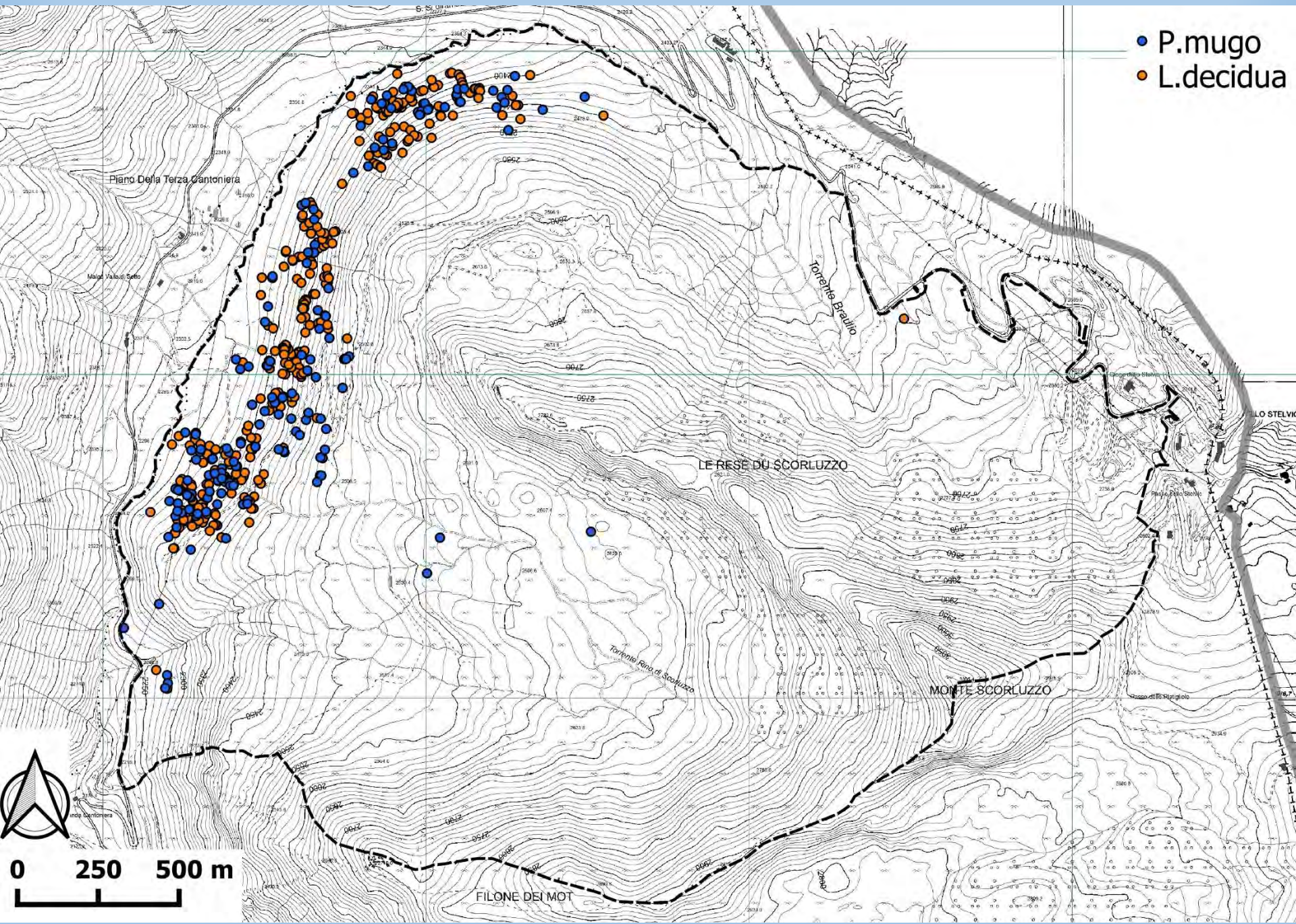

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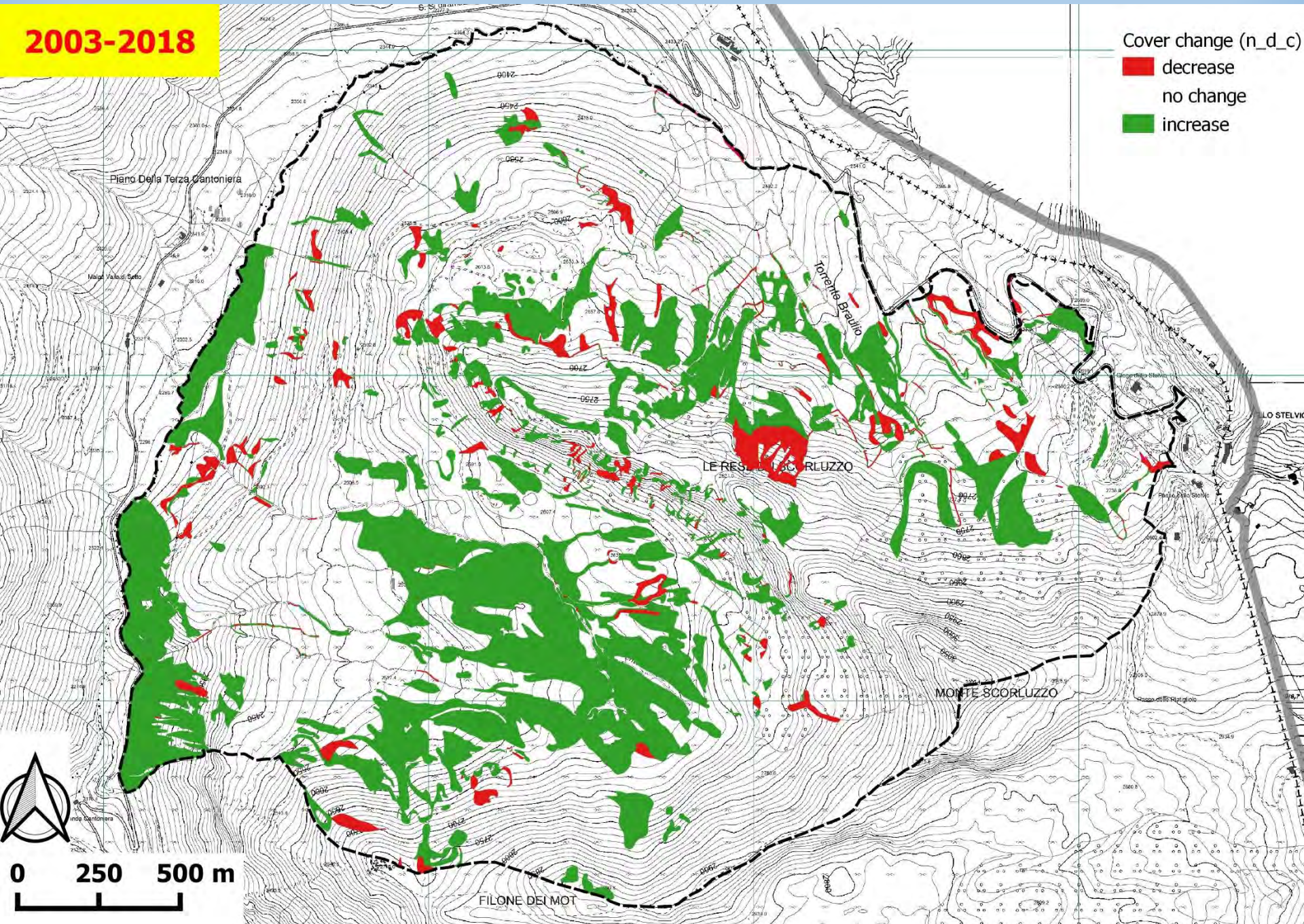

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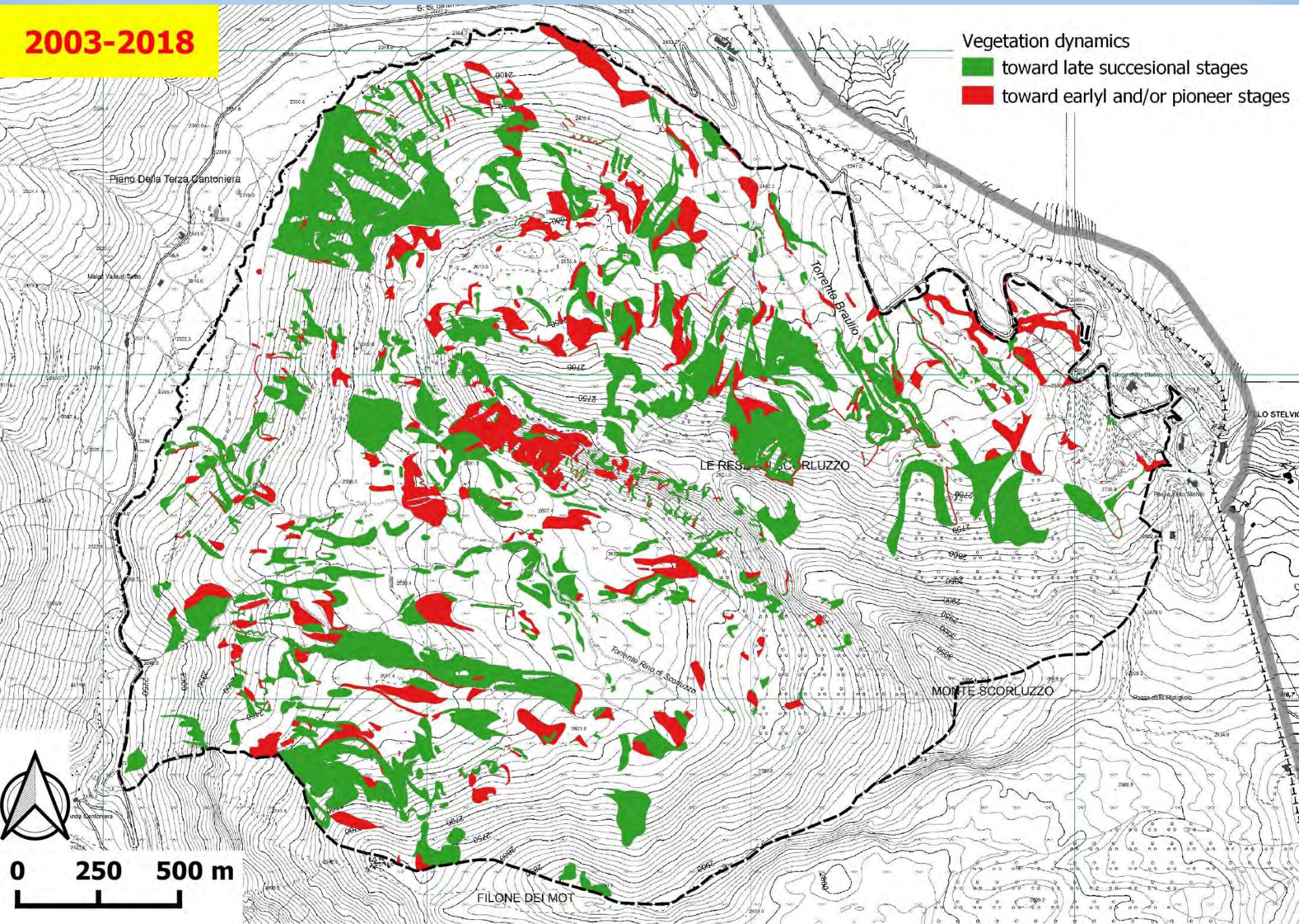

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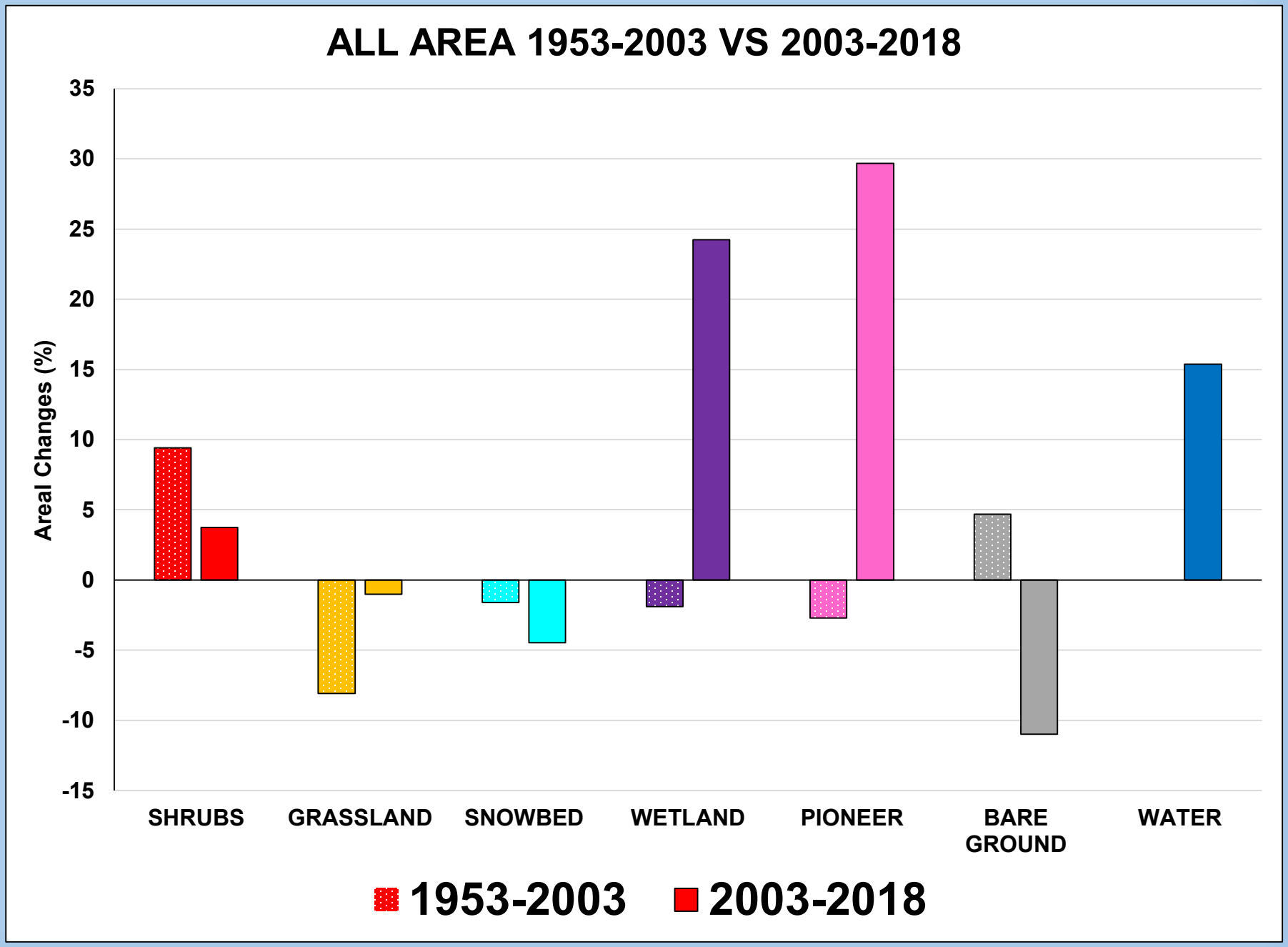
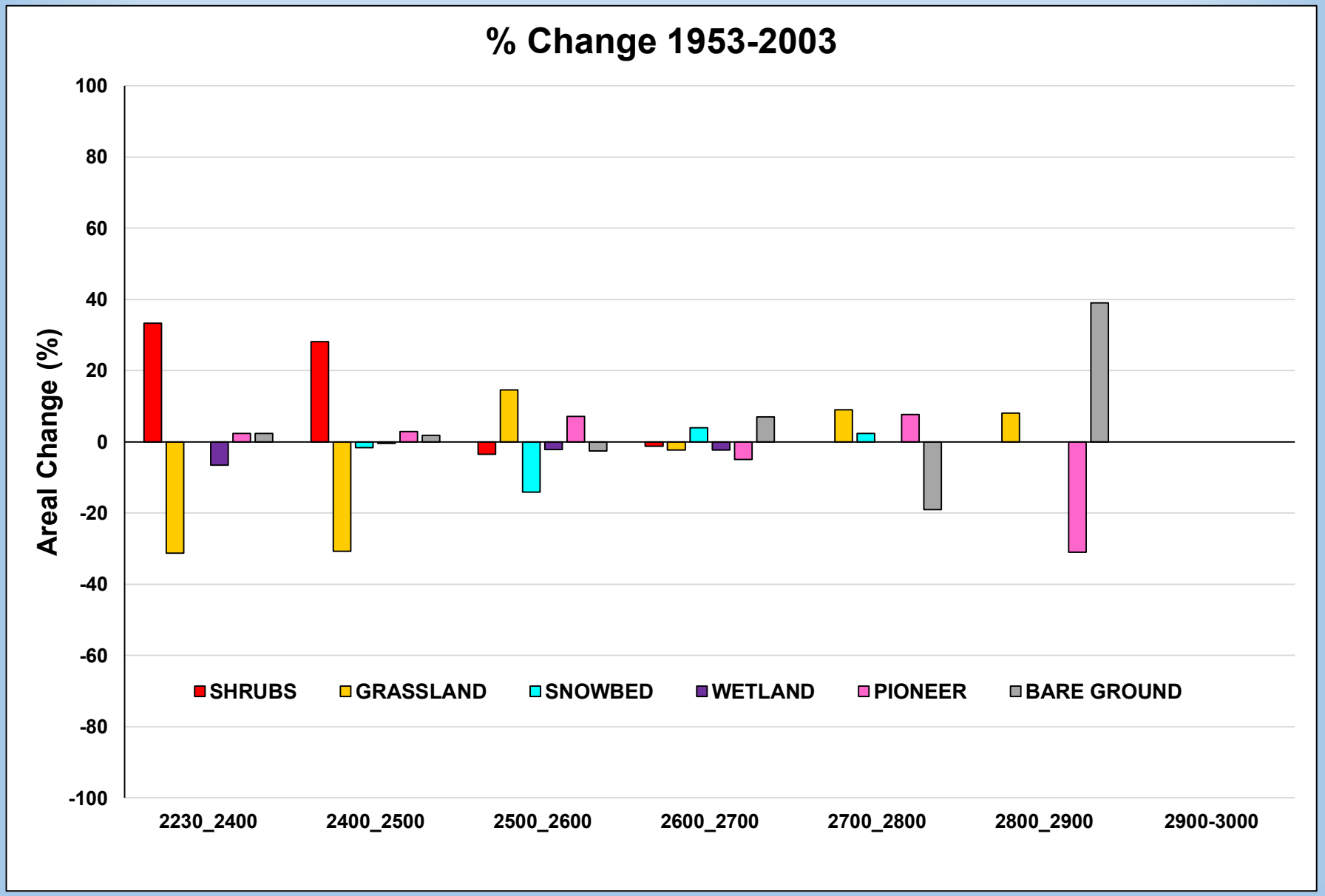


Vegetation Mapping: CHANGES 1953-2003-2018

Ecological Series



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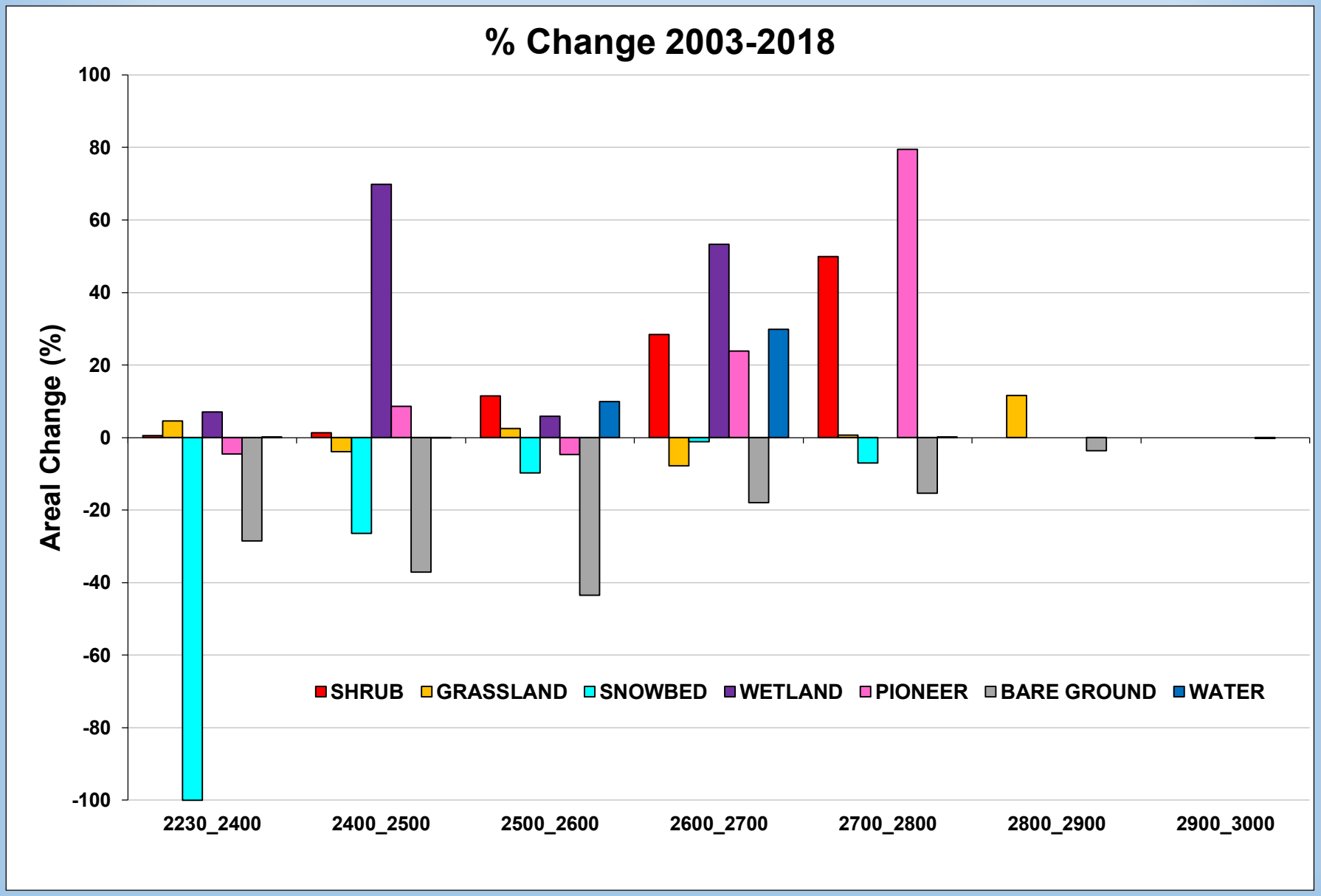
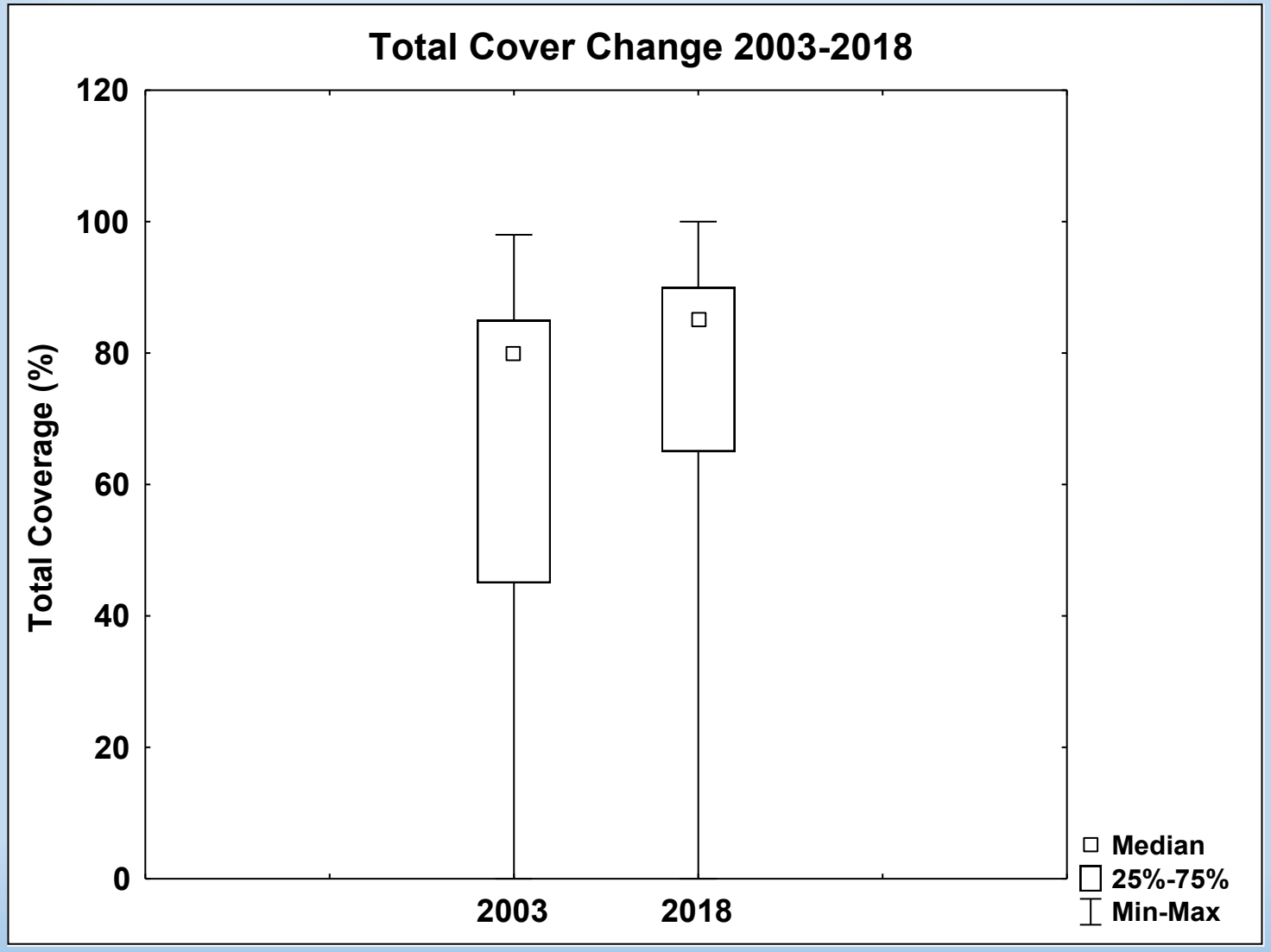
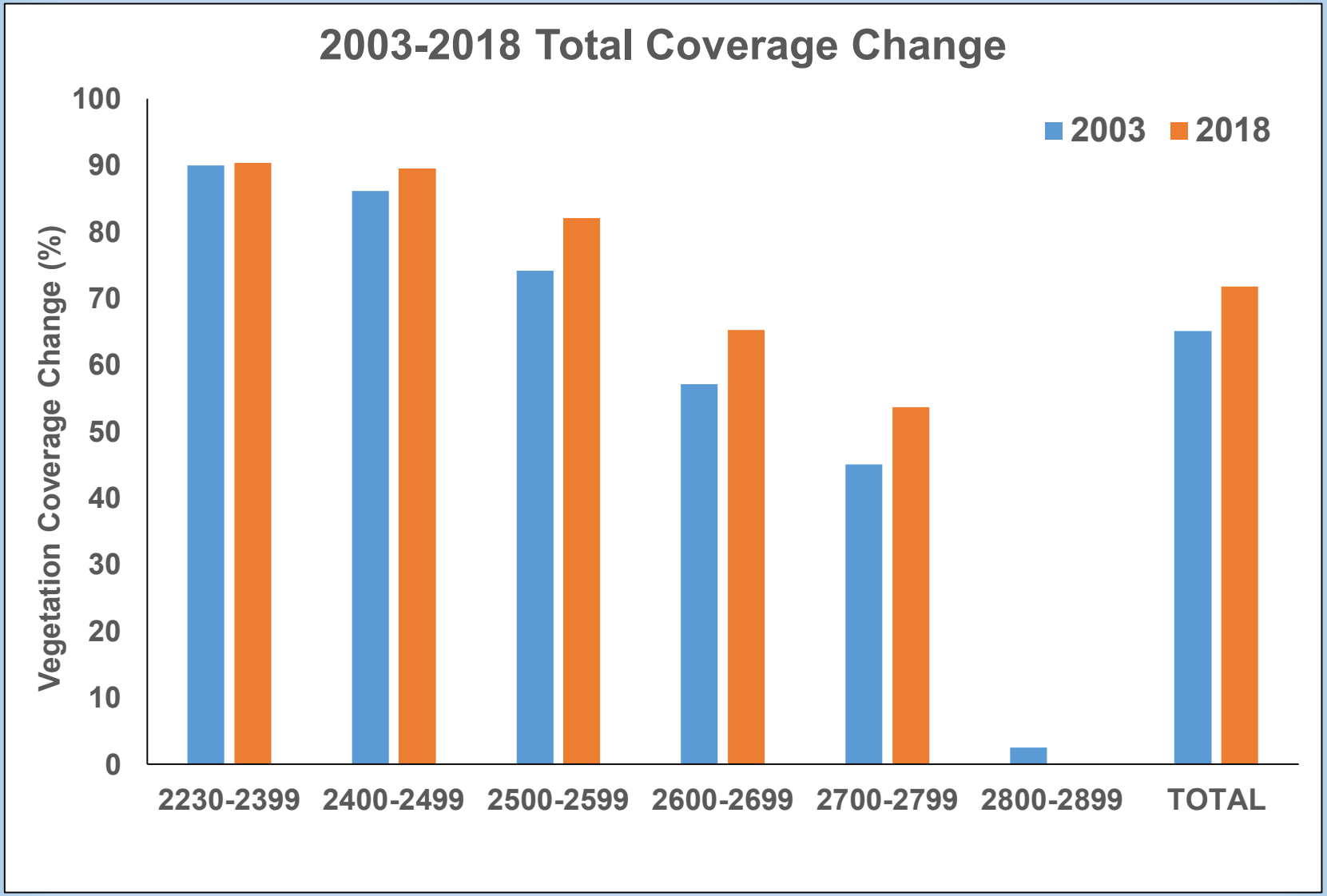
Ecological Series



Analysis of the phytosociological relevés:
143 relevés (2003)
143 relevés (2018)



Analysis of the phytosociological relevés (2003-2018)



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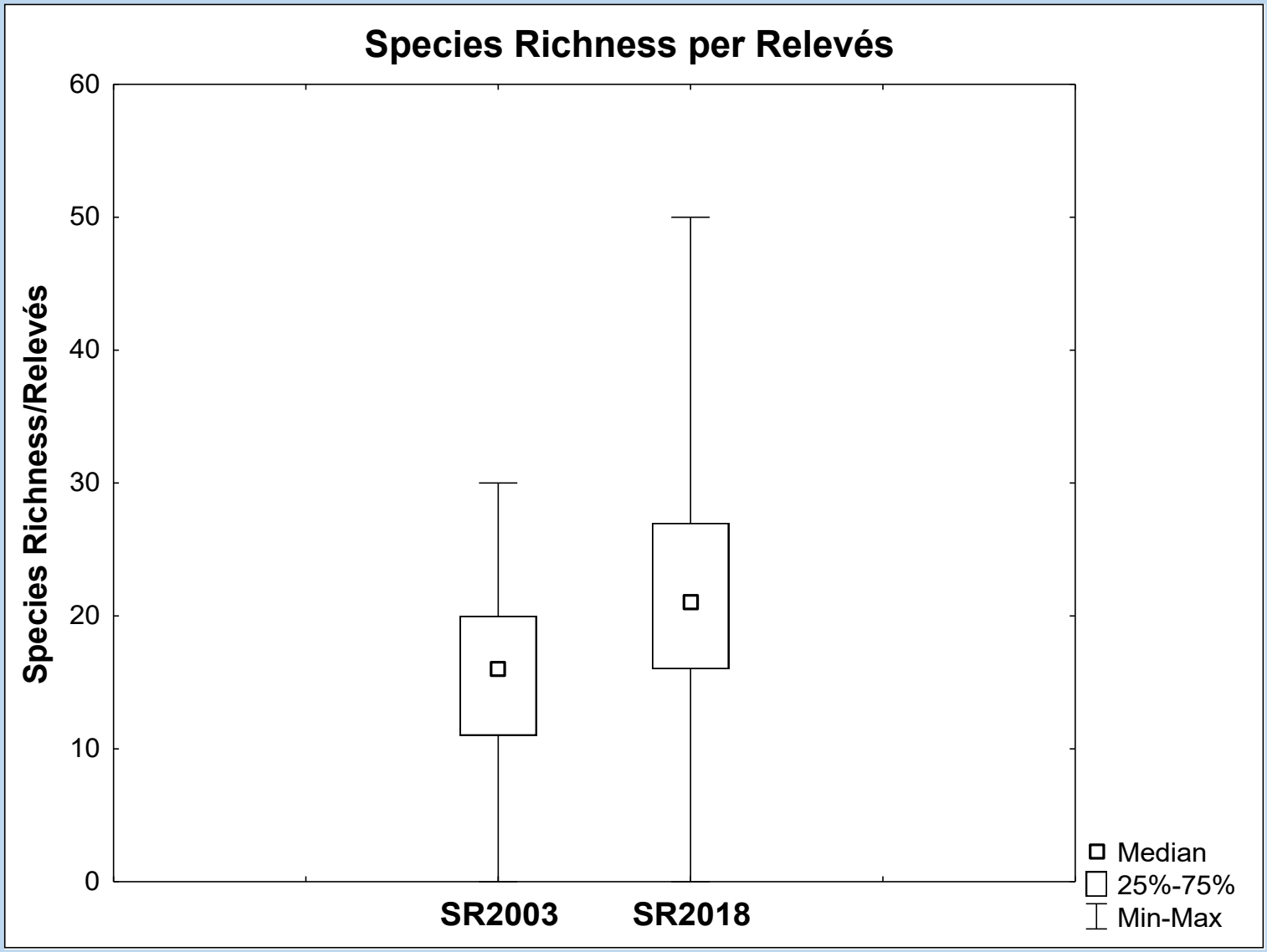

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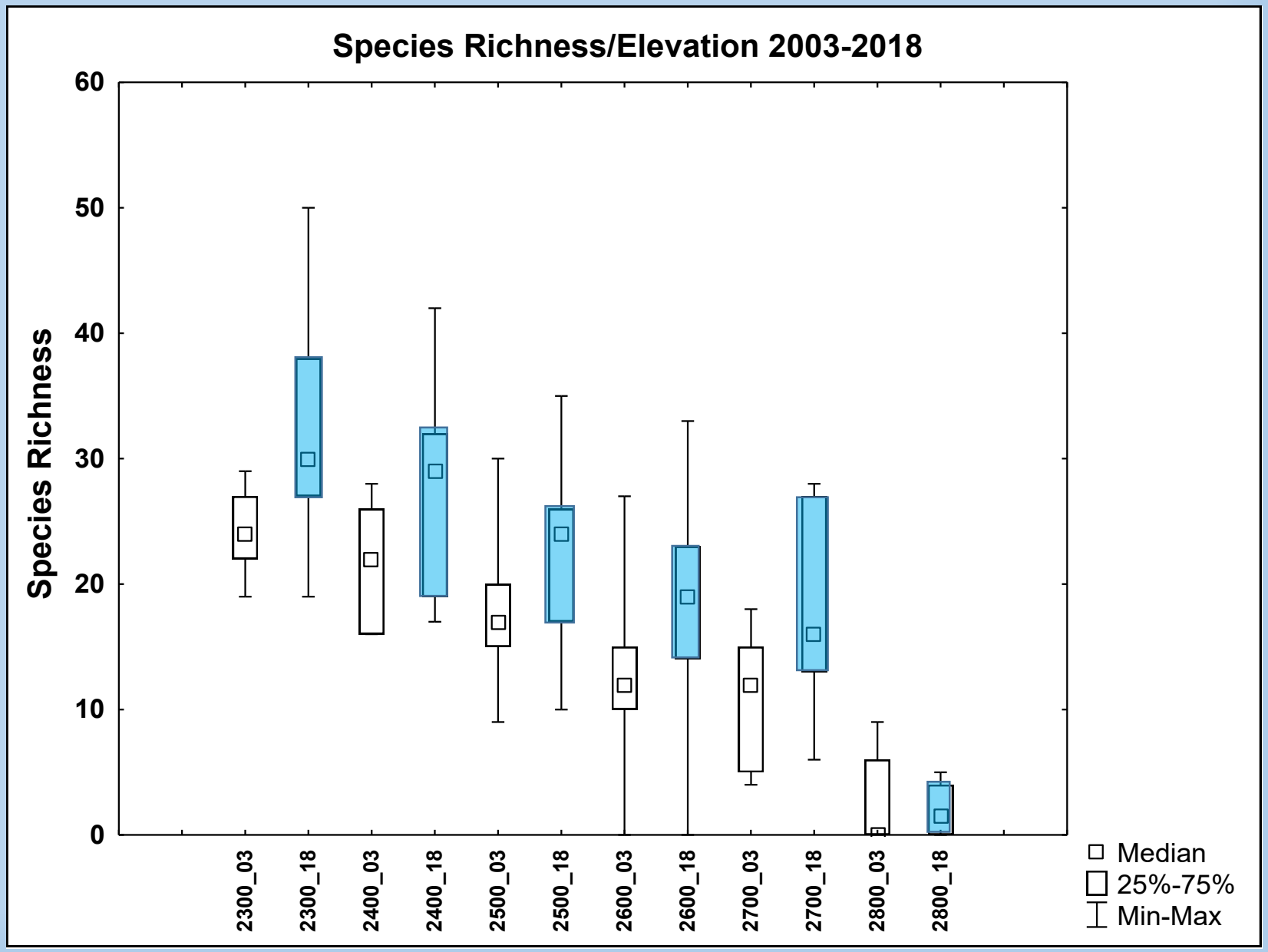

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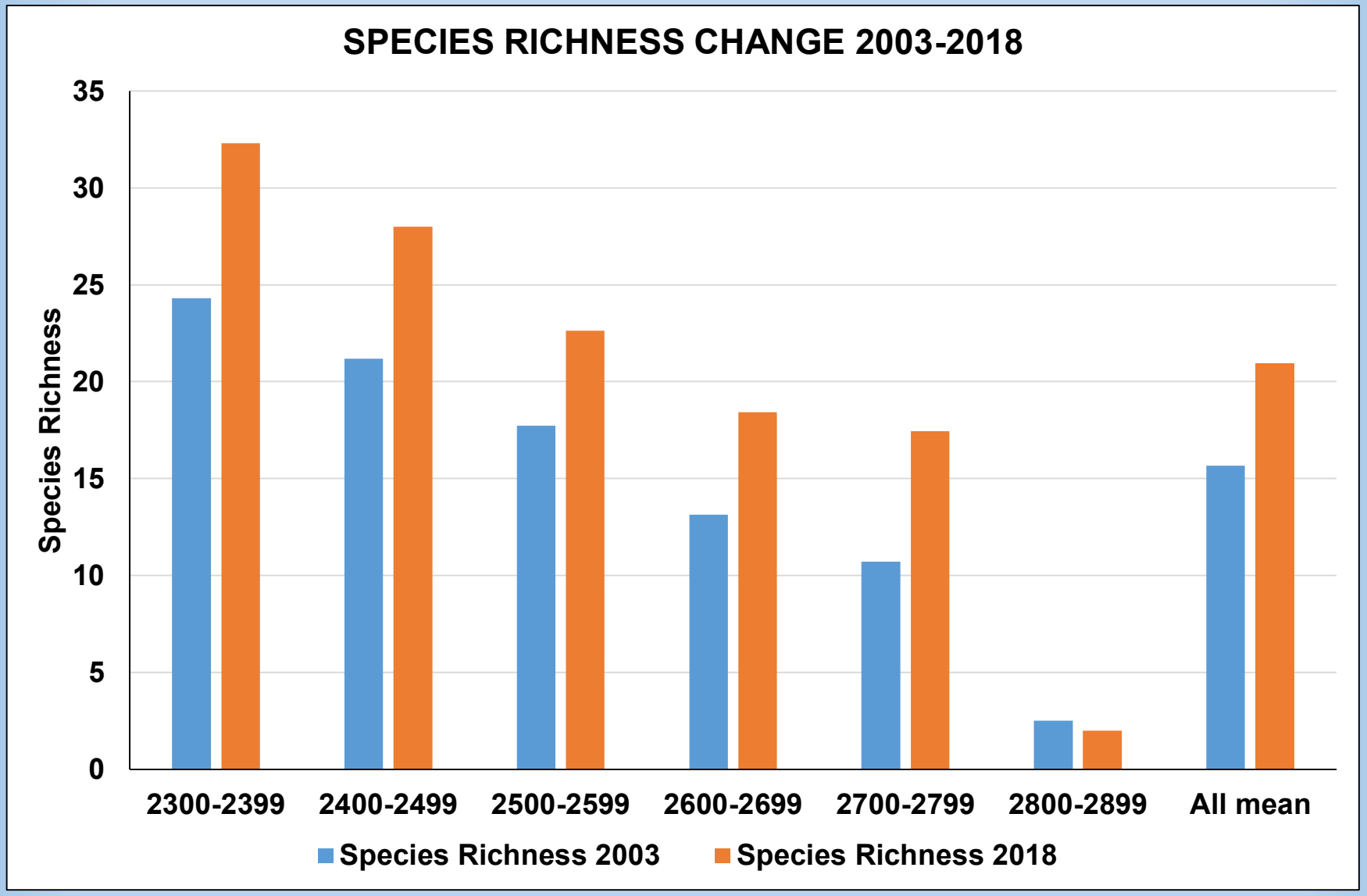
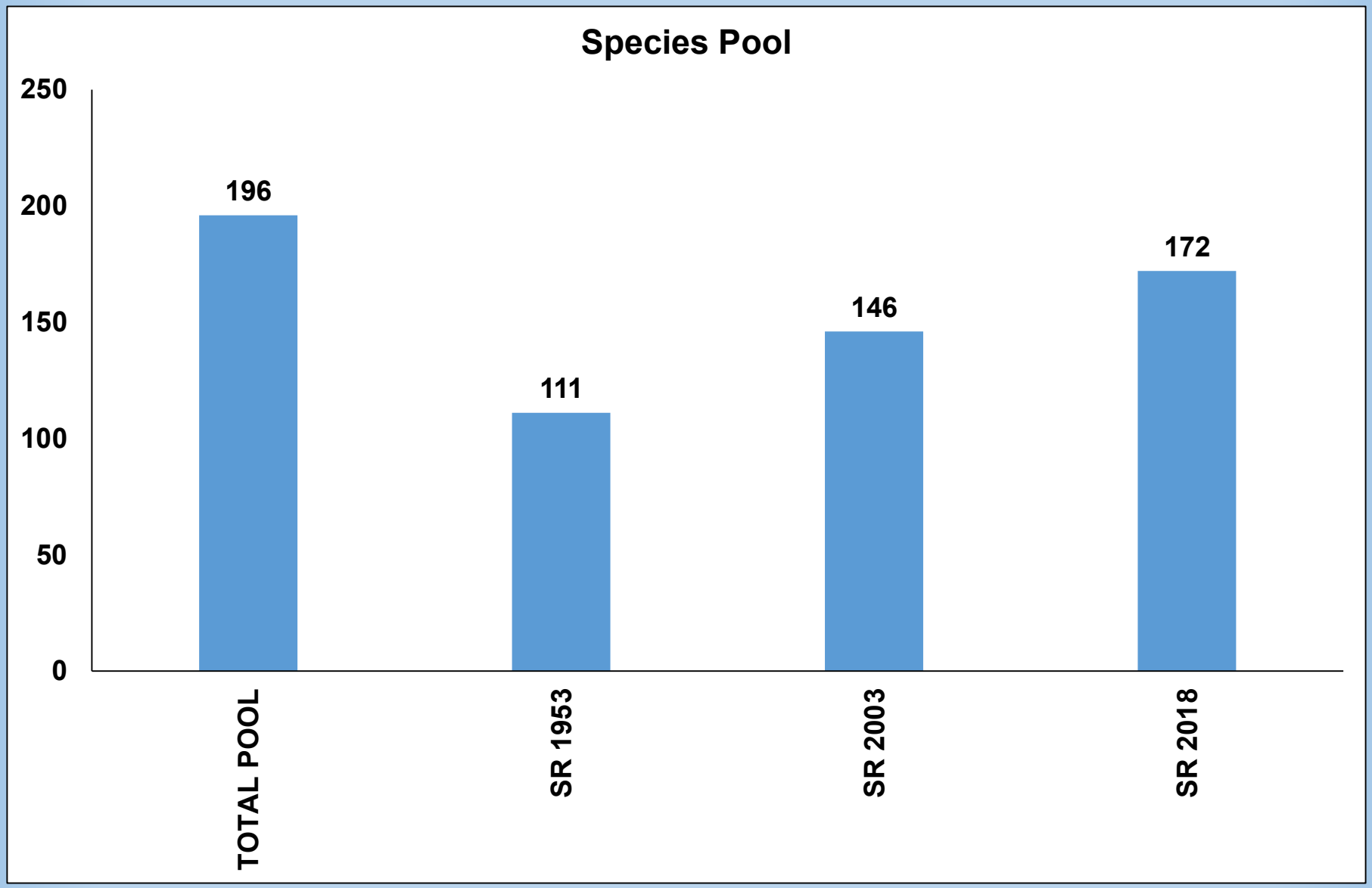
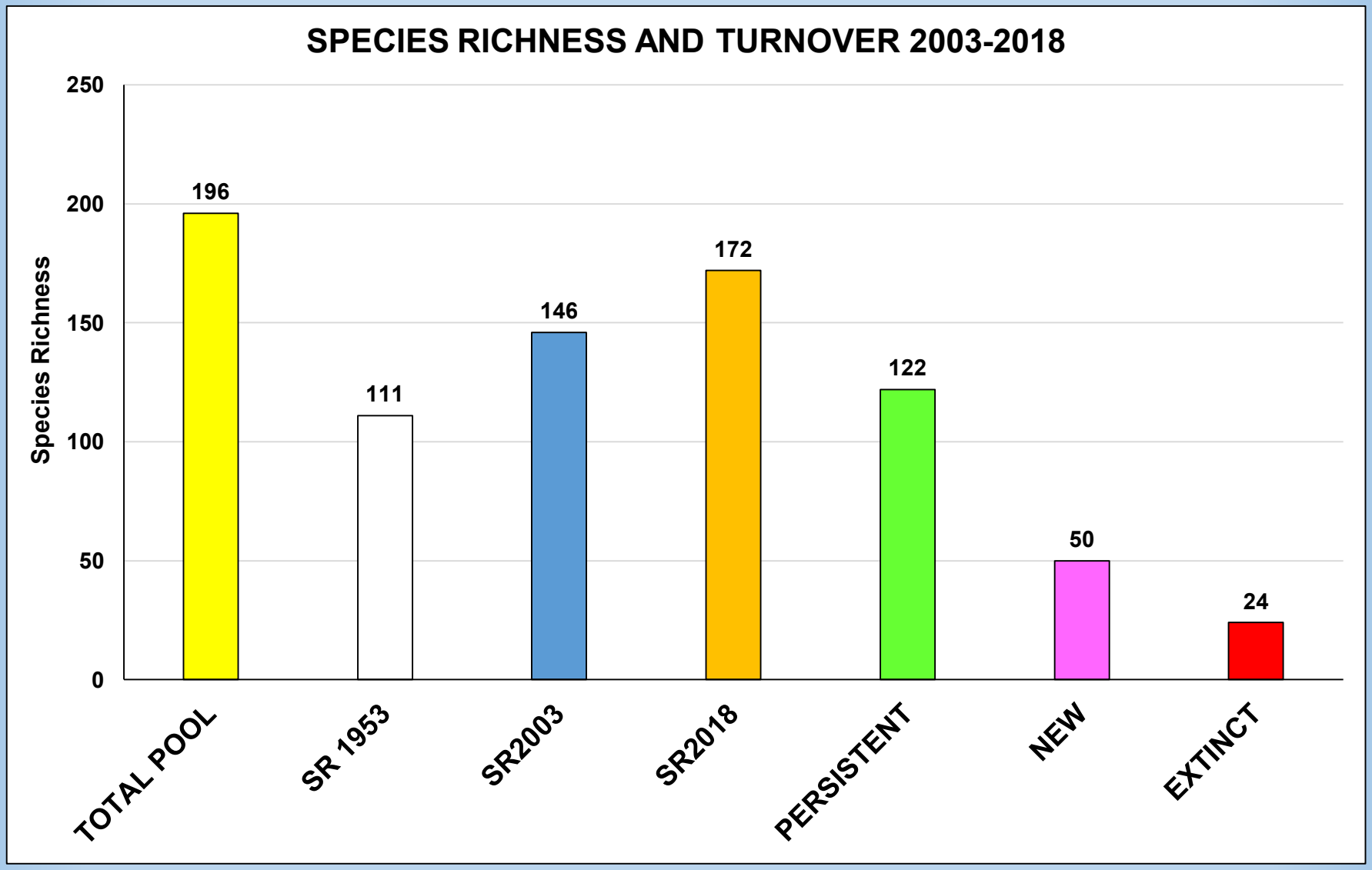


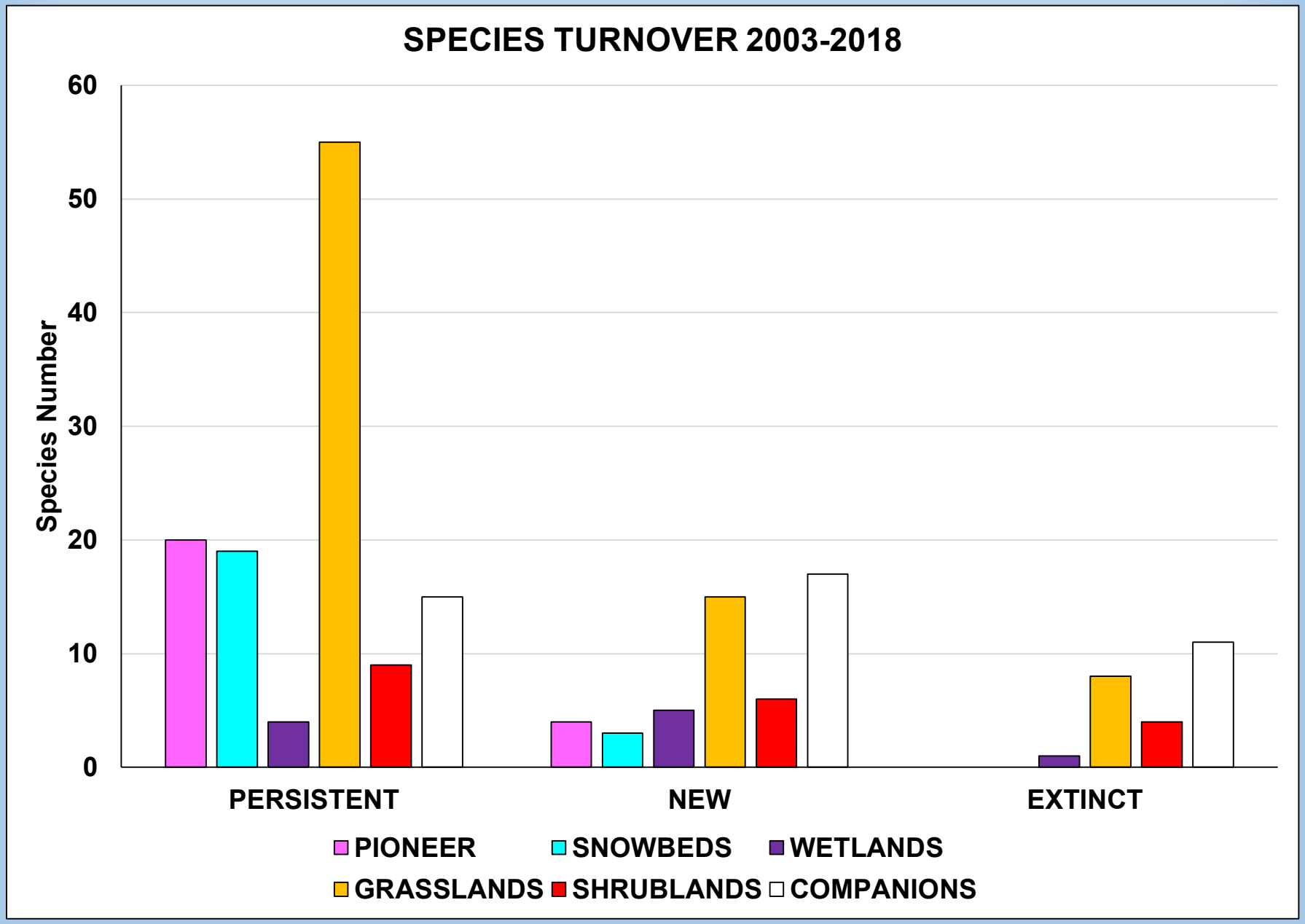
1953-2003-2018



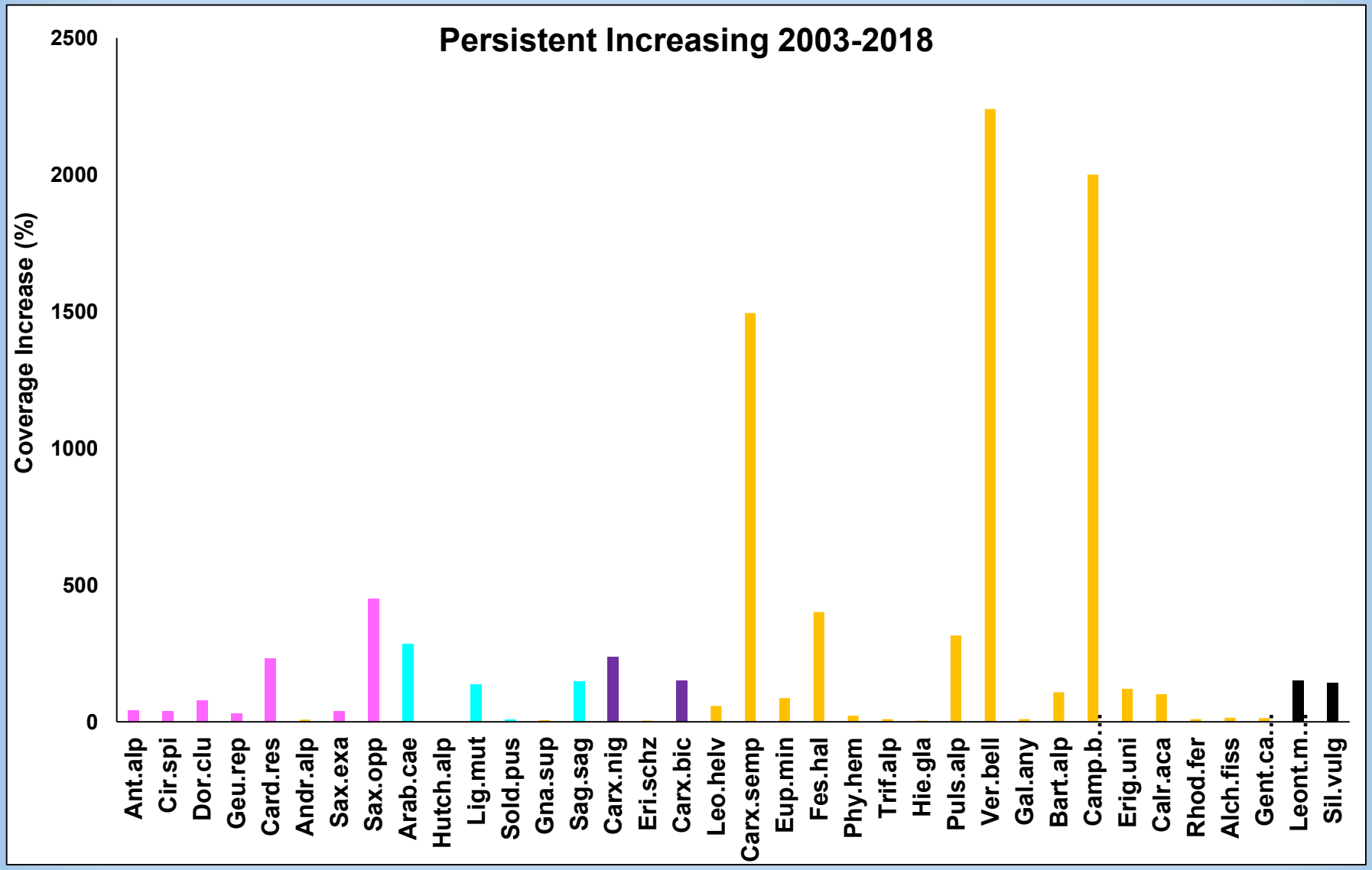
Analysis of the phytosociological relevés (2003-2018)



Analysis of the phytosociological relevés (2003-2018)

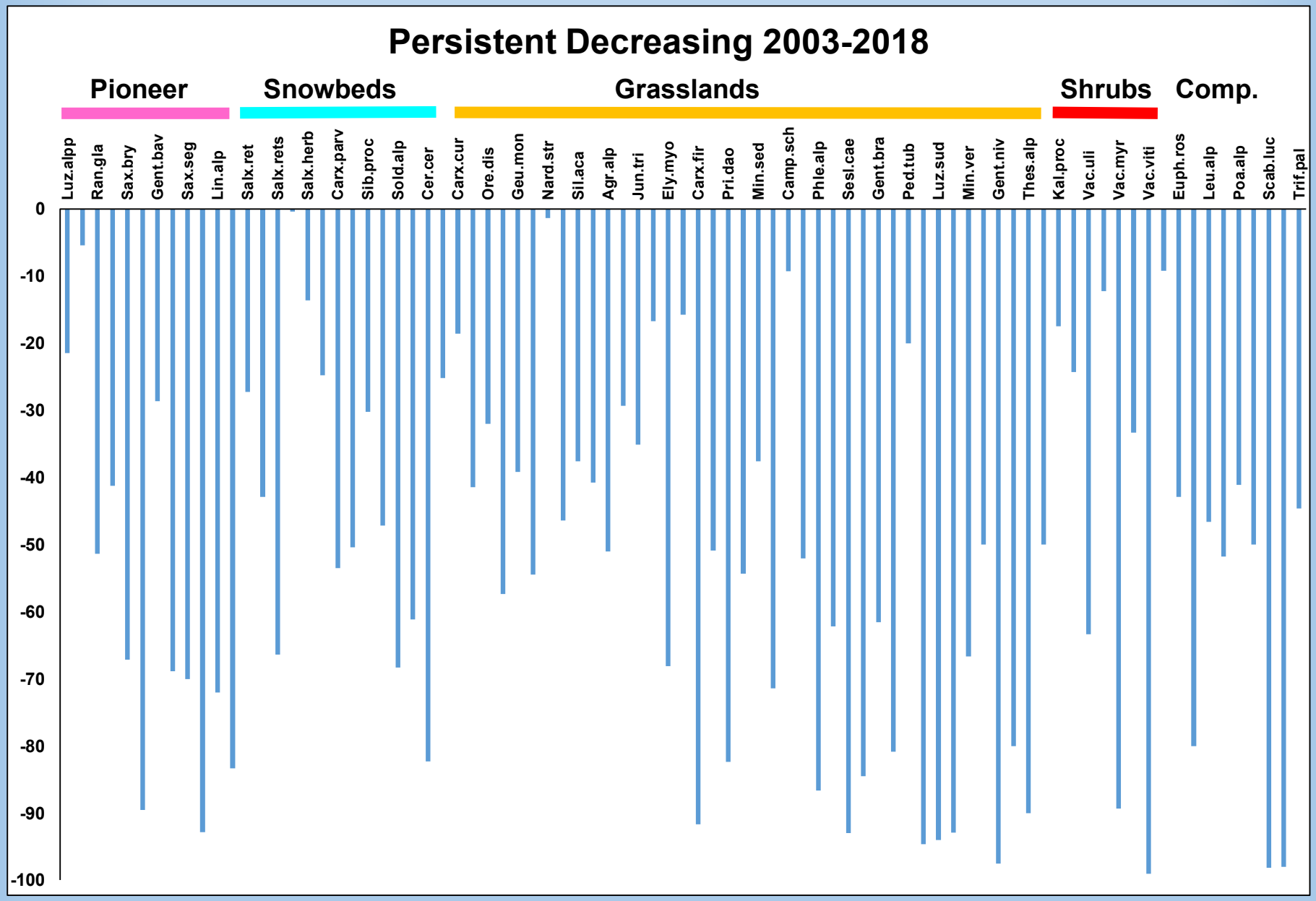


Analysis of the phytosociological relevés (2003-2018)



Only 32 (of the 122) persisting species are increasing their coverage

Analysis of the phytosociological relevés (2003-2018)



84 (of 122) persisting species are decreasing their coverage

Conclusions

- Vegetation is showing fast responses to climate change with an acceleration in the last 15 years
- CC impacts prosecute at different ecological levels from species to community to landscape
- The limited impacts detected above 2600 m in 2003 were due to permafrost degradation, providing a barrier to upward migration
- Permafrost degradation is now occurring at higher elevations (> 2800 m) and its limitation is less effective, allowing vegetation development
- Snowbeds are retreating and being sustituted by wetlands (probably due to earlier snowmelting)
- Shrub encroachment is prosecuting at higher elevations
- Trees are now colonizing the area where shrub expanded in 1953-2003


THANK YOU FOR YOUR ATTENTION!!!