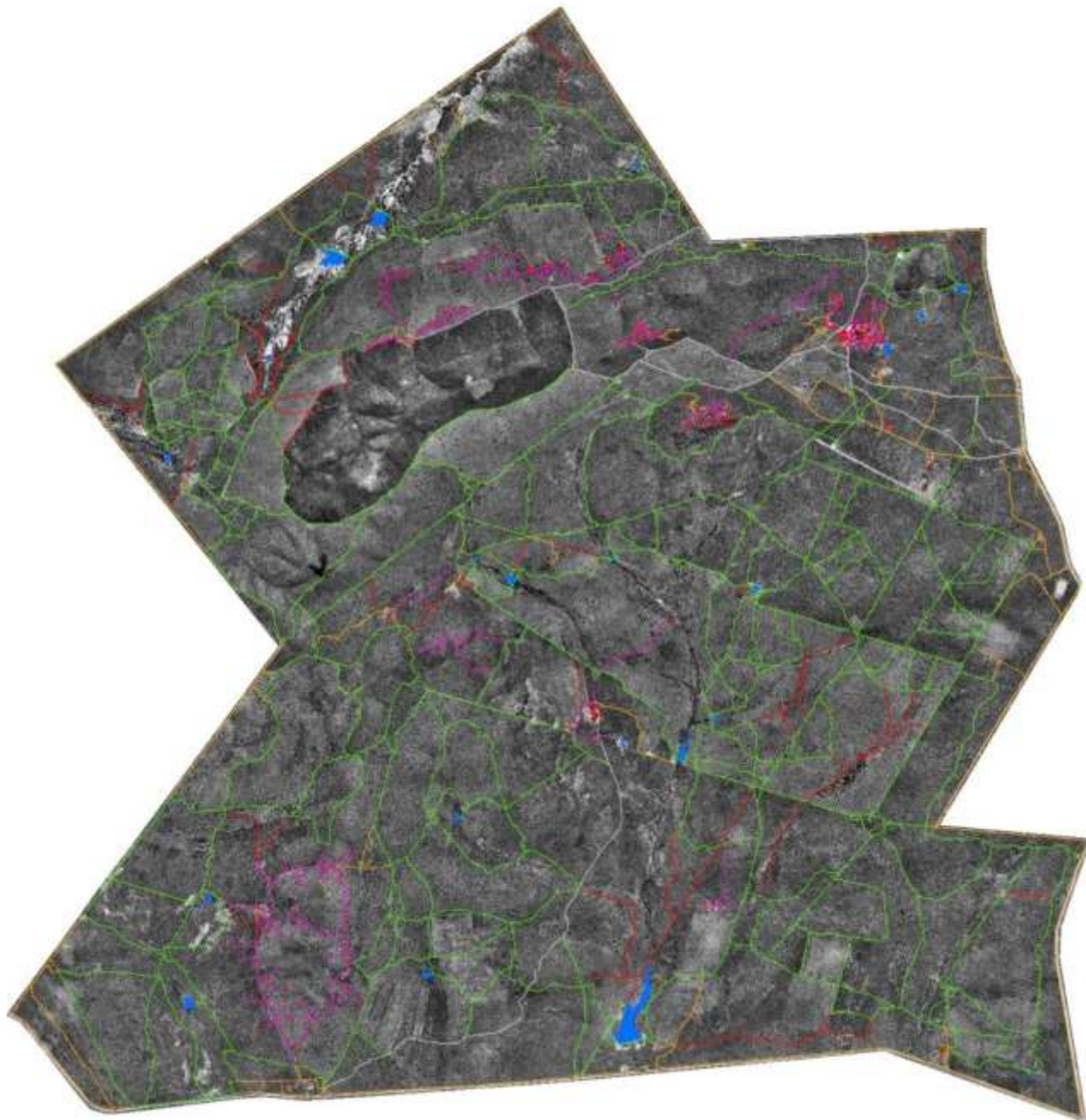


**AN ALTERNATIVE HYPOTHESIS FOR THE CAUSE OF
BUSH ENCROACHMENT
IN THE WATERBERG SOURVELD AND THE POSSIBLE
CONSEQUENCES FOR
GAME RESERVE MANAGEMENT.**



MABULA GAME RESERVE



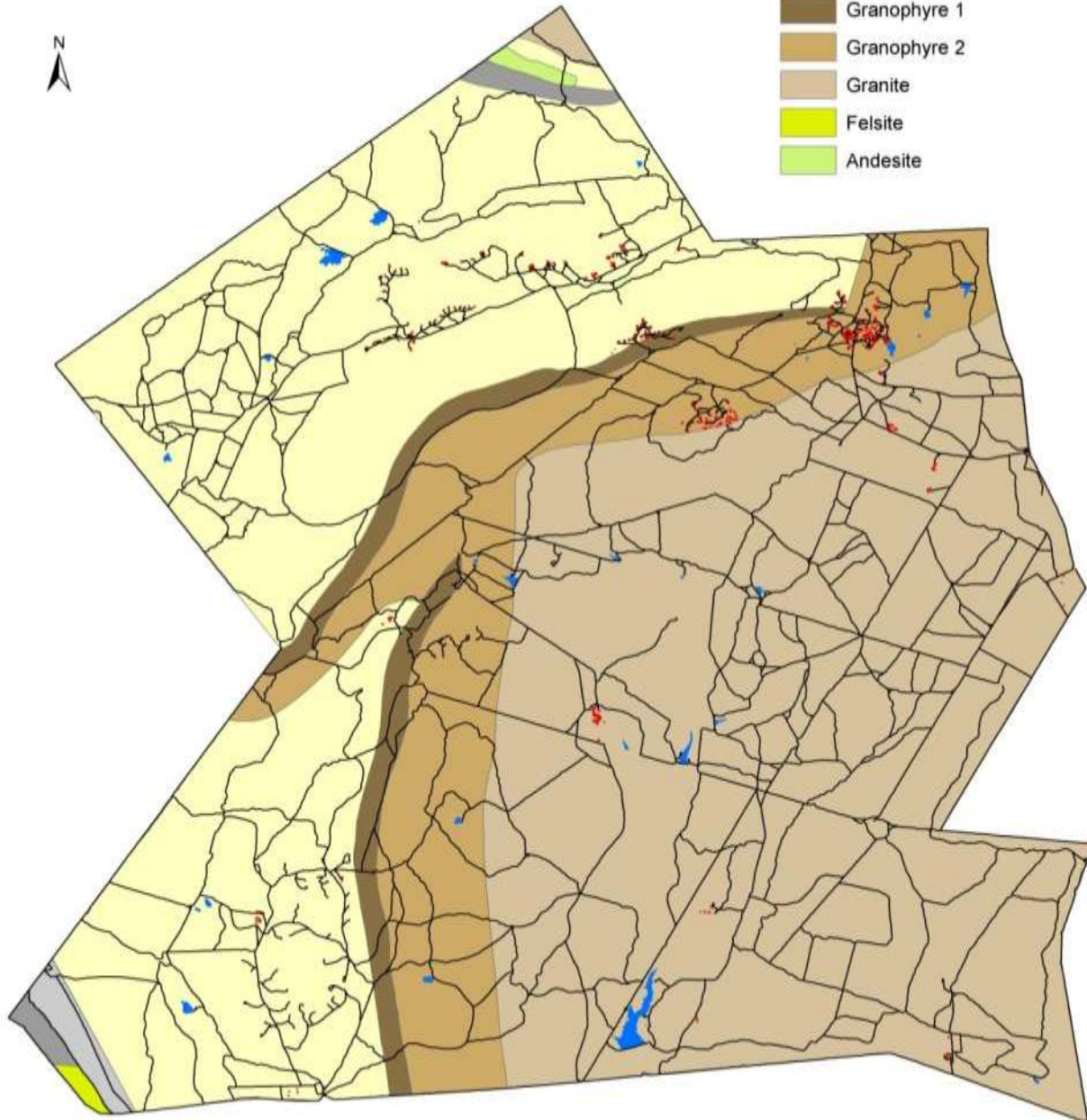


MABULA GAME RESERVE

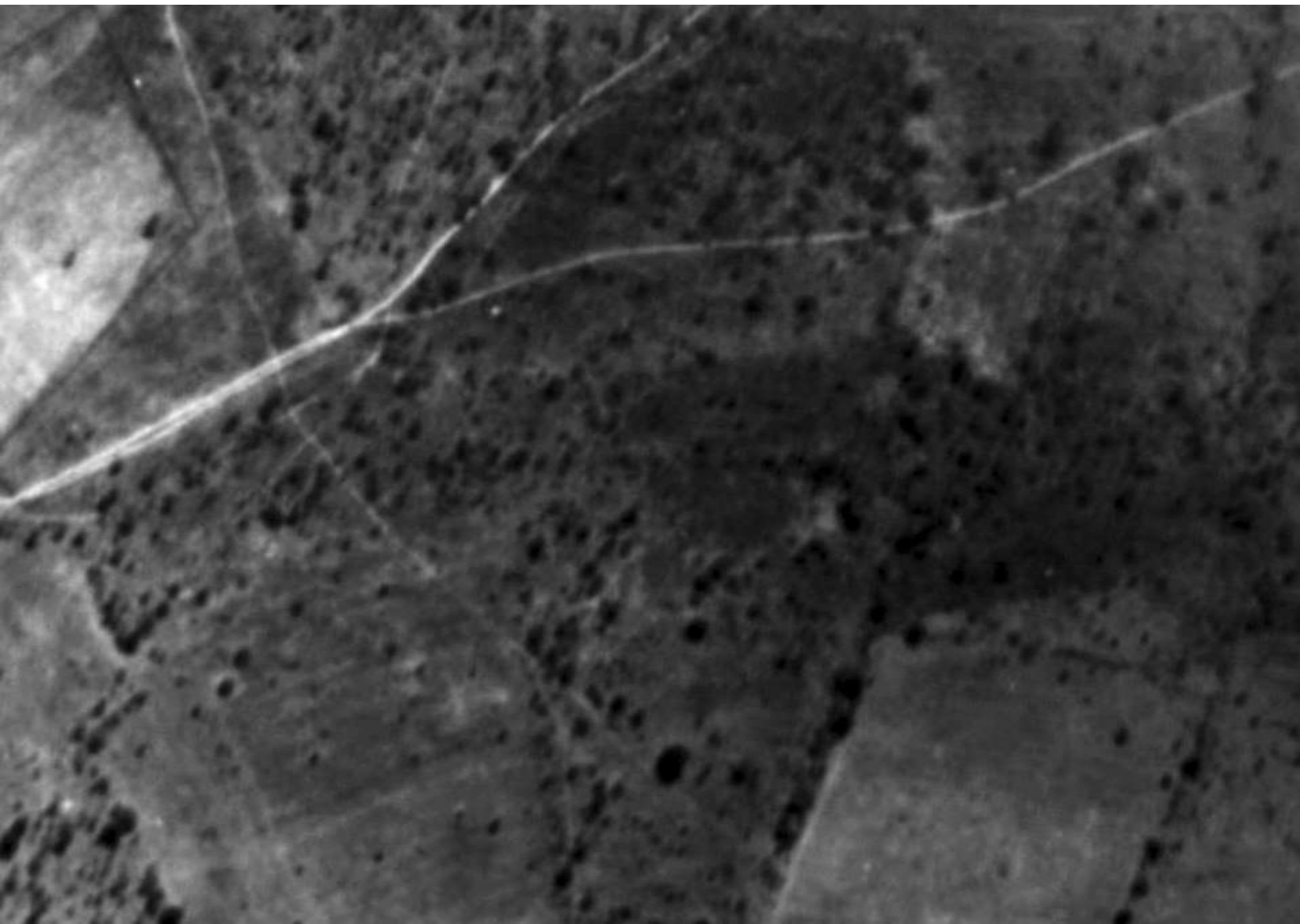
0 2,600 5,200 Meters



- Shaly Quartz
- Shale
- Quartz
- Granophyre 1
- Granophyre 2
- Granite
- Felsite
- Andesite



STUDY AREA 1947



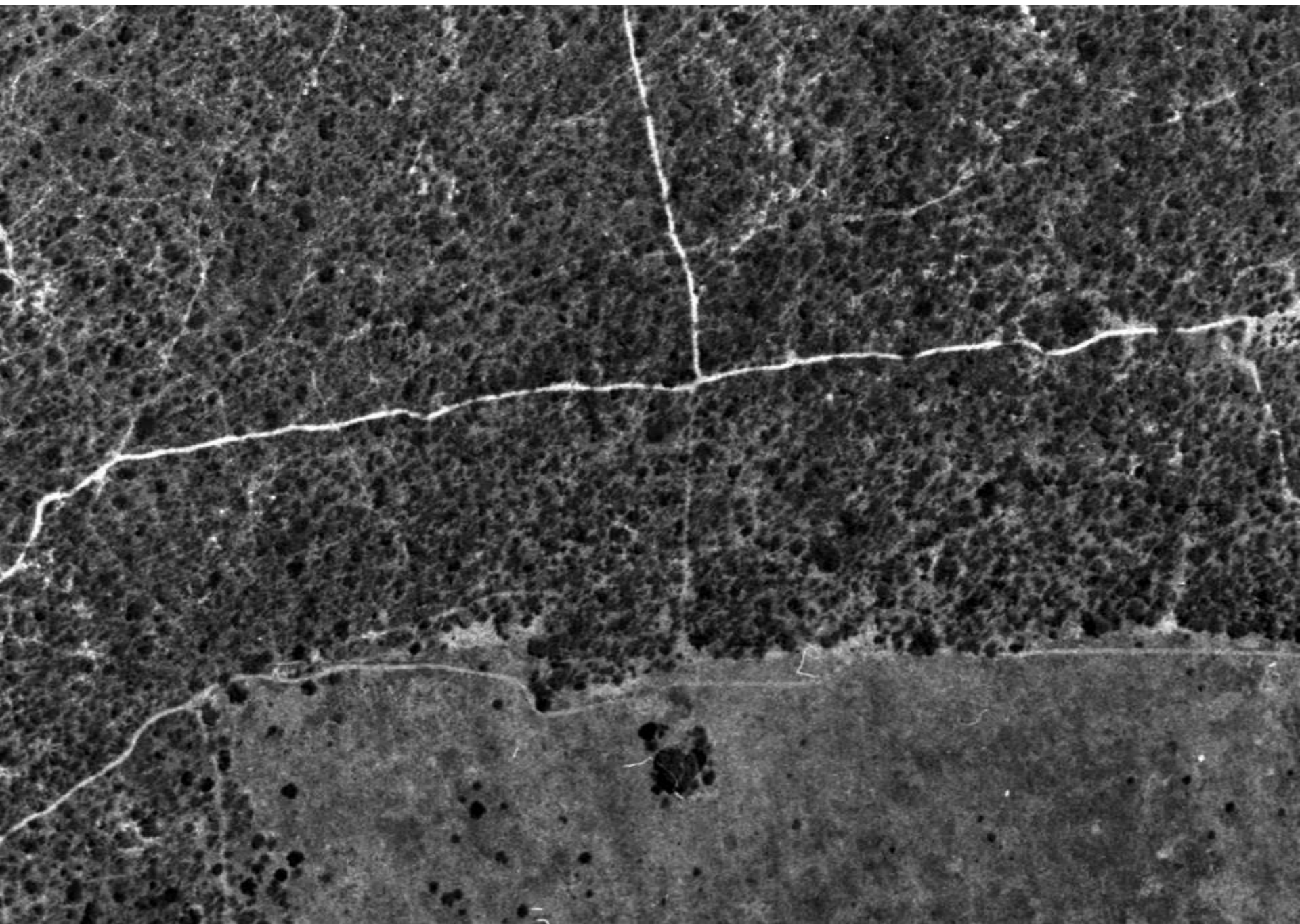
STUDY AREA 1969



STUDY AREA 1980



STUDY AREA 1999

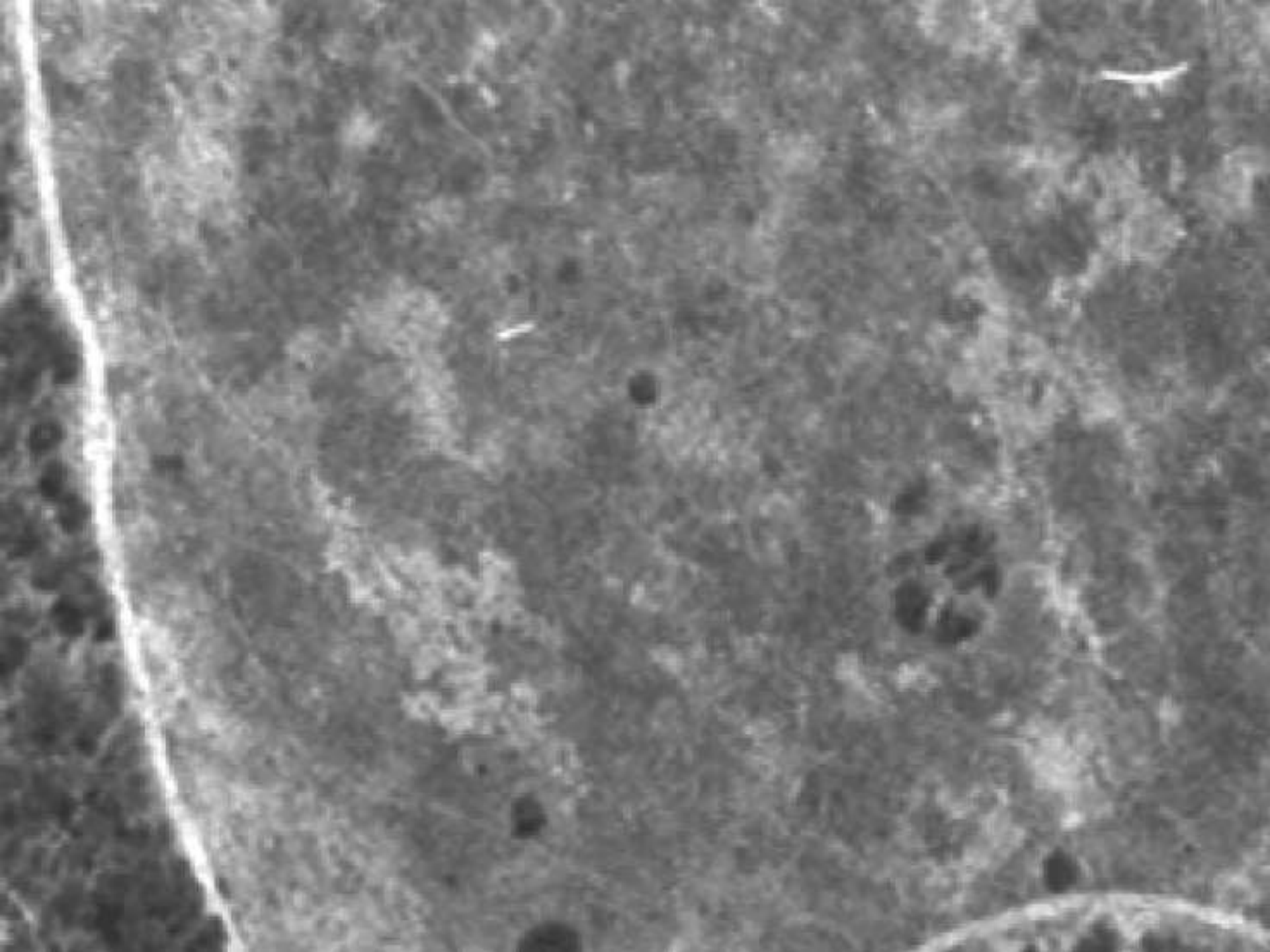


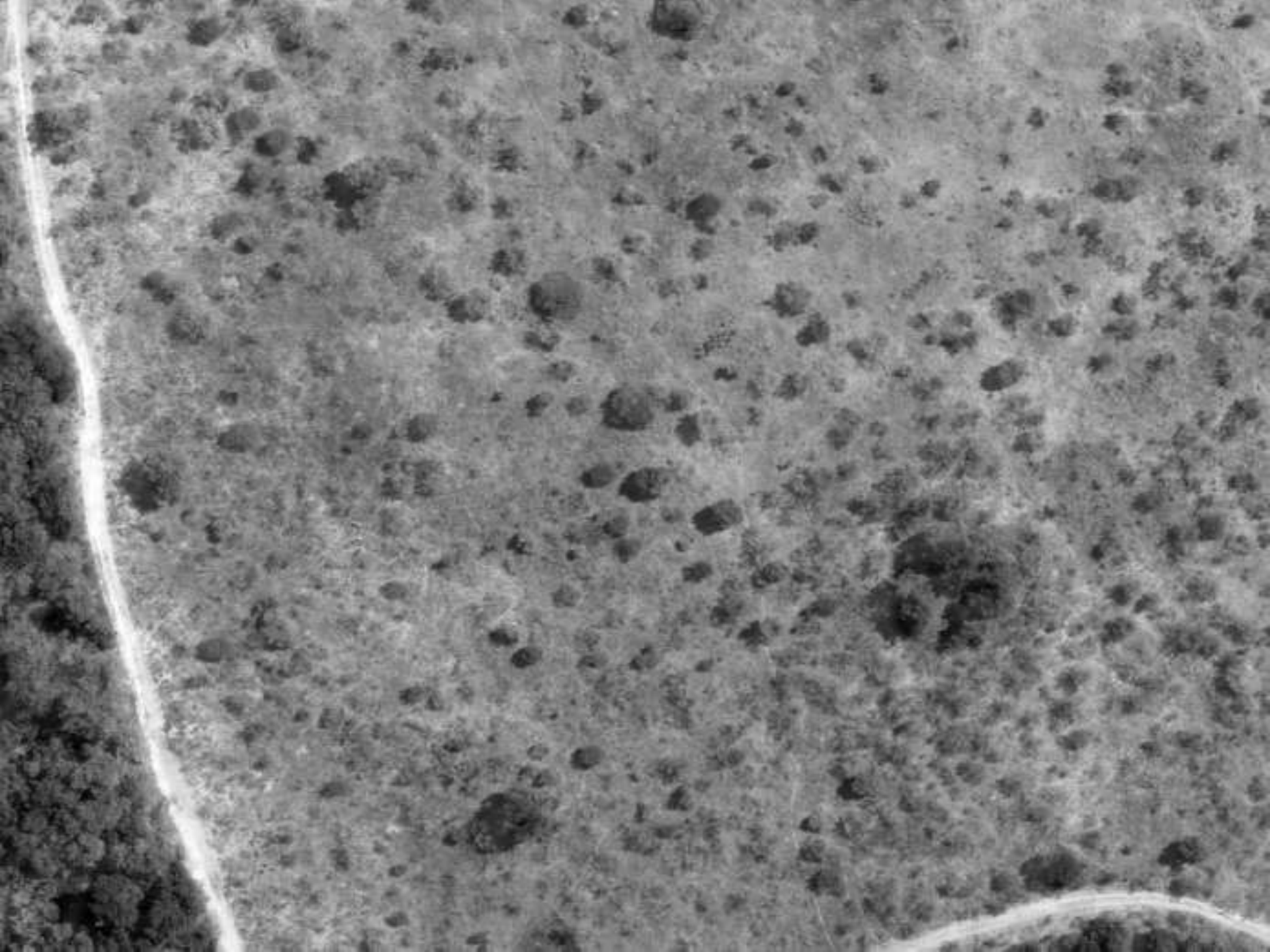
STUDY AREA 2008

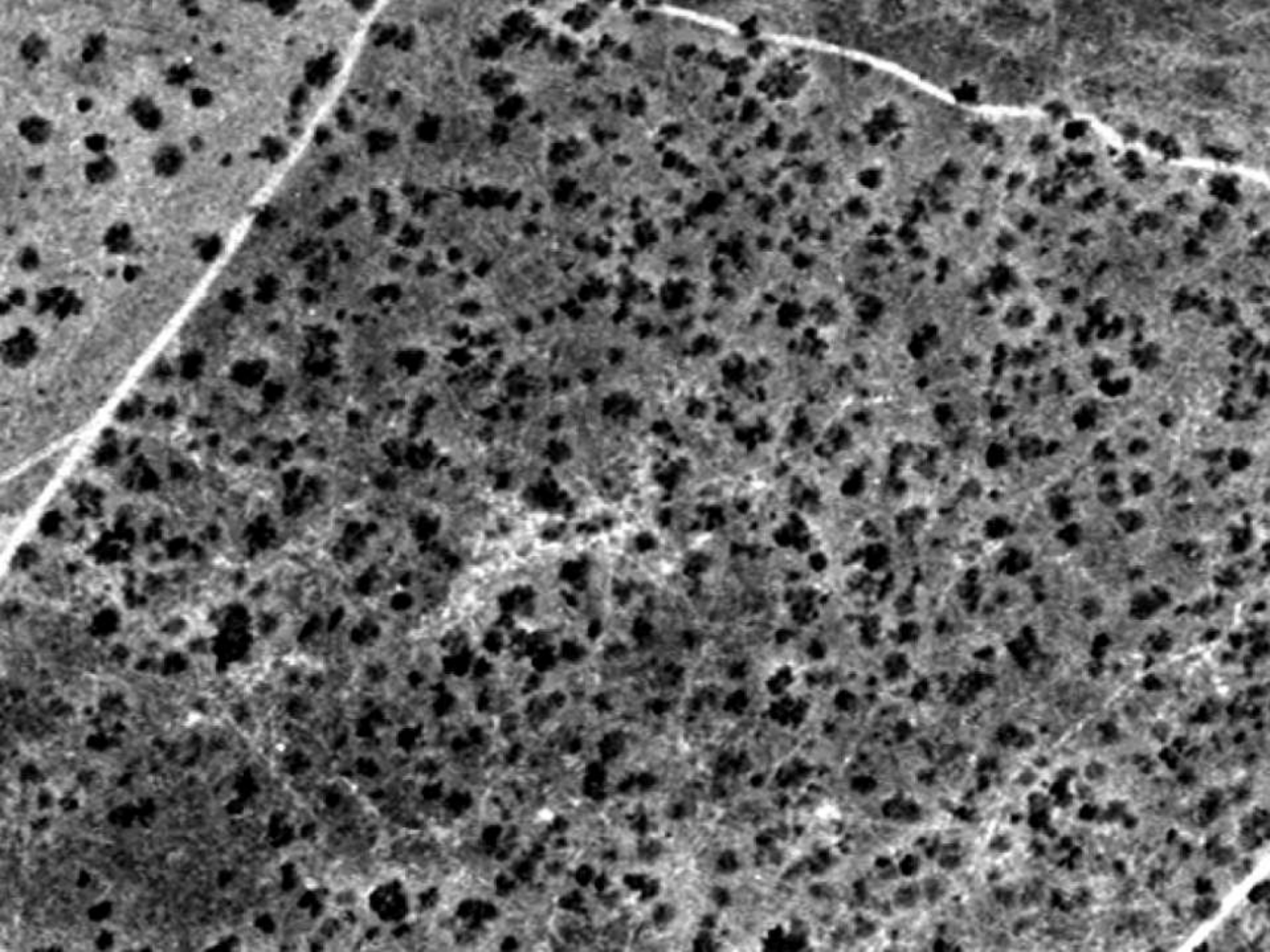


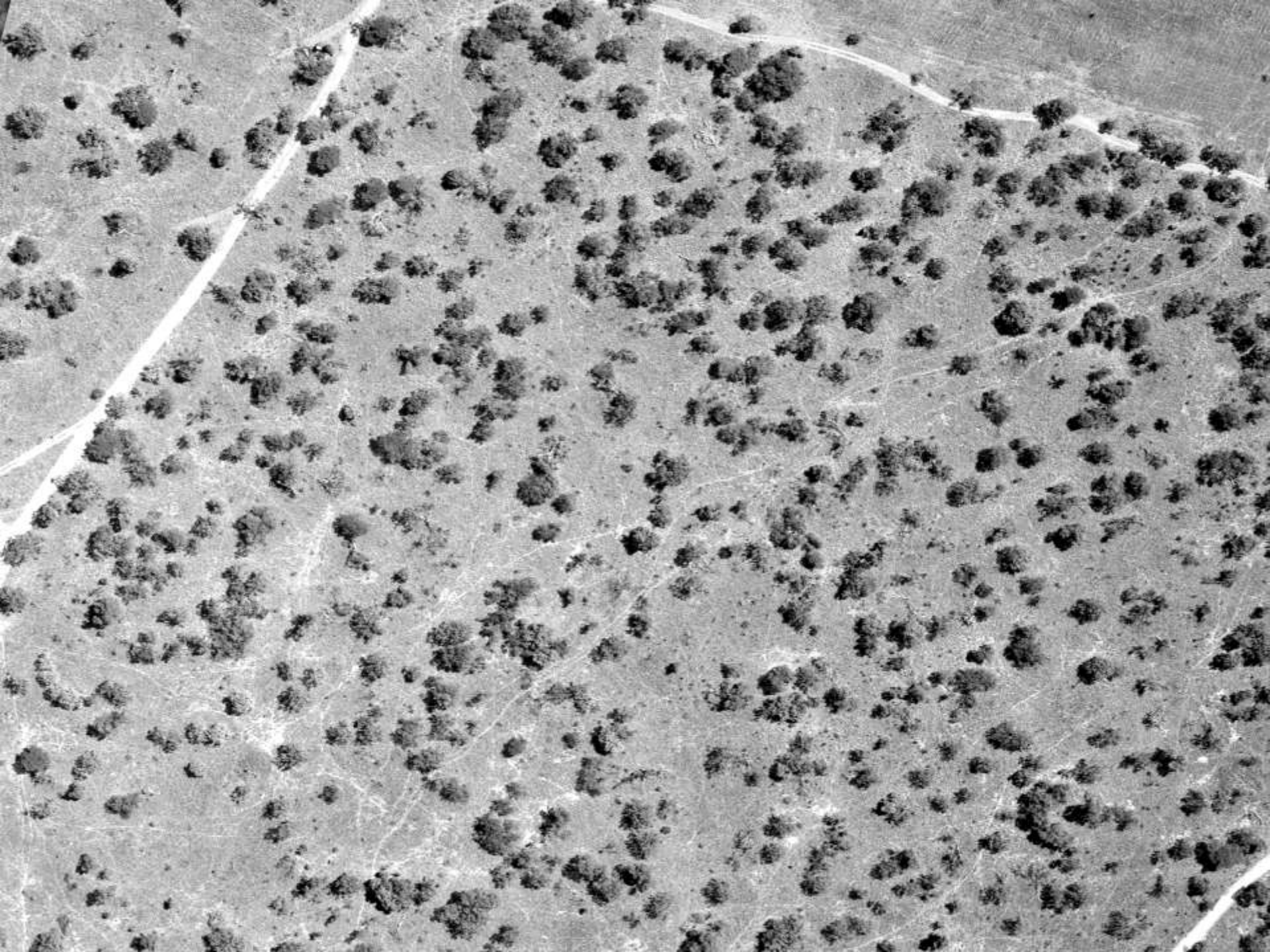














MPGR HYPOTHESIS

STUDY AREA 2010



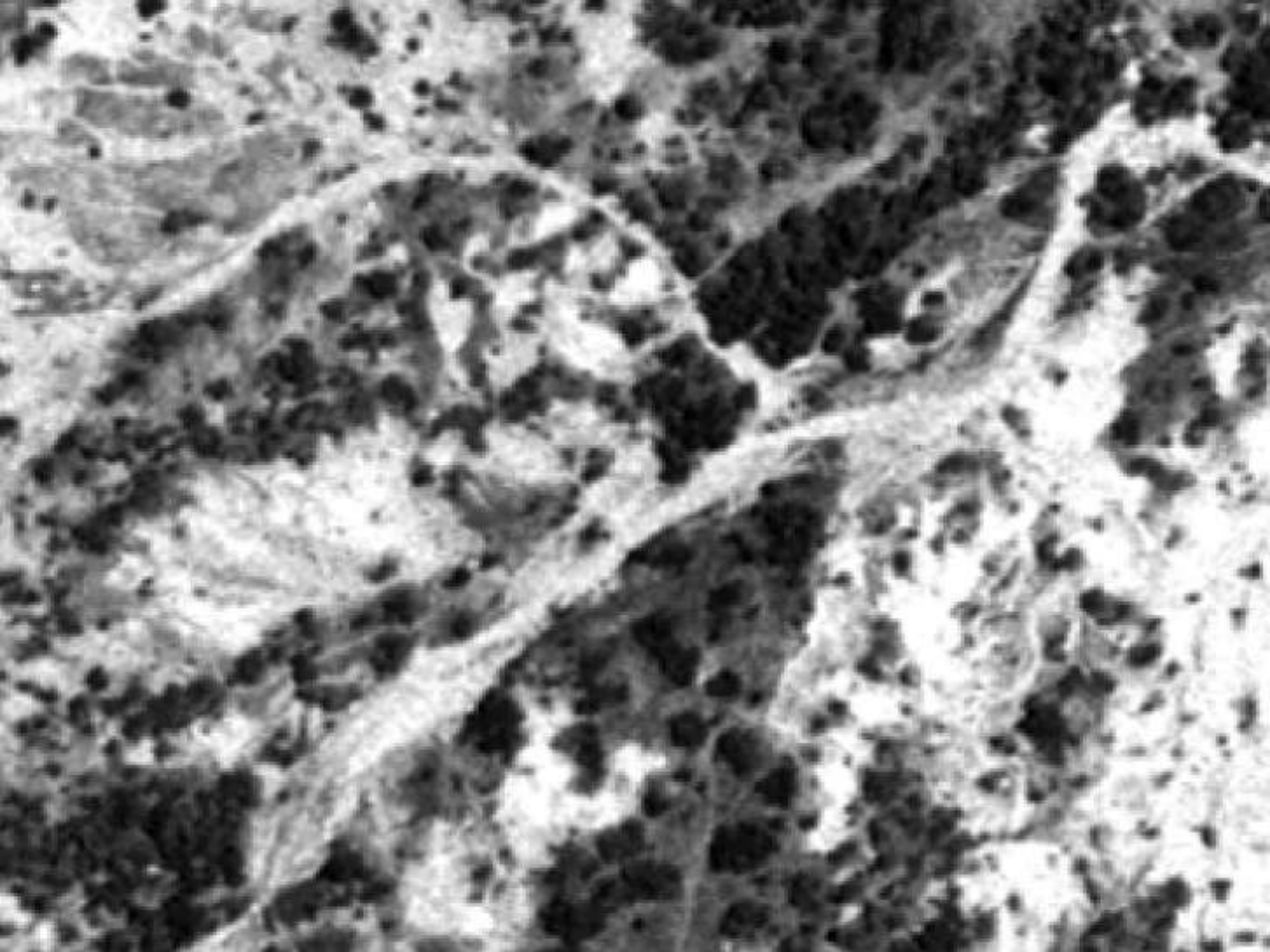
STUDY AREA 2013

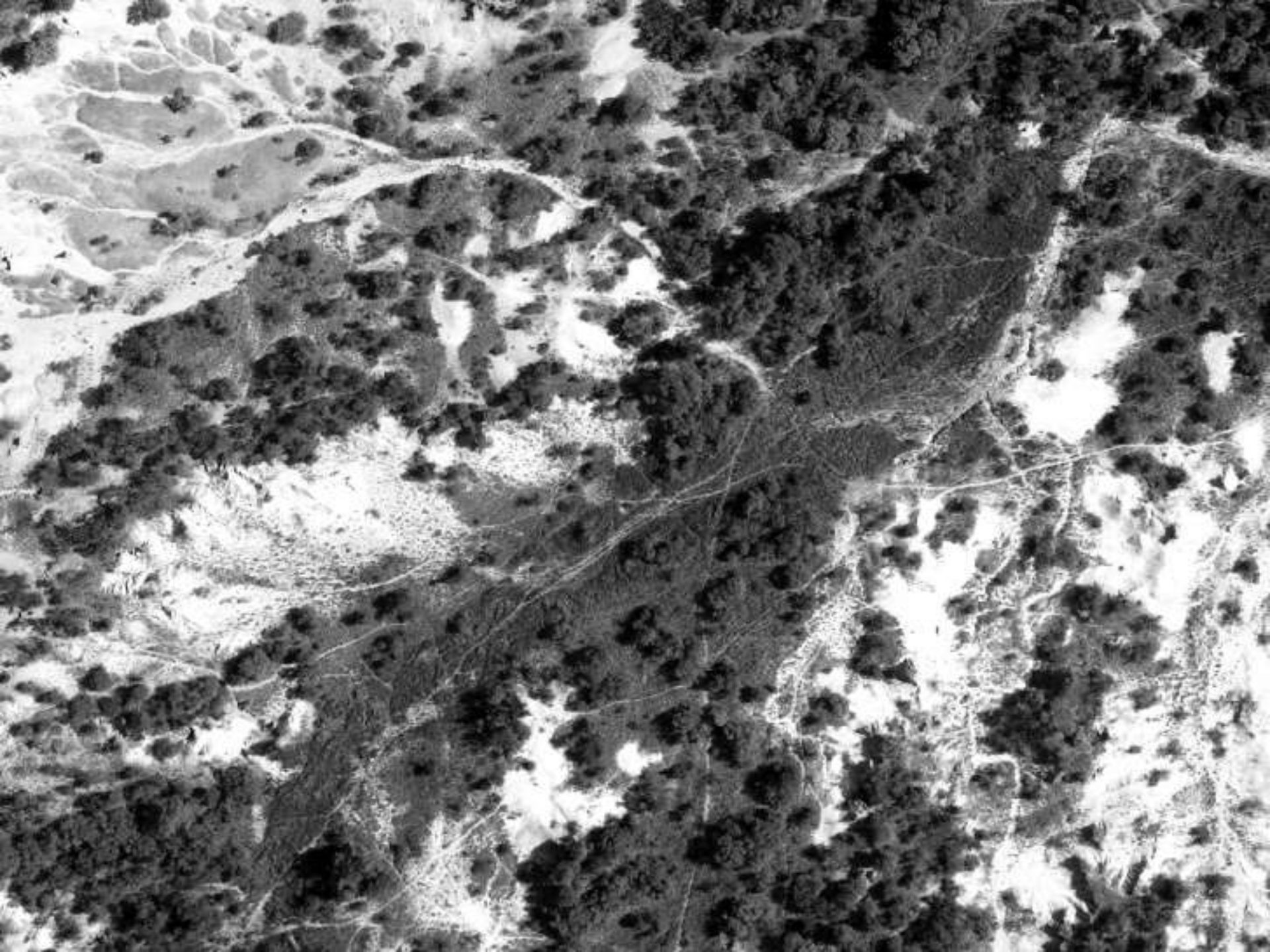










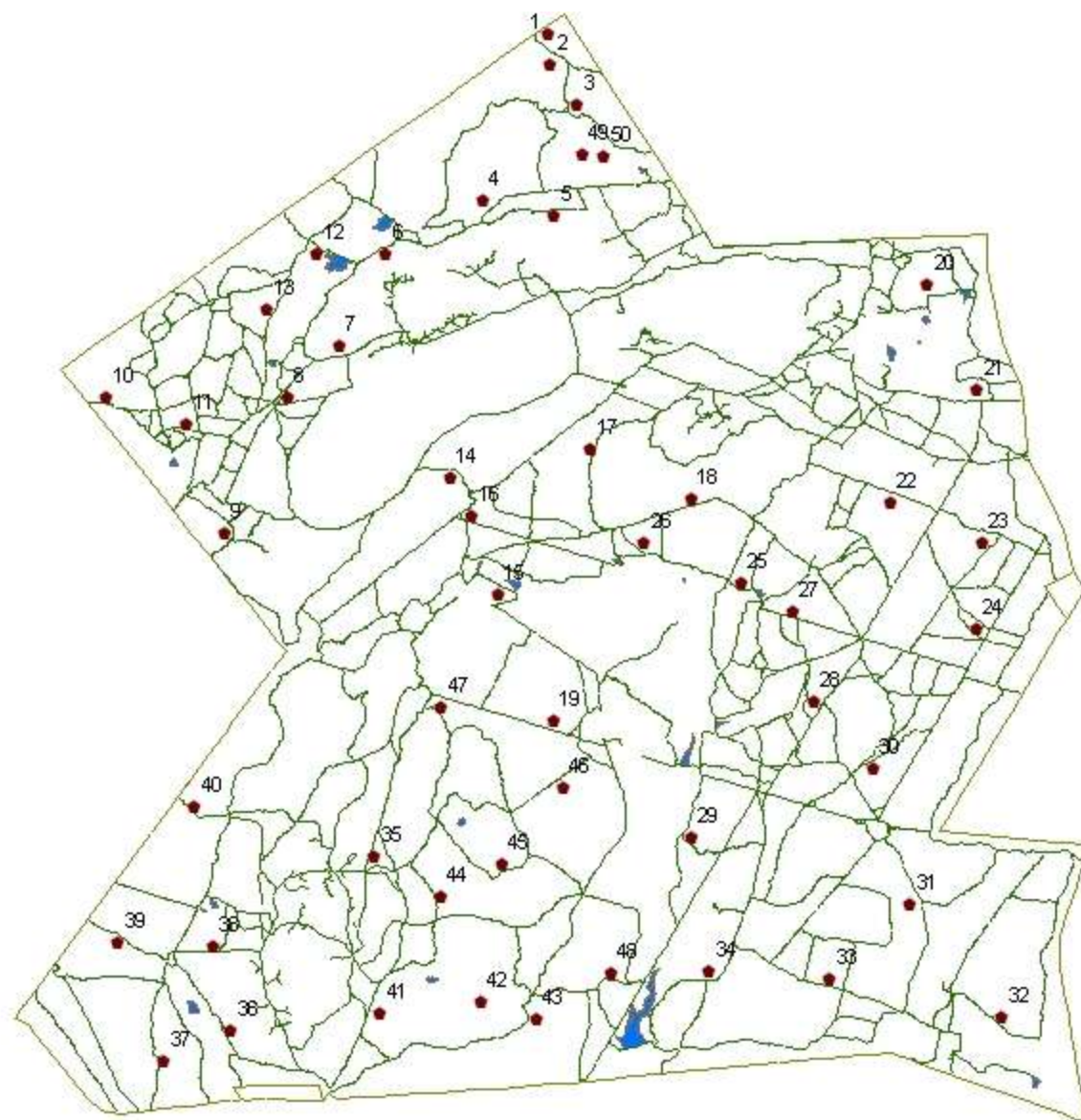


Veld Index overall

Number of burns	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	% improvement
0	483	617	660	680	770	753	643	740	682	721	49
1	666	689	743	729	704	686	556	717	740	816	23
2	720	730	781	808	760	762	631	739	730	780	8
3	953	1013	1031	1150	1049	1117	1061	1141	988	1084	14
4	935	881	1012	1043	1030	1077	941	1032	881	1031	10

Perennial grass response

No. of burns	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	% improvement
0	85	101	109	119	119	125	109	123	122	133	57
1	91	104	101	104	99	114	87	107	108	112	23
2	115	119	121	121	124	125	109	130	124	132	15
3	145	140	140	148	142	155	150	157	148	159	10
4	150	142	148	155	157	151	144	158	123	171	14











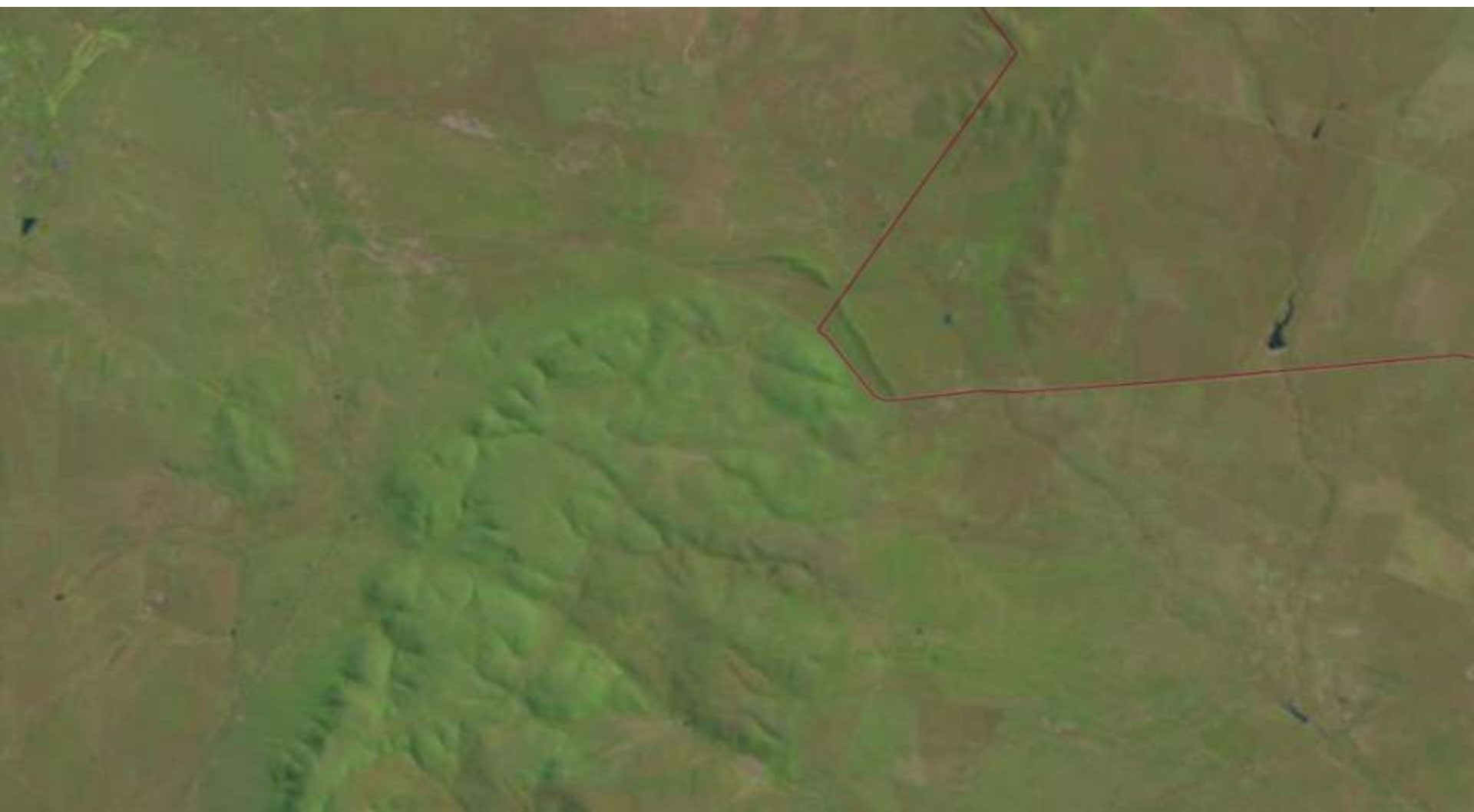
1998



1998



1999



1991



1992

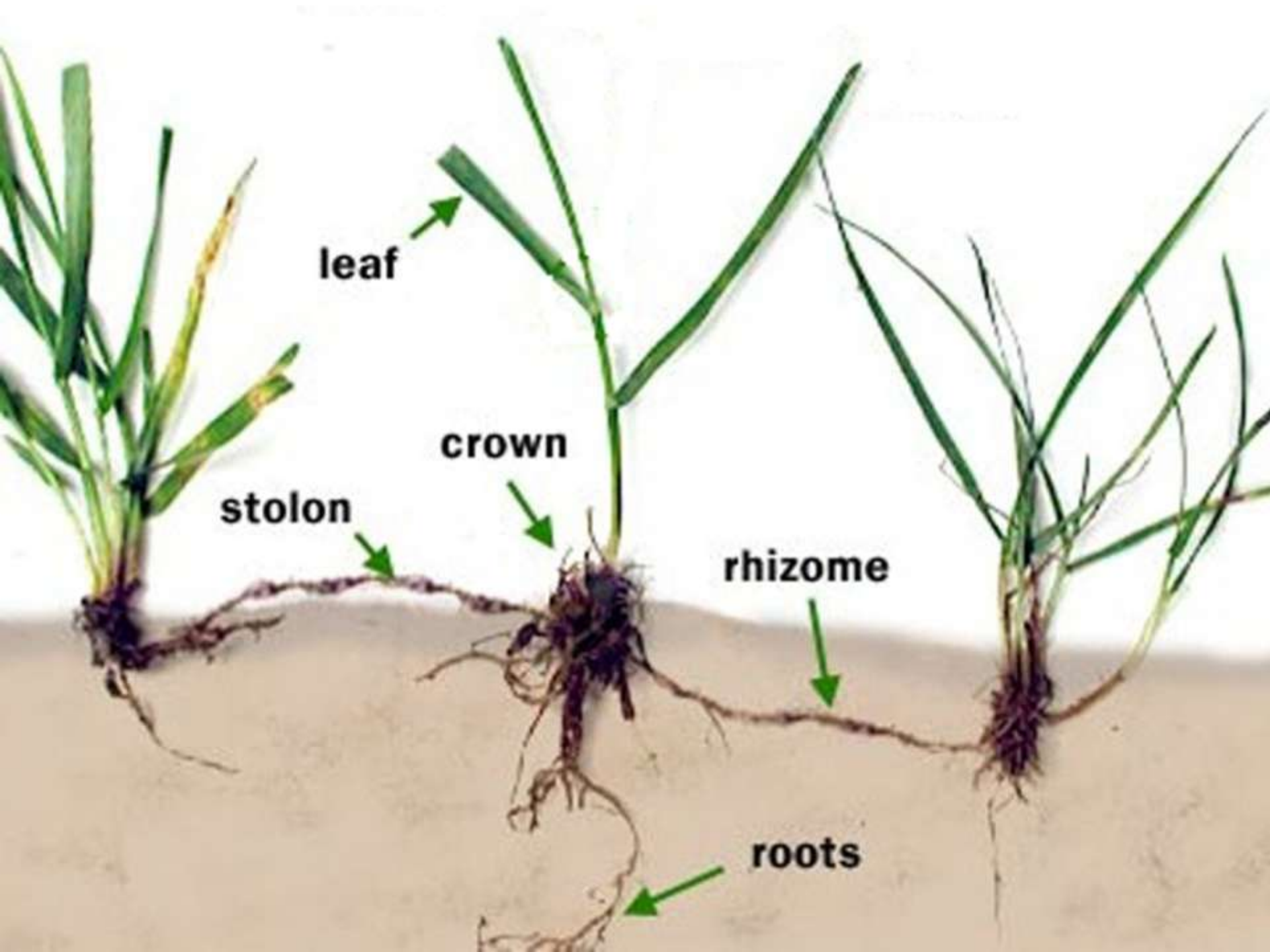


1998 Summer



1998 Winter





leaf

crown

stolon

rhizome

roots

This plant requires;

- Light**
- Mechanical support**
- Heat**
- Air**
- Water**
- Nutrients**

From air & water

Carbon
Hydrogen
Oxygen

94 – 99.5%

From soil solids

Large amounts

Nitrogen
Phosphorus
Potassium
Calcium
Magnesium
Sulphur

0.5 – 6%

Small amounts

Iron
Manganese
Boron
Molybdenum
Copper
Zinc
Chlorine
Cobalt

Nitrogen – mostly in organic matter - Organic to Ammonium to Nitrates to Nitrites
Phosphorous – in organic matter & mineral form
Potassium – Mostly in mineral form
Calcium – Mostly in mineral form

The point is many processes need to happen before the plant gains access to the minerals.

These processes will not happen effectively unless the soil has.....

**Ideal pH = 6 – 6.5 too low less macro elements
 too high less micro elements**

**Ideal structure = loose enough for air and water movement
 loose enough for root growth and soil organism movement
 compact enough for plant structural support
 compact enough for water retention and minimal leaching**

**These come from texture (sand, silt, clay) and organic matter and when
Everything is present and working we have nutrients made available by CEC**

Fire is natural component of savanna

Fire must be excluded from a degraded savanna

For ecotourism in this area bush encroachment is desirable

Clearing without repairing the soil means making space for trees

Clearing should be done with spiral cutting teeth to reduce compaction & cost

Clearing should not be done by hand because of stumps

Clearing should be done to create variations in micro climate and slow run off

Clearing can be done without herbicides on any soil state

Follow up should be with tractor drawn slashers