

## **EIGHT YEARS MONITORING OF TIMBER RATTLESNAKES ON COOPERS ROCK (CR) AND WEST VIRGINIA RESEARCH (WVR) STATE FORESTS: 2023 UPDATE**

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Frank Jernejcic is the Principal Investigator (PI), now retired 9 years after working 45 years as District 1 fishery biologist for the WV DNR. Part of his duties included responding to statewide public inquiries about snakes as well as giving educational lectures and live snake exhibits. He also provided annual lectures to WVU Wildlife classes about snakes, fishery management topics and fish sampling field trips.

Scientific Collecting Permits have been issued by both WV DNR Parks and DNR Wildlife sections from 2016 to 2021. Starting in 2022, the Wildlife Section determined that monitoring Timber Rattlesnakes (TR) on CR should be the responsibility of the Parks Section and the CR Superintendent. We have worked closely with the current Superintendent, as well as his predecessors, who have recognized the value of our monitoring and ability to safely relocate nuisance TRs from High Use Areas (HUA). We have also instructed CR personnel about safe handling procedures and appropriate care of nuisance TRs until we can respond and relocate the TRs when necessary.

It is anticipated that we will be encountering more TRs needing relocation in 2024 as construction, started in 2023, continues for the McCollum Campground (CG) expansion, and cabins at the Woodshed site. Many encounters with TRs by the public and DNR have occurred in both areas.

### **ORIGINAL PURPOSE**

Preliminary TR distribution was initiated in 2016 after interviewing residents living adjacent to CR and WVR, and interviewing CR personnel. Posters were displayed at trail heads and parking areas to solicit reports of encounters by the public. Additional encounters were obtained by hiking power line rights-of-ways (PL).

Our initial objectives were to determine TR relative abundance and possible overwintering sites (OWS). The scope expanded as more TRs were encountered (many more than anticipated) and additional data/information was generated. A unique ID number was given to all TRs we encountered or were reported by the public.

Captured TRs are marked by painting the basal segments of the rattle with a different color for each year and cauterizing caudal scales with a unique numerical pattern. These marked TRs were then released in place unless requiring relocation from a HUA. All encounters and relocations were mapped using Terrain Navigator Pro mapping software which facilitated monitoring. Approximately 1,345 individuals were identified and mapped during the eight study years. These valuable maps show the locations of encounters in relation to HUAs, roads, and the campground expansion and cabin construction sites. This expansion will likely require additional TR relocations.

The results and recommendations of the Marshall University telemetry project during 2019 and 2020 confirmed the value of our monitoring, relocation protocol, and public outreach and interaction with CR visitors. OWSs were determined for 44 TRs but not reported in the resulting thesis. I have mapped the locations but will not publicize the sites. A seven-year (2016-22) summary report of monitoring TRs on CR and WVR is available on request.

### **SUMMARY OF ENCOUNTERS DATA THAT WILL BE USEFUL FOR DNR PARKS and CR ADMINISTRATION DECISIONS.**

TRs have been located throughout CR and WVR. We have documented/monitored 916 encounters on CR and 429 on WVR in eight years. (Table 1).

**Table 1. TOTAL TR ENCOUNTERS ON CR AND WVR 2016-2023**

	2016	2017	2018	2019	2020	2021	2022	2023	TOTALS
<b>CR</b>	59	67	159	212	180	72	62	105	<b>916</b>
<b>WVR</b>	98	92	47	86	55	21	14	16	<b>429</b>
<b>TOTALS</b>	<b>157</b>	<b>159</b>	<b>206</b>	<b>298</b>	<b>235</b>	<b>93</b>	<b>76</b>	<b>121</b>	<b>1,345</b>

The public reported 519 encounters and DNR 826 encounters (Table 2). The higher number of DNR encounters include the tracking efforts for the telemetry project administered during 2019 and 2020 on CR. Gate closure on WVR starting in 2018 restricted public access which reduced public encounters compared to 2016 and 2017. However, this closure did not affect DNR monitoring efforts.

**Table 2. TR ENCOUNTERS BY DNR AND PUBLIC 2016-2023**

		DNR								GRAND TOTALS	
		2016	2017	2018	2019	2020	2021	2022	2023	Totals	
<b>CR</b>		34	25	70	157	111	28	16	45	<b>486</b>	
<b>WVR</b>		65	68	38	77	54	20	6	12	<b>340</b>	
<b>TOTALS</b>		99	93	108	234	165	48	22	57	<b>826</b>	
		PUBLIC								GRAND TOTALS	
		2016	2017	2018	2019	2020	2021	2022	2023	Totals	
<b>CR</b>		25	42	89	55	69	44	46	60	<b>430</b>	<b>916</b>
<b>WVR</b>		33	24	9	9	1	1	8	4	<b>89</b>	<b>429</b>
<b>TOTALS</b>		58	66	98	64	70	45	54	64	<b>519</b>	<b>1,345</b>

There were 719 encounters with TRs in HUAs on CR from 2016 to 2023 (Table 3). The number of encounters on and around the Raven Rock Trail (226), and in and around the McCollum CG, Rhododendron CG and Shelters, Overlook Area (OL), and Henry Clay Furnace combined (155) is notable. Most encounters in HUAs were made by the public (410). All encounters reported by the public were considered unique and exciting events.

	<b>DNR</b>	<b>PUBLIC</b>	<b>TOTALS</b>
<b>Raven Rock OL/trail/PL</b>	91	135	226
<b>Other trails</b>	42	167	209
<b>Roads</b>	86	35	121
<b>Rhod CG; Shelters 3,4</b>	26	27	53
<b>Henry Clay Furnace</b>	6	28	34
<b>Overlook Area</b>	19	12	31
<b>McCollum CG</b>	31	6	37
<b>Park Office; Woodshed</b>	8	0	8
	<b>309</b>	<b>410</b>	<b>719</b>

Public encounters peaked in June and July (Table 4), associated with increasing visitation and TR seasonal movements. DNR encounters peaked in May and decreased as summer progressed. The high number of encounters by DNR in May reflects the telemetry tracking effort during 2019 and 2020. As summer progressed, a combination of higher temperatures and increased vegetation growth on PLs also reduced DNR encounters and capture efficiency on PLs.

**Table 4. ENCOUNTERS BY MONTH 2016-2023**

	<b>DNR</b>	<b>PUBLIC</b>	<b>RELOCS</b>
March	3	0	0
April	0	7	0
May	250	73	7
June	183	146	14

July	167	147	33
August	104	98	15
Sept	70	49	9
October	14	5	0
Nov	1	2	0
<b>TOTALS</b>	<b>792</b>	<b>527</b>	<b>78</b>

TRs undoubtedly emerged from OWSs earlier than our first DNR encounter dates (Table 5). The later Public first encounters (May) reflects the time when public visitation increases and when TRs have left OWSs and begun their seasonal movements. This increases the likelihood of encounters throughout CR.

**Table 5. FIRST and LAST ENCOUNTER DATES 2016-2023**

YEAR	FIRST		LAST	
	DNR	PUBLIC	DNR	PUBLIC
<b>2016</b>	Apr 24	May 10	Sep 14	Sep 12
<b>2017</b>	Apr 26	May 18	Sep 27	Sep 26
<b>2018</b>	May 9	May 3	Oct 7	Sep 21*
<b>2019</b>	Apr 13	May 7	Nov 14	Oct 20
<b>2020</b>	Mar 29	May 15	Oct 12	Oct 10
<b>2021</b>	Mar 9	May 18	Sep 6	Oct 21
<b>2022</b>	May 11	May 3	Oct 11	Oct 15
<b>2023</b>	May 12	Apr 5	Oct 3	Nov 4

\*One neonate caught 11/5/18; an anomaly

Recaptures indicate the site where TRs move after marking. This data also suggests that the majority (hopefully all) have survived the handling associated with marking and measuring. Recaptures reported in Table 6 did not include TRs marked in the telemetry study (about 180 additional). We recaptured 58 of 231 (25%) marked TRs from 2016 to 2023 (Table 6) which indicates our marking and handling procedures are not detrimental to TR survival. Twenty-six were recaptured the same year as marked and 26 were recaptured one to six years later. Several were recaptured twice and two were recaptured and relocated three times (2023<sup>a</sup> and 2023<sup>b</sup>).

Table 6.		NUMBERS MARKED BY YEAR AND TOTAL RECAPTURES 2016-2023																TOTALS
		2016		2017		2018		2019		2020		2021		2022		2023		
		CR	WVU	CR	WVU	CR	WVU	CR	WVU	CR	WVU	CR	WVU	CR	WVU	CR	WVU	
MARKED		9	21	13	32	32	5	9	31	0	24	10	8	7	0	22	8	231
RECAPS		1	0	3	3	3	4	10	8	5	8	5	0	5	0	2	1	58
INDIVIDUAL RECAPTURES BY YEAR MARKED																		
	2016		2017	2017	2018	2016	2016	2016	2017	2020	2018		2016		2023 <sup>a</sup>	2021		
			2017	2017	2018	2016	2016	2016	2017	2020	2019		2018		2023 <sup>b</sup>			
			2017	2017	2018	2018	2018	2017	2018	2020	2020		2018					
					2018	2018	2019	2019	2020	2020	2020		2018					
						2018	2019	2019	2020	2021		2018						
						2018	2019		2020									
						2018	2019		2020									
						2018	2019		2020									
						2018												
						2018												

There are currently more than 400 TRs with unique identifying marks that are a resource of potential data if recaptured.

A total of 72 TRs were relocated from HUAs on CR from 2016 to 2023 (Table 7). This represents 10% of the estimated 719 encounters on HUAs (Table 3).

Table 7		TR RELOCATIONS FROM CR HUAs 2016-2023						TOTALS
SITE	2016-18	2019	2020	2021	2022	2023		
McCullum CG	7	4	1	0	1	4	17	
Rhod CG	3	3	3	1	1	1	12	
Roads	6	2	1	0	4	7	20	
Overlook	4	1	0	0	1	2	8	
Park Office	3	1	0	0	0	0	4	
Woodshed	1*	0	0	2*	0	3	6	
Trail	1	0	0	0	2	0	3	
Adjacent Residence	0	0	1	0	0	1	2	
<b>Subtotals</b>	<b>25</b>	<b>11</b>	<b>6</b>	<b>3</b>	<b>9**</b>	<b>18***</b>	<b>72</b>	

\*18524-1 recaptured twice; \*\*five recaptures

\*\*\* Two TRs each caught three times and relocated three times from original two capture sites.

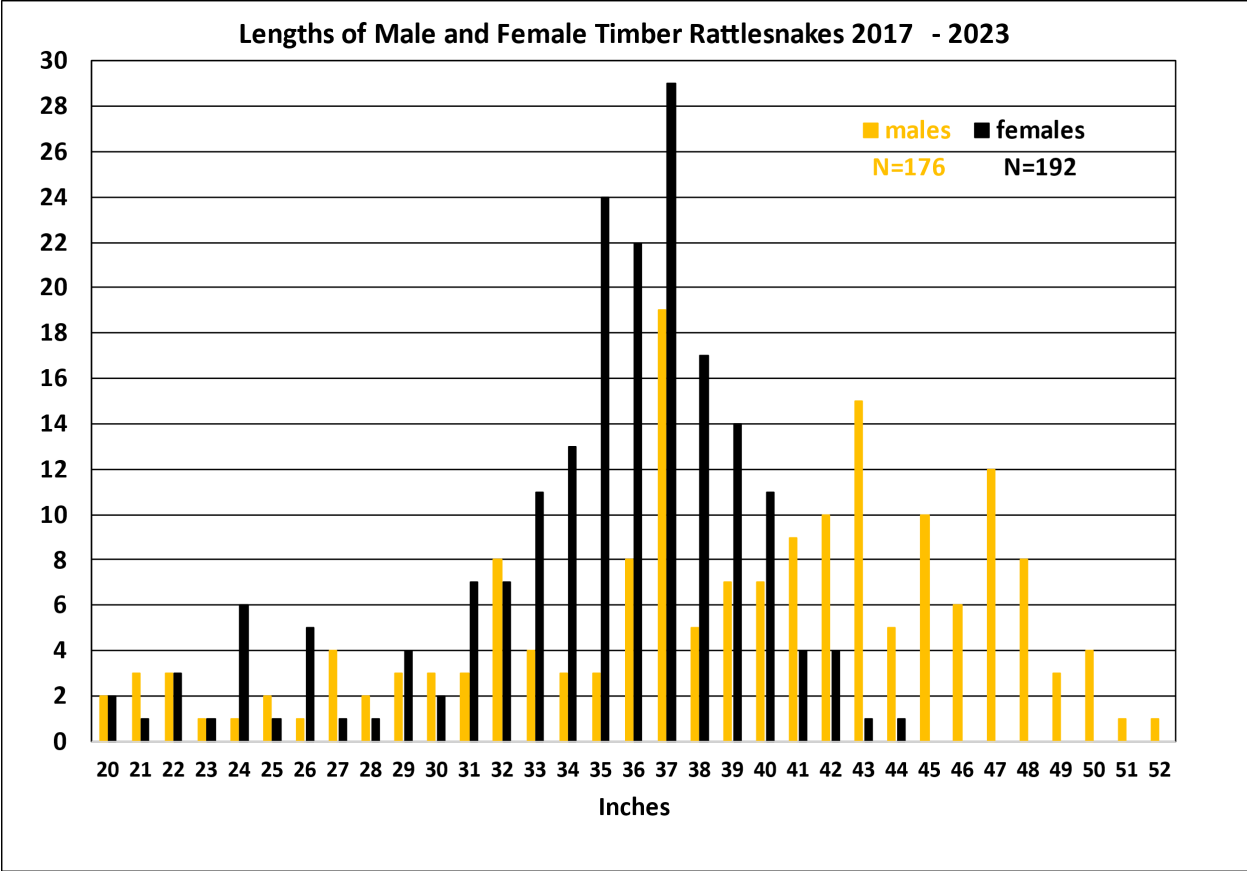
One TR (18524-1) that was marked with green paint in 2018 at the Woodshed and relocated 100 ft was recaptured again at the Woodshed in 2021. It was then relocated 500 ft from the Woodshed but recaptured again in two weeks back at the Woodshed. It was again relocated 500 ft for a third time. The green paint was barely visible after three years and the identity was confirmed by the cauterized scales. Another TR (23619-1) was also caught three times at the Woodshed in 2023 and relocated three times. One TR (23604-7) was also caught and relocated three times from the McCollum CG in 2023. That same TR was seen an additional five times by campers.

A major McCollum CG expansion was started in 2023, in addition to a new cabin complex being constructed at the Woodshed site. This will undoubtedly increase public encounters and necessitate additional relocations in future years.

Nine relocations in 2022 included five recaptures which had been marked previously in 2016 or 2018 (Table 6). Attempting to understand and interpret the movements of marked, recaptured, and relocated TRs is informative but speculative at this time.

The average snout to base-of-the-rattle length of 368 TRs actually measured from 2017 to 2023 was 37-inches. Males averaged 39-in and females 35-in. Seventy-eight percent were shorter than the previously established 42-in DNR size limit. The longest male measured was 52-in and the longest female, 44-in (Graph 1). Only four females (1%) were longer than the former 42-in size limit which was certainly protective of females. However, starting in 2021 it became illegal to possess any size TR in WV.

**Graph 1.**



A total of 38 road kills were documented from 2016 to 2023 with 29 found on at CR (Table 8). Most road kills (36) occurred on the paved roads. Gender of the 16 males and seven females that were collected were identified by subcaudal scale counts or penis expression. Males have larger home ranges and travel greater distances than females which increases the probability of males crossing roads. Length range of 24 measured TRs was 29-48 in.

Table		ROAD KILLS 2016-2023							TOTAL
		2016	2017	2018	2019	2020	2021	2022	
Surfac									

<b>CR</b>	4	4	8	3	2	2	2	4	<b>29</b>
<b>WVR</b>	3	0	1	1	0	2	2	0	<b>9</b>
<b>Totals</b>	7	4	9	4	2	4	4	4	<b>38</b>
Paved	6	4	8	4	2	4	4	4	36
Gravel	1	0	1	0	0	0	0	0	2
<b>Length (n)</b>	36-44 (3)	31-45(3 )	29-47(7 )	35-38(3 )	41,4 8	37-48 (4)	36-42(2 )	36-42( 4)	
<b>M/F</b>	0/0	1/1	4/2	2/1	2/0	2/2	2/0	3/1	<b>16/7</b>

There were at least another 121 TRs encountered on the roads or berms from 2016 to 2023 (Table 3), which represent potential road kills. Many were escorted or monitored until they moved off the road. The number of TRs encountered within 500 to 1,000 ft of paved roads on CR is significant and represents potential road kills based on the normal movements we have observed.

The WV Department of Highways (DOH) installed Rattlesnake Signs (April 2018) at six paved road locations on CR based upon historic observations of road kills by CR personnel. The intent was to slow traffic and reduce road kills but this may have not been obvious to drivers based on subsequent public comments. However, road kills were reduced after 2018. One of these signs was stolen in 2021 and subsequently replaced by DOH. Another was stolen in 2024 and will also be replaced.

There is no evidence of road kills on I-68, since its construction 43 years ago, which would suggest TRs move between the CR and the WVU. I-68 appears to be an obvious barrier.

4/22/24