



Site Selection for Grapes in the Niagara Peninsula

J. Wiebe and E. T. Andersen
Horticultural Research
Institute of Ontario
Vineland Station, Ontario

The Niagara tripart built is an intensive tripart-producing area along the south shore of Lake Ontario. In this narrow strip of land, the Niagara tripart is the most important crop group, of which about 23,000 acres are in grapes. Tripart production in Niagara has been consistently successful since the 1930s. However, occasionally severe cold injury to grapes does occur in certain locations. To help growers understand the reasons for these cold injuries, we decided to be (a) part of cold injury. Information is provided here on differences between locations, the timing of cold injury, and the effects of cold injury on grape yield and quality. We used data from 1973 to 1976, on 10 vine sites of Victoria's vineyard (regional road 34) and from the choice of 10 vine sites. The data were analyzed by using a two-way analysis of variance based largely on topographic and other physiographic features supported by thermal infrared images of the vineyard. The results of the analysis are presented in the form of maps and graphs. The maps show the spatial distribution of cold injury measurements throughout the region. The grape cultivars traditionally planted in Niagara are the same as those planted in the other tripart-producing areas. To the climatic and soil conditions of the Niagara tripart. In recent years, there has been an increased interest in production of wine grapes in the Niagara tripart. In the Niagara tripart, breeding programs in Ontario and New York State

[illegible]

The lake is much warmer than the land surface. Though zonal zones do not have definite sharp dividing lines, the Niagara front has the following characteristics. These are presented in figure 1, and are shown on the map.

Zone A - lakeland effect zone. The zone near the lake for a distance of 1 to 2 miles (1.3 to 3.2 km) from the lakeland. The wind is light and calm rapidly on a clear night. The lake is calm and the air is warm. The wind is light and calm over the land rises and flows in cool air from over the lake. This is particularly evident in spring and early summer when the lake is warm and the air is cool. The wind is more than it is 3 to 5 miles (5 to 8 km) from the lake. In spring, heavy "steaming" of the land results from the rising steam and the wind is light and calm. The rising steam is not so thick in summer, and the wind is light and calm.

The cool lake breeze in spring and early midsummer starts from the lake and flows in over the land. The wind is light and calm, and the lake is warm. The wind is sometimes poor close to the lake because of lower day temperatures.

Zone B - lakeland effect zone. The zone near the lake for a distance of 3 to 5 miles (5 to 8 km) from the lake. In spring, the lake is so air flows to the lake surface, is warmer, rises and flows back over and down in the land surface. During

water, with the lake surface temperature ($16.6 \pm 0.1^\circ\text{C}$) within the air-flow pattern may occur night and day. Heavy stream flow over the lake in the reverse of the spring condition over the lake surface may occur during the winter. The lake is the largest area within this zone, affecting considerable moderation of midwinter low temperatures.

Zone 4—This zone is the largest and is subject to winter cold events. Cold-tolerant, premium grape cultivars from hardiness zones 4 and 5 are planted in this zone. It is the zone with the reservation that fruit quality might be better in zones that have more consistently warmer day temperatures.

Zone 5—Low plant between vineyard and lake. This zone is the smallest and is subject to the least moderation of winter, while just past and east of St. Catharines it is up to 1 m below its level. It has very little slope. During cold, calm, clear days, the lake surface may be 1 to 2°C warmer than the air above the lake. The lake below the lake. Winter cold and spring frosts are common in this zone.

Zone 6—This zone is the smallest and is the least moderated of winter. The distance from the lake, during warming in early rapid and early season fruit matures earlier than in quite north of Niagara.

Zone C — *Cave or overcast sleep* Regional road #1 was originally constructed at the base of the escarpment or what was once the beach at a glacial lake. From this site the lake drains southward. The slope is easy to traverse, it has good surface drainage but is not so steep that the machine operation is difficult or dangerous. This zone contains the most cold nights of greatest extent.

On cold, calm nights there is enough slope to cause cold air to collect in the zone. The cold air is not so dangerous considerable. The cold air from this zone tends to flow down into the zone below. The cold air may be trapped as rain clouds or dense fogs.

The whole escarpment slope cost of St. Catharines has been built on the escarpment slope. The slope is not so narrow, and with greater distance from the lake the storm portion of the slope is less favored than zone D, D.

Zone D — *Steep north-facing escarpment slope* Position of the escarpment are too steep to be considered as potential for wind, but the slope is steep enough to cause a slope of 45-90° should be seen as prime sites for the production of cold-sender currents.

On cold nights in winter or snow, air drainage

[illegible]

in shallow, but of fairly good quality. Animals during cold nights withdraw the slope of the land. Cold injury was not observed in the animals. The slope of the land is not very steep, but the slope than part way up at the top of a sloped area. This zone is generally suitable for the production of cold injury risks are higher than in zones A, D, low-lying areas, or those where animals is impeded, should be avoided.

Zone 5 – Flat and rolling land south of the excavation. The area is suitable for crop production as far as 30 m (30 m) into the field. The area is suitable for the production of cold injury risks are higher than in zones A, D, low-lying areas, or those where animals is impeded, should be avoided.

Zone 6 – Fertilized land. The large gravel and sand Fertilized land is not suitable for the production of cold injury risks are higher than in zones A, D, low-lying areas, or those where animals is impeded, should be avoided.

CLIMATE – ZONE INTERACTIONS

The standard American and some hybrid grasses will grow in all seven zones. The most tender and highest priced cultivars will grow best in zones A and D, and possibly C. Some of the likes of 'Poa annua' and 'Poa trivialis' will be glaucous, more hardy ones in less favored zones. Sufficient soil should be available to satisfy the needs of the grasses. The grasses will grow in the presence of some equipment and cultural practices may be necessary. On fairly steep slopes, fractures with a low extent of gravity and soil erosion will be a problem. The grasses will grow on soil and maintained grassed drainage ditches and waterways will carry excess water safely without serious erosion. The grasses will be able to grow in the presence of good ground covered during fall, winter and spring.

The zones described do not have sharp boundaries nor are the zones of the grasses. The zones are a gradual change of slope as well as distance from the lake. Kevins, tall herbaceous or bushes, bodies of water such as Jordan Harbor and other hydrologic features modify effects within a zone.

WINTER HARDINESS RATINGS OF CULTIVARS

The ability of vines to tolerate winter cold is influenced by nutrition, amount of fruit in the previous season and general vine health. Within a group of cultivars there are gradations of hardiness. Seasonal differences also occur. The cultivars which follow have been rated for winter hardiness and are divided as follows:

- | | |
|---------|--|
| Group 1 | Hardly do not suffer winter injury even away from the lake. Suitable in all zones. |
| Group 2 | Normally do not suffer winter injury in the traditional grape area. Suitable in zones A through E. |
| Group 3 | Suffer winter injury in cold winters even on good grape sites. Suitable in zones A, C, D and E. |
| Group 4 | Frequently show winter injury. Suitable in zones A, C and D. |
| Group 5 | Some injury in most winters even on good sites. Suitable in zones A and D. |

Culture	Type	1989 Group	1990-1991	1992-1993	1994-1995	1996-1997	1998-1999	2000-2001	2002-2003	2004-2005	2006-2007	2008-2009	2010-2011	2012-2013	2014-2015	2016-2017	2018-2019	2020-2021	2022-2023	2024-2025	2026-2027	2028-2029	2030-2031	2032-2033	2034-2035	2036-2037	2038-2039	2040-2041	2042-2043	2044-2045	2046-2047	2048-2049	2050-2051	2052-2053	2054-2055	2056-2057	2058-2059	2060-2061	2062-2063	2064-2065	2066-2067	2068-2069	2070-2071	2072-2073	2074-2075	2076-2077	2078-2079	2080-2081	2082-2083	2084-2085	2086-2087	2088-2089	2090-2091	2092-2093	2094-2095	2096-2097	2098-2099	2100-2101	2102-2103	2104-2105	2106-2107	2108-2109	2110-2111	2112-2113	2114-2115	2116-2117	2118-2119	2120-2121	2122-2123	2124-2125	2126-2127	2128-2129	2130-2131	2132-2133	2134-2135	2136-2137	2138-2139	2140-2141	2142-2143	2144-2145	2146-2147	2148-2149	2150-2151	2152-2153	2154-2155	2156-2157	2158-2159	2160-2161	2162-2163	2164-2165	2166-2167	2168-2169	2170-2171	2172-2173	2174-2175	2176-2177	2178-2179	2180-2181	2182-2183	2184-2185	2186-2187	2188-2189	2190-2191	2192-2193	2194-2195	2196-2197	2198-2199	2200-2201	2202-2203	2204-2205	2206-2207	2208-2209	2210-2211	2212-2213	2214-2215	2216-2217	2218-2219	2220-2221	2222-2223	2224-2225	2226-2227	2228-2229	2230-2231	2232-2233	2234-2235	2236-2237	2238-2239	2240-2241	2242-2243	2244-2245	2246-2247	2248-2249	2250-2251	2252-2253	2254-2255	2256-2257	2258-2259	2260-2261	2262-2263	2264-2265	2266-2267	2268-2269	2270-2271	2272-2273	2274-2275	2276-2277	2278-2279	2280-2281	2282-2283	2284-2285	2286-2287	2288-2289	2290-2291	2292-2293	2294-2295	2296-2297	2298-2299	2300-2301	2302-2303	2304-2305	2306-2307	2308-2309	2310-2311	2312-2313	2314-2315	2316-2317	2318-2319	2320-2321	2322-2323	2324-2325	2326-2327	2328-2329	2330-2331	2332-2333	2334-2335	2336-2337	2338-2339	2340-2341	2342-2343	2344-2345	2346-2347	2348-2349	2350-2351	2352-2353	2354-2355	2356-2357	2358-2359	2360-2361	2362-2363	2364-2365	2366-2367	2368-2369	2370-2371	2372-2373	2374-2375	2376-2377	2378-2379	2380-2381	2382-2383	2384-2385	2386-2387	2388-2389	2390-2391	2392-2393	2394-2395	2396-2397	2398-2399	2400-2401	2402-2403	2404-2405	2406-2407	2408-2409	2410-2411	2412-2413	2414-2415	2416-2417	2418-2419	2420-2421	2422-2423	2424-2425	2426-2427	2428-2429	2430-2431	2432-2433	2434-2435	2436-2437	2438-2439	2440-2441	2442-2443	2444-2445	2446-2447	2448-2449	2450-2451	2452-2453	2454-2455	2456-2457	2458-2459	2460-2461	2462-2463	2464-2465	2466-2467	2468-2469	2470-2471	2472-2473	2474-2475	2476-2477	2478-2479	2480-2481	2482-2483	2484-2485	2486-2487	2488-2489	2490-2491	2492-2493	2494-2495	2496-2497	2498-2499	2500-2501	2502-2503	2504-2505	2506-2507	2508-2509	2510-2511	2512-2513	2514-2515	2516-2517	2518-2519	2520-2521	2522-2523	2524-2525	2526-2527	2528-2529	2530-2531	2532-2533	2534-2535	2536-2537	2538-2539	2540-2541	2542-2543	2544-2545	2546-2547	2548-2549	2550-2551	2552-2553	2554-2555	2556-2557	2558-2559	2560-2561	2562-2563	2564-2565	2566-2567	2568-2569	2
---------	------	------------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	---

ACKNOWLEDGMENTS

The Canada Centre for Remote Sensing in Ottawa provided aerial photography and thermal infrared imagery.