

Epidemiology and Infection

Geography but not alternative host species explain the spread of raccoon rabies virus in Vermont

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Supplementary Material

Supplementary Table S1. Summary of raccoon rabies cases reported by county in Vermont, 1994 - 2012

Year	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Total	
County																					
Addison		14	41	7	5	11	5	8	8	6	4	8	12	7	2	9	7	4	4		162
Bennington	15	23	5	2	15	2	2	18	13		2	1	4	2	2	5	2			2	115
Caledonia					10	5	2					15	12	11		1	1	3	10		70
Chittenden			12	85	14	6	6	3	6	11	4	1	4	27	9	10	15	6	13		232
Essex						1														1	2
Franklin				1	6	2	4						7	85	10	3				2	120
Grand Isle				1										7	9	3	1				21
Lamoille						5	7	2	2	1			9	6	5	3	1	1	11		53
Orange			3	2	2	5	4	1	2	4	5	5	7	9	2		1		4		56
Orleans						2	2	1							8	9	6	1	5		34
Rutland	6	24	7	4	4	11	7	5	17	2	3	1	11	2		1	8	2	2		117
Washington					16	40	6	3	2		13	17	4	2	1	2	6	8	4		124
Windham	5	63	6				2	13	30	9	4			3	21	10			1	2	169
Windsor		10	31	10			6	5	9	1	6		2	1	3	8	6			1	99
Unknown				1																	1
Total	26	134	105	113	72	90	53	59	89	34	41	48	72	162	72	64	54	26	61	1375	

Supplementary Table S2. RRV samples employed in this study.

Designation	Species	State	County	Town	Year recovered	Sequence type	Viral variant group*	GenBank Accession
MA.2003.5142	Raccoon	MA	unknown	unknown	2003	Illumina	VI	MG562518
NH.2003.5152	Raccoon	NH	unknown	unknown	2003	Illumina	NY HIST (outlier)	MG562519
NH.2003.5154	Raccoon	NH	unknown	unknown	2003	Illumina	VI	MG562520
NJ.2004.1927	Equine	NJ	unknown	unknown	2004	Illumina	VI (outlier)	MG562521
NY.1990.2072	Raccoon	NY	Sullivan	Tusten	1990	Sanger	NY HIST (VI outlier)	MG562523
NY.1990.5015	Raccoon	NY	Orange	Deer Park	1990	Illumina	NY HIST	MG562524
NY.1992.0394	Raccoon	NY	Westchester	Bedford	1992	Illumina	NY HIST	MG562525
NY.1995.0364	Raccoon	NY	Saratoga	Malta	1995	Illumina	NY HIST	MG562526
NY.1995.3745	Raccoon	NY	Clinton	Black Brook	1995	Sanger	NY HIST	MF143291
NY.2003.1734	Raccoon	NY	Rensselaer	Nassau	2003	Illumina	VII	MG562527
NY.2003.2059	Raccoon	NY	Saratoga	Saratoga	2003	Illumina	IIIa	MG562528
NY.2003.3040	Raccoon	NY	Saratoga	Wilton	2003	Illumina	VII	MG562529
NY.2003.7854	Raccoon	NY	Rensselaer	Schaghticoke	2003	Illumina	V	MG562530
NY.2003.7914	Raccoon	NY	Albany	Albany C.	2003	Illumina	VII	MG562531
NY.2003.7917	Skunk	NY	Saratoga	Moreau	2003	Illumina	VII	MG562532
NY.2003.7990	Raccoon	NY	Columbia	Austerlitz	2003	Illumina	VII	MG562533
NY.2004.1046	Raccoon	NY	Washington	Kingsbury	2004	Illumina	IIIa	MG562534
NY.2004.1247	Raccoon	NY	Rensselaer	Pittstown	2004	Illumina	V	MG562535
NY.2004.1705	Raccoon	NY	Albany	Bethlehem	2004	Sanger	VII	MG562536
NY.2004.2620	Raccoon	NY	Rensselaer	Nassau	2004	Illumina	VII	MG562537
NY.2004.4138	Raccoon	NY	Albany	Westerlo	2004	Sanger	VII	MG562538
NY.2004.5339	Raccoon	NY	Albany	Coeymans	2004	Illumina	VII	MG562539
NY.2004.6383	Skunk	NY	Washington	Greenwich	2004	Illumina	V	MG562540
NY.2004.6937	Skunk	NY	Washington	White Creek	2004	Illumina	V	MG562541
NY.2004.8403	Raccoon	NY	Washington	Cambridge	2004	Illumina	V	MG562542
NY.2010.0729	Raccoon	NY	Washington	Jackson	2010	Illumina	IV	MG562543
NY.2010.0775	Raccoon	NY	Rensselaer	Berlin	2010	Illumina	VII	MG562544

NY.2010.1098	Skunk	NY	Rensselaer	Troy City	2010	Illumina	VII	MG562545
NY.2010.5433	Raccoon	NY	Saratoga	Ballston	2010	Illumina	VII	MG562546
NY.2011.0005	Skunk	NY	Albany	Albany City	2011	Illumina	VII	MG562547
NY.2011.0007	Raccoon	NY	Rensselaer	North Greenbush	2011	Illumina	VII	MG562548
NY.2011.0042	Raccoon	NY	Albany	Bethlehem	2011	Illumina	VII	MG562549
NY.2011.0560	Raccoon	NY	Washington	Cambridge	2011	Illumina	IIIa	MG562550
NY.2011.0714	Gray Fox	NY	Saratoga	Moreau	2011	Illumina	IIIa	MG562551
NY.2011.1343	Gray Fox	NY	Essex	Westport	2011	Illumina	Ib	MG562552
NY.2011.2001	Raccoon	NY	Essex	Crown Point	2011	Illumina	Ib	MG562553
NY.2011.4095	Skunk	NY	Essex	Crown Point	2011	Illumina	IIIa	MG562554
NY.2011.5590	Skunk	NY	Clinton	Champlain	2011	Illumina	IIIa	MF143334
VA.2003.5213	Raccoon	VA	unknown	unknown	2003	Illumina	outgroup	MG562522
VT.2005.0142	Raccoon	VT	Caledonia	Peacham	2005	Sanger	IIb	MG562555
VT.2005.0167	Raccoon	VT	Caledonia	Peacham	2005	Illumina	IIb	MG562556
VT.2005.0212	Raccoon	VT	Caledonia	Barnet	2005	Illumina	IIb	MG562557
VT.2005.0214	Skunk	VT	Orange	Bradford	2005	Illumina	IIb	MG562558
VT.2005.0215	Raccoon	VT	Washington	Cabot	2005	Sanger	IIa	MF143373
VT.2005.0270	Raccoon	VT	Washington	Barre Town	2005	Illumina	IIa	MG562559
VT.2005.0274	Raccoon	VT	Orange	Orange	2005	Illumina	IIa	MG562560
VT.2005.0275	Raccoon	VT	Orange	Newbury	2005	Sanger	IIb	MG562561
VT.2005.0277	Raccoon	VT	Rutland	Rutland City	2005	Illumina	IIIa	MG562562
VT.2005.0296	Raccoon	VT	Washington	Northfield	2005	Illumina	IIIb	MG562563
VT.2006.0104	Raccoon	VT	Caledonia	St. Johnsbury	2006	Illumina	IIb	MF143374
VT.2006.0108	Raccoon	VT	Lamoille	Stowe	2006	Sanger	IIIb	MF143375
VT.2006.0116	Bovine	VT	Caledonia	Danville	2006	Illumina	IIb	MF143278
VT.2006.0117	Skunk	VT	Chittenden	South Burlington	2006	Illumina	Ia	MF143376
VT.2006.0147	Raccoon	VT	Addison	Leicester	2006	Sanger	Ib	MG562564
VT.2006.0153	Skunk	VT	Lamoille	Stowe	2006	Sanger	IIIb	MF143377
VT.2006.0161	Raccoon	VT	Addison	New Haven	2006	Sanger	Ib	MG562565
VT.2006.0166	Raccoon	VT	Rutland	Clarendon	2006	Illumina	IV	MF143279
VT.2006.0173	Raccoon	VT	Rutland	Hubbardton	2006	Sanger	Ib	MG562566

VT.2006.0178	Skunk	VT	Addison	Panton	2006	Illumina	IIIc	MF143280
VT.2006.0218	Skunk	VT	Orange	Chelsea	2006	Sanger	IIIb	MG562567
VT.2006.0225	Raccoon	VT	Lamoille	Stowe	2006	Both	IIIb	KY026478
VT.2006.0245	Raccoon	VT	Caledonia	Peacham	2006	Illumina	IIb	MG562568
VT.2006.0259	Skunk	VT	Windsor	Bethel	2006	Sanger	IIb	KY026479
VT.2006.0263	Raccoon	VT	Bennington	Dorset	2006	Sanger	IV	MG562569
VT.2006.0287	Raccoon	VT	Orange	Corinth	2006	Illumina	IIIb	MG562570
VT.2006.0288	Bovine	VT	Addison	Shoreham	2006	Sanger	IIIc	MG562571
VT.2006.0289	Raccoon	VT	Rutland	Mount Holly	2006	Sanger	IIIa	MG562572
VT.2006.0325	Raccoon	VT	Bennington	Dorset	2006	Illumina	IV	MG562573
VT.2006.0332	Skunk	VT	Addison	Middlebury	2006	Illumina	Ib	MF143281
VT.2006.0366	Woodchuck	VT	Orange	Bradford	2006	Illumina	IIb	MG562574
VT.2007.0084	Skunk	VT	Chittenden	Burlington	2007	Sanger	Ia	MF143378
VT.2007.0092	Raccoon	VT	Caledonia	Lyndon	2007	Illumina	IIb	MF143282
VT.2007.0294	Horse	VT	Rutland	Benson	2007	Illumina	Ib	MG562575
VT.2007.0297	Raccoon	VT	Lamoille	Stowe	2007	Illumina	IIIb	MF143283
VT.2007.0308	Raccoon	VT	Bennington	Pownal	2007	Illumina	V	MF143284
VT.2007.0320	Skunk	VT	Chittenden	Williston	2007	Illumina	Ia	MF143285
VT.2007.0342	Raccoon	VT	Franklin	St. Albans City	2007	Sanger	Ia	MF143379
VT.2007.0357	Skunk	VT	Washington	Barre Town	2007	Illumina	IIIb	MG562576
VT.2007.0380	Raccoon	VT	Franklin	Fairfield	2007	Sanger	Ia	MF143380
VT.2007.0392	Raccoon	VT	Chittenden	Burlington	2007	Sanger	Ia	MF143381
VT.2007.0398	Skunk	VT	Franklin	Georgia	2007	Sanger	Ia	MF143382
VT.2007.0412	Raccoon	VT	Chittenden	Essex	2007	Illumina	Ia	MF143286
VT.2007.0417	Skunk	VT	Orange	Bradford	2007	Illumina	IIb	MG562577
VT.2007.0465	Skunk	VT	Franklin	Sheldon	2007	Sanger	Ia	MF143383
VT.2007.0473	Raccoon	VT	Windham	Rockingham	2007	Sanger	VIa	MG562578
VT.2007.0479	Skunk	VT	Franklin	Swanton	2007	Sanger	Ia	MF143384
VT.2007.0489	Raccoon	VT	Grand isle	North Hero	2007	Sanger	Ia	MF143385
VT.2007.0491	Skunk	VT	Franklin	Franklin	2007	Sanger	Ia	MF143337
VT.2007.0492	Raccoon	VT	Caledonia	Danville	2007	Illumina	IIb	MF143287
VT.2007.0496	Raccoon	VT	Caledonia	Danville	2007	Sanger	IIb	MF143386
VT.2007.0505	Skunk	VT	Caledonia	Danville	2007	Sanger	IIb	MF143387

VT.2007.0506	Skunk	VT	Franklin	Georgia	2007	Sanger	Ia	MF143388
VT.2007.0512	Skunk	VT	Franklin	Sheldon	2007	Sanger	Ia	MF143389
VT.2007.0520	Skunk	VT	Addison	Bridport	2007	Illumina	VIII	MG562579
VT.2007.0522	Raccoon	VT	Orange	Braintree	2007	Illumina	IIb	KY026480
VT.2007.0523	Skunk	VT	Franklin	Franklin	2007	Sanger	Ia	MF143390
VT.2008.0041	Raccoon	VT	Windsor	Windsor	2008	Sanger	VIc	MG562580
VT.2008.0111	Raccoon	VT	Windham	Townshend	2008	Sanger	VIa	MG562581
VT.2008.0170	Skunk	VT	Bennington	Bennington	2008	Sanger	V	MG562582
VT.2008.0180	Raccoon	VT	Windham	Wardsboro	2008	Illumina	VIa	MG562583
VT.2008.0205	Skunk	VT	Windsor	Chester	2008	Sanger	IIIa	MG562584
VT.2008.0209	Raccoon	VT	Chittenden	Charlotte	2008	Sanger	VIII	KY026481
VT.2008.0233	Skunk	VT	Washington	Moretown	2008	Sanger	IIa	MG562585
VT.2008.0237	Raccoon	VT	Lamoille	Stowe	2008	Sanger	Ia	KY026482
VT.2008.0270	Skunk	VT	Lamoille	Elmore	2008	Illumina	IIIb	MF143288
VT.2008.0275	Skunk	VT	Addison	Bristol	2008	Illumina	Ib	MG562586
VT.2008.0277	Skunk	VT	Orange	Randolph	2008	Illumina	IIIb	MG562587
VT.2008.0283	Skunk	VT	Orange	Newbury	2008	Sanger	IIb	MG562588
VT.2008.0296	Raccoon	VT	Windham	Dover	2008	Sanger	VIa	MG562589
VT.2008.0310	Bovine	VT	Franklin	Bakersfield	2008	Sanger	Ia	MF143391
VT.2008.0536	Raccoon	VT	Bennington	Bennington	2008	Sanger	V	MG562590
VT.2008.0704	Raccoon	VT	Windham	Westminster	2008	Sanger	VIa	MG562591
VT.2008.0764	Raccoon	VT	Windham	Rockingham	2008	Illumina	VIa	MG562592
VT.2009.0023	Skunk	VT	Windsor	Royalton	2009	Sanger	IIIb	MG562593
VT.2009.0036	Skunk	VT	Franklin	Fairfax	2009	Sanger	Ia	MF143392
VT.2009.0092	Raccoon	VT	Grand Isle	South Hero	2009	Illumina	Ia	MF143393
VT.2009.0093	Skunk	VT	Orleans	Craftsbury	2009	Illumina	IIb	MF143394
VT.2009.0124	Skunk	VT	Chittenden	Williston	2009	Illumina	Ib	MF143395
VT.2009.0134	Skunk	VT	Caledonia	Sheffield	2009	Illumina	IIb	MF143396
VT.2009.0136	Raccoon	VT	Chittenden	Essex	2009	Illumina	Ia	MF143397
VT.2009.0137	Horse	VT	Windsor	Hartford	2009	Sanger	VIc	MG562594
VT.2009.0146	Raccoon	VT	Orleans	Craftsbury	2009	Illumina	IIb	MF143398
VT.2009.0164	Raccoon	VT	Franklin	Franklin	2009	Illumina	Ia	MF143399
VT.2009.0169	Skunk	VT	Chittenden	Shelburne	2009	Illumina	Ib	MF143400
VT.2009.0191	Raccoon	VT	Chittenden	Charlotte	2009	Illumina	Ia	MG562595

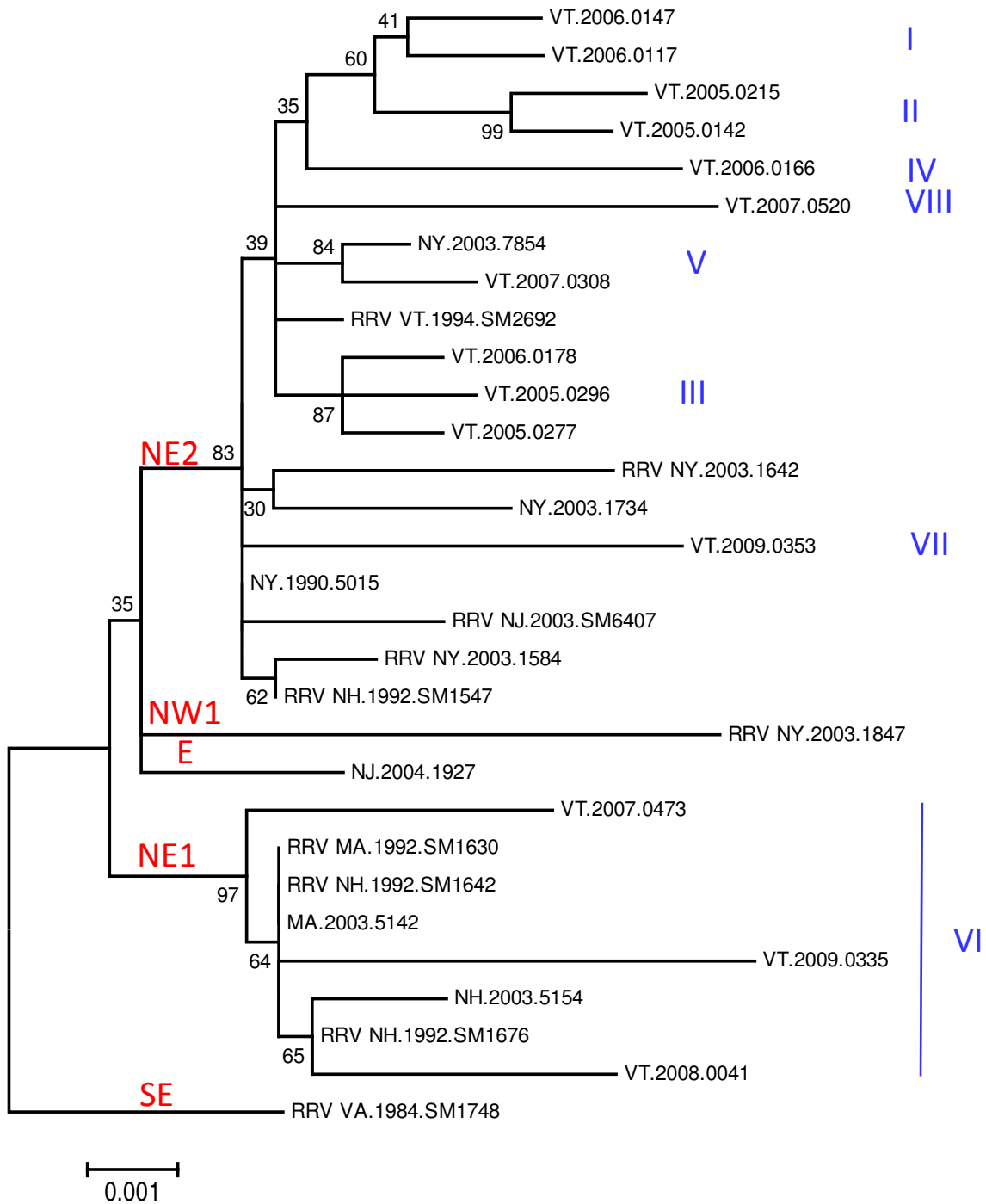
VT.2009.0194	Raccoon	VT	Chittenden	Williston	2009	Illumina	Ia	MF143401
VT.2009.0322	Gray Fox	VT	Windham	Putney	2009	Sanger	VIb	MG562596
VT.2009.0335	Raccoon	VT	Windham	Townshend	2009	Sanger	VIb	MG562597
VT.2009.0346	Raccoon	VT	Addison	Vergennes	2009	Sanger	Ia	MG562598
VT.2009.0352	Raccoon	VT	Grand Isle	Grand Isle	2009	Sanger	Ia	MF143402
VT.2009.0353	Raccoon	VT	Bennington	Bennington	2009	Illumina	VII	MG562599
VT.2009.0361	Raccoon	VT	Windsor	Hartford	2009	Sanger	VIc	MG562600
VT.2009.0370	Raccoon	VT	Lamoille	Stowe	2009	Illumina	Ia	MF143289
VT.2009.0371	Cow	VT	Orleans	Barton	2009	Sanger	IIb	MF143403
VT.2009.0377	Raccoon	VT	Windham	Dover	2009	Illumina	VIa	MG562601
VT.2009.0384	Raccoon	VT	Windsor	Baltimore	2009	Sanger	IIIa	MG562602
VT.2009.0393	Cow	VT	Addison	Addison	2009	Sanger	Ib	MG562603
VT.2009.0397	Cow	VT	Orleans	Greensboro	2009	Sanger	IIb	MF143338
VT.2009.0406	Raccoon	VT	Bennington	Dorset	2009	Illumina	IV	MG562604
VT.2009.0423	Raccoon	VT	Orleans	Greensboro	2009	Sanger	IIb	MF143404
VT.2009.0428	Raccoon	VT	Franklin	Franklin	2009	Sanger	Ia	MF143405
VT.2009.0443	Cow	VT	Lamoille	Hyde Park	2009	Sanger	IIIb	MF143406
VT.2009.0475	Skunk	VT	Chittenden	Charlotte	2009	Sanger	Ib	MG562605
VT.2009.0500	Raccoon	VT	Bennington	Manchester	2009	Sanger	IV	MG562606
VT.2010.0003	Gray Fox	VT	Bennington	Bennington	2010	Illumina	VII	MG562607
VT.2010.0044	Skunk	VT	Chittenden	Burlington	2010	Illumina	Ia	MF143407
VT.2010.0054	Raccoon	VT	Chittenden	South Burlington	2010	Illumina	Ia	MF143408
VT.2010.0070	Skunk	VT	Chittenden	Hinesburg	2010	Illumina	Ib	MG562608
VT.2010.0089	Raccoon	VT	Chittenden	Burlington	2010	Illumina	Ia	MF143409
VT.2010.0090	Skunk	VT	Chittenden	Winooski	2010	Illumina	Ia	MF143410
VT.2010.0093	Skunk	VT	Chittenden	Winooski	2010	Illumina	Ia	MF143411
VT.2010.0145	Skunk	VT	Orleans	Craftsbury	2010	Illumina	IIb	MF143412
VT.2010.0172	Skunk	VT	Chittenden	South Burlington	2010	Illumina	Ia	MF143339
VT.2010.0246	Gray Fox	VT	Addison	Middlebury	2010	Illumina	Ib	MG562609
VT.2010.0370	Skunk	VT	Chittenden	Burlington	2010	Illumina	Ia	MF143413
VT.2011.0079	Skunk	VT	Chittenden	Burlington	2011	Illumina	Ia	MF143414
VT.2011.0122	Skunk	VT	Caledonia	Walden	2011	Both	Ia	KY026483

VT.2011.0138	Skunk	VT	Orleans	Derby	2011	Illumina	IIb	MF143340
VT.2011.0145	Skunk	VT	Caledonia	Ryegate	2011	Illumina	VIc	MG562610
VT.2011.0198	Raccoon	VT	Chittenden	Burlington	2011	Illumina	Ib	MF143415

*as described in the main text, NY HIST refers to New York historical isolates from the 1990s.

Supplementary Table S3. Additional sequences used for the phylogenetic analysis illustrated in Supplementary Figure 1.

Sample designation	State origin	County	Year of collection	Accession number: N gene	Accession number: G gene
RRV_MA.1992.SM1630	MA	Worcester	1992	DQ886050	DQ888343
RRV_NH.1992.SM1547	NH	Grafton	1992	DQ886055	DQ888348
RRV_NH.1992.SM1642	NH	Hillsboro	1992	DQ886054	DQ888347
RRV_NH.1992.SM1676	NH	Rockingham	1992	DQ886056	DQ888349
RRV_NJ.2003.SM6407	NJ	Sussex	2003	DQ886058	DQ888351
RRV_NY.2003.1584	NY	Westchester	2003	DQ886041	DQ888334
RRV_NY.2003.1642	NY	Otsego	2003	DQ886043	DQ888336
RRV_NY.2003.1847	NY	Genesee	2003	DQ886044	DQ888337
RRV_VA.1984.SM1748	VA	Spotsylvania	1984	DQ886062	DQ888355
RRV_VT.1994.SM2692	VT	Bennington	1994	DQ886069	DQ888362



Supplementary Figure S1. Concatenated N and G gene sequences were used for a ML analysis employing 1000 bootstrap replicates. Viral groupings as described in this report are shown in blue to the right of the tree while clades previously identified by Biek et al. [8] are identified in red along the main branches. Bootstrap values are indicated at several nodes.