Survey of Land Snails at Devils Tower National Monument

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Introduction

Invertebrates comprise 99% of the species on earth (Ponder and Lunney 1999). Despite the fact that most animals lack a backbone, far less is known about these animals compared to their vertebrate counterparts. Non-marine mollusks are a diverse group of invertebrates composed of terrestrial snails, and freshwater snails and bivalves. Non-marine mollusks are one of the most critically impaired groups of animals on earth (Lydeard et al. 2004). Unfortunately, the highest number of recorded extinctions occurred within the mollusk group. About 24,000 terrestrial mollusks are described, and an estimated 11,000 to 40,000 terrestrial mollusks are currently undescribed (Lydeard et al. 2004). Of the described species, 1,222 (5%) were on the 2002 International Union for Conservation of Nature Red List of Threatened Species (www.redlist.org; Lydeard et al. 2004).

Land snails have unique life history traits and play an important role in the ecosystem. Land snails generally live in moist microhabitats on the landscape, such as by streams, springs and on north-facing slopes. Snails require moisture to live, because their tissues can be 50% water by weight (Burch and Pearce 1990). In addition, snails move by secreting mucous and mucous is mainly composed of water. Snails move small distances each year, making dispersal extremely limited (Overton et al. 2009). Because few individuals immigrate to new colonies, gene flow is probably limited. For these reasons, local endemic species may arise. Snails may move long distances via passive dispersal, such as hitchhiking on birds, humans, etc.; however, little is known about long distance dispersal by snails. In the food web, land snails are vital decomposers that break down leaf litter. Land snails are also food to many predators, such as small mammals and birds. Despite their small size, land snails are diverse and vital to ecosystem health.

The land snails at Devils Tower National Monument have not been previously studied, but the Monument has ideal habitat for land snails: rock outcrops, limestone, moist areas (e.g., springs), leaf litter, etc. Calcium-rich limestone is a critical mineral for many land snails, because calcium is needed to build shells. The objective of the study is to inventory the land snails of Devils Tower National Monument. Discovering what species live at the Monument will help inform management decisions and learn about the distribution of these unique species in Wyoming.

Methods

To survey the land snails at Devils Tower National Monument, I chose areas that appeared to have suitable conditions. I hiked all the trails at the Monument, visited the 5 active springs, and looked for snails in other wet areas, north facing slopes, etc. Litter and soil were sorted in the field and search for

land snails. I recorded habitat conditions, location information using a GPS, and photographed sites that contained land snails. Live snails were drowned in water and preserved in increasing concentrations of ethanol over 3 days. I typically identified land snails to species using a dissecting microscope and available keys (Pilsbry 1939; Burch and Pearce 1990; Anderson 2004; Nekola and Coles 2010; Nekola no date).

Results and Discussion

I surveyed land snails from 30 May to 2 June 2010 at Devils Tower National Monument, and found 14 sites that land snail inhabited (Figure 1).

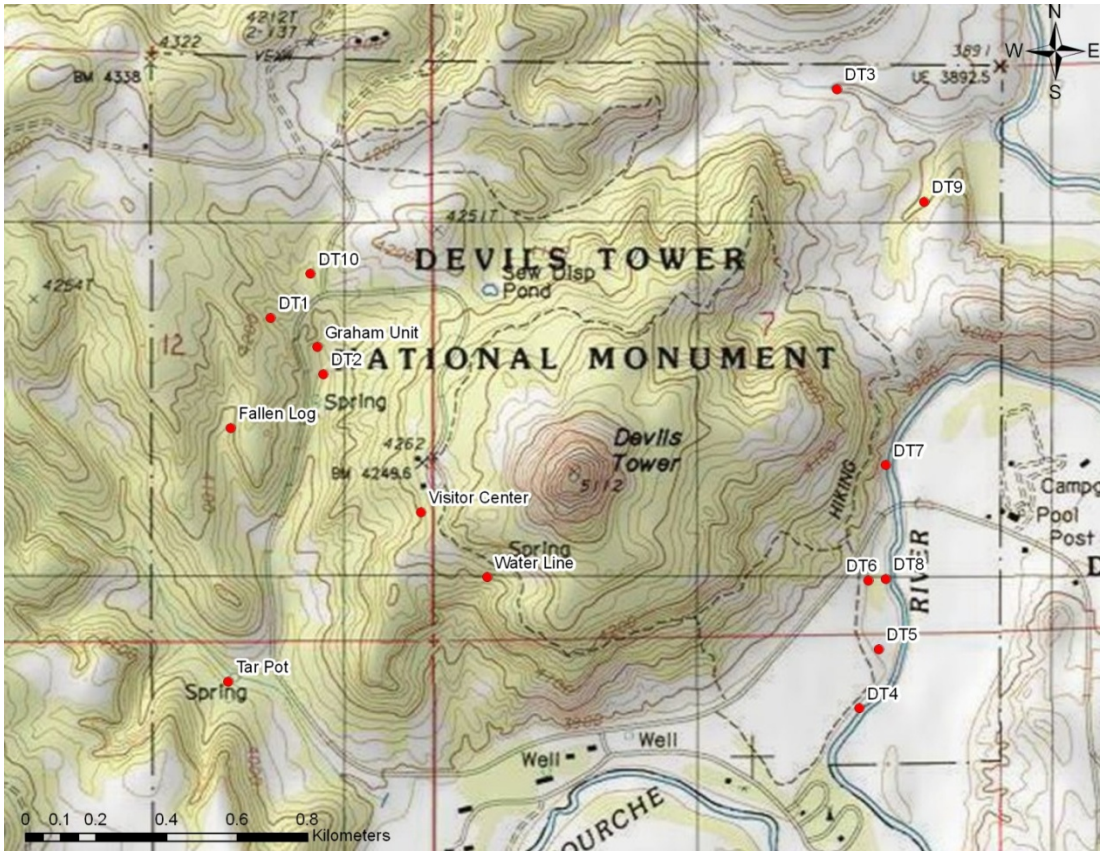


Figure 1. Map of Devils Tower National Monument showing the sites sampled where land snails lived.

I identified 9 genera and 12 species of land snails at Devils Tower National Monument (Table 1). *Vallonia gracilicosta/albula* was found at 93% of the sites, and *Gastrocopta similis*, *Zonitoides nitidus*, and *Succinea* were found at 36% of the sites. Several species were found at only 1 site.

Table 1. The land snails identified from Devils Tower National Monument and the number of sites that each taxa was found at.

Species	**Number of sites**
Discus catskillensis	2
Gastrocopta pentodon	1
Gastrocopta procera	1
Gastrocopta similis	5
Hawaiia minuscula	3
Nesovitrea binneyana	2
Succinea	5
Vallonia gracilicosta/albula	13
Vallonia perspectiva	1
Vertigo binneyana	1
Vitrina pellucida	1
Zonitoides arboreus	3
Zonitoides nitidus	5

Summary by site

Site DT1

Coordinates: 13T 521746E 4937945N (NAD83)

Elevation: 1284 m (4213 ft)

Site description: North-facing slope on west side of road across from Graham Spring. The hillside was covered by grass and forbs. I found shells on ground surface. Area burned.

Notes: No live snails present.

Photos of the site (left), *Gastrocopta similis* (middle), and *Zonitoides arboreus* (right).

Land snails found at this site:

Gastrocopta similis

Vallonia gracilicosta/albula

Zonitoides arboreus

Site DT2

Coordinates: 13T 521896E 4937784N (NAD83)

Elevation: 1236 m (4055 ft)

Site description: U-shaped stream bottom by first order stream. South of Graham Spring.

Notes: Most shells were long dead. Shells were mainly on slope near the stream. Area burned.

Photo of the site (left) and *Zonitoides nitidus* (right).

Land snails found at this site:

Gastrocopta similis

Succinea

Vallonia gracilicosta/albula

Vertigo binneyana

Zonitoides nitidus

Site DT3

Coordinates: 13T 523348E 4938593N (NAD83)

Elevation: 1228 m (4029 ft)

Site description: U-shaped gully that may have running water during snow melt. I found snails on the north aspect along the gully. Chokecherry, ponderosa pine, and oak growing here. Abundant grass.

Notes: Snails very patchy here.

Photo of the site (top), and ventral (bottom left) and dorsal views of *Vallonia perspectiva* (bottom right).

Land snails found at this site:

Vallonia perspectiva

Vallonia gracilicosta/albula

Vertigo

Vitrina pellucida

Site DT4

Coordinates: 13T 523412E 4936842N (NAD83)

Elevation: 1179 m (3868 ft)

Site description: Site on north bank of the Belle Fourche River east of the campground. On a little rise ~1 m from the water. Area has thick grass, but no overstory.

Notes: I found 1 live *Succinea* snail. Many long dead shells. River was over its banks recently.

Photos of the site along the Belle Fourche River looking northeast (top left) and southwest (top right), and *Discus catskillensis* (bottom left).

Land snails found at this site:

Discus catskillensis

Hawaiia minuscula

Physidae (aquatic snails)

Planorbidae (aquatic snail)

Succinea

Vallonia gracilicosta/albula

Zonitoides nitidus

Site DT5

Coordinates: 13T 523467E 4937005N (NAD83)

Elevation: 1190 m (3904 ft)

Site description: Site is along the Belle Fourche River under a Cottonwood tree about 200 ft from the river on the north. I found snails in an isolated pocket under the tree.

Notes: Many live snails of the same species.

Photos of live snails at the site (top) and a close up photo of *Zonitoides nitidus* (bottom left).

Land snails found at this site:

Zonitoides nitidus

Site DT6

Coordinates: 13T 523437E 4937202N (NAD83)

Elevation: 1184 m (3884 ft)

Site description: Site is under a cottonwood tree in a groove of trees in the floodplain, about 150 ft from the Belle Fourche River. I found snails under a pile of bark.

Notes: Little leaf litter, mainly bark and grass.

Photo of the site. Most of the snails found were under bark.

Land snails found at this site:

Vallonia gracilicosta/albula

Zonitoides arboreus

Site DT7

Coordinates: 13T 523486E 4937529N (NAD83)

Elevation: 1183 m (3881 ft)

Site description: Site is on a 1 ft rise above the river, about 8 ft from the west back of the river, north side of the bridge.

Notes: Found empty shells of a couple different species. Bank was dry with no sign of live snails in grass.

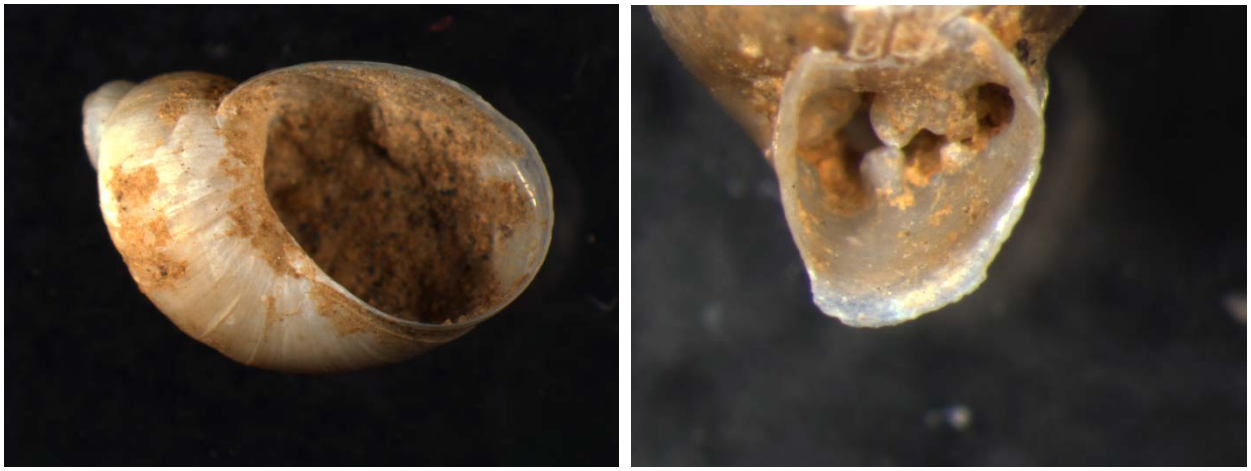


Photo of *Succinea* (left) and the aperture of *Gastrocopta procera* (right).

Land snails found at this site:

Gastrocopta procera

Succinea

Vallonia gracilicosta/albula

Site DT8

Coordinates: 13T 523491E 4937203N (NAD83)

Elevation: 1206 m (3957 ft)

Site description: Site is on the west bank of the Belle Fourche River, south of the bridge about 6 ft from the river.

Photo of *Gastrocopta pentodon* (left) and aperture of *Gastrocopta similis* (right).

Land snails found at this site:

Gastrocopta pentodon

Gastrocopta similis

Succineidae

Vallonia gracilicosta/albula

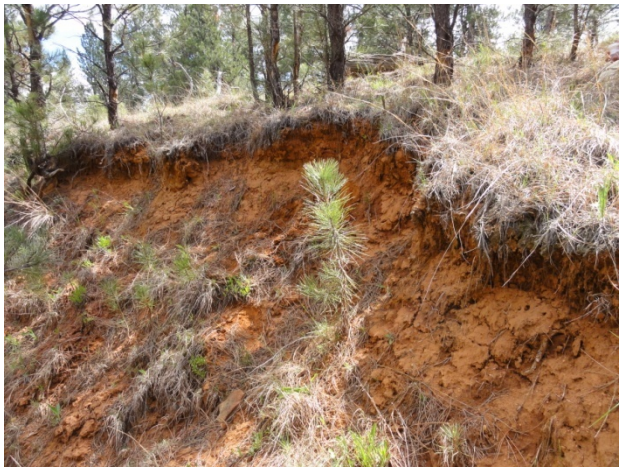
Site DT9

Coordinates: 13T 523595E 4938275N (NAD83)

Elevation: 1190 m (3904 ft)

Site description: Site is where the Red Beds Trail meets the Joyner connection trail. East of trails at head of gully. Red soil (Spearfish Formation). The gully is deep and surrounded by pine trees. Found snails on the northeast side of gully.

Notes: Snails are scarce here. Found one live specimen at the top of the gully where the bare ground and grass meet.



Photos of site showing the red soil from the Spearfish Formation.

Land snails found at this site:

Gastrocopta similis

Vallonia gracilicosta/albula

Site DT10

Coordinates: 13T 521857E 4938070N (NAD83)

Elevation: 1236 m (4055 ft)

Site description: Site is on the west side of where the Joyner Ridge Road joins the main road. The gully has water at times, but no water when sampled. Pine and oak trees.

Notes: I found snails on hill side at the bottom of the gully and under litter next to a rotting log. I found 1 live snail. Snails are scarce here.

Photos of the site (top right and left) and *Hawaiia minuscula* (bottom left).

Land snails found at this site:

Gastrocopta

Hawaiia minuscula

Succinea

Vallonia gracilicosta/albula

Site Fallen Log Spring

Coordinates: 13T 521618E 4937620N (NAD83)

Elevation: 1260 m (4134 ft)

Site description: Site is at Fallen Log Spring. The spring flows through a small gully for a short distance.

Notes: Found shells on both banks and under logs near spring. Snail shells fairly abundant.

Photos of the site looking downstream (left) and upstream (right) a Fallen Log Spring.

Land snails found at this site:

Gastrocopta similis

Hawaiia minuscula

Succinea

Vallonia gracilicosta/albula

Zonitoides arboreus

Site Tarpot Spring

Coordinates: 13T 521608E 4936940N (NAD83)

Elevation: 1218 m (3996 ft)

Site description: Site is at Tarpot spring. Searched for snails along the stream that runs by Tarpot Spring. Moist gully.

Notes: Found snails in dirt, below spring box, and a different species above spring in the litter. Sanils very abundant.

Photo of the stream running through the site (top left) and the habitat with the abundant land snail colony (top right). *Nesovitrea binneyana* is pictured at bottom left.

Land snails found at this site:

Discus catskillensis

Nesovitrea binneyana

Vallonia gracilicosta/albula

Zonitoides nitidus

Site Waterline Spring

Coordinates: 13T 522355E 4937206N (NAD83)

Elevation: 1295 m (4249 ft)

Site description: Site near the Waterline Spring. Hillside with southwest aspect. Found snail 10-20 ft away from spring under an oak tree in the litter.

Notes: I looked next to spring but didn't see any snails. I looked under trees and found a few snails. Recently dead and long dead shells. Snails are scarce at this site.

Photo of the spring source (left) and one of the spring boxes (right) at the site.

Land snails found at this site:

Nesovitrea binneyana

Vallonia gracilicosta/albula

Zonitoides nitidus

Site Visitor Center Spring

Coordinates: 13T 522176E 4937405N (NAD83)

Elevation: 1281 m (4203 ft)

Site description: The lower section of the spring is moist, but no standing water. Some standing water at the upper section of the spring. Abundant oak and pine litter. Burned. Igneous rock abundant. Very wet site.

Notes: Only a few snails found at the lower section of the spring near rock and tree in the litter. Snails are scare at this site.

Photos of the spring below the visitor center (left) and searching the litter for land snails (right).

Land snails found at this site:

Vallonia gracilicosta/albula

Summary by species

Discus catskillensis (Pilsbry 1896)

Common name: Angular Disc

Width: ~5 mm

Whorls: ~4

Characteristics: Prominent ribs on top and bottom of shell. Outer whorl is angular.

Habitat: Found near water, such as at Tarpot Spring and next to the Belle Fourche River.

Distribution: From Maine to West Virginia and New York to South Dakota. Known from the Black Hills.

Gastrocopta pentodon (Say 1822)

Common name: Comb Snaggletooth

Height: <3 mm

Whorls: ~6

Characteristics: Much taller than wide, angulo-parietal lamella a simple peg, lower palatal lamella deep in aperture, white shell.

Habitat: Found along the Belle Fourche. According to Nekola and Cole (2010), this species is a cosmopolitan species found in a variety of habitats.

Distribution: From Maine to Florida, and New York to California

Gastrocopta procera (Gould 1840)

Common name: Wing Snaggletooth

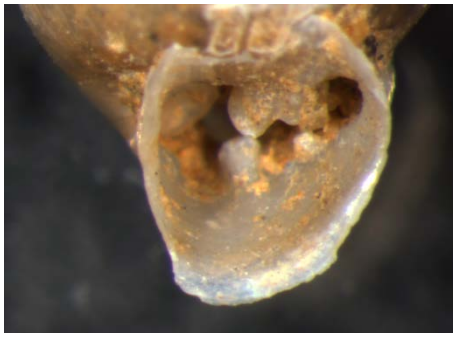
Height: <3 mm

Whorls: ~6

Characteristics: Brown shell, angulo-parietal lamella bi-lobed.

Habitat: Found along Belle Fourche River. Nekola and Cole (2010) state that the snail can be found in floodplains.

Distribution: From Maryland to Florida and New Mexico to New York. Known from the Black Hills.



Gastrocopta similis (Sterki 1909)

Common name: Great Lakes Snaggletooth

Height: 3-5 mm

Whorls: ~5-7

Characteristics: Translucent white shell, lower palatal lamella deeper in aperture than upper palatal lamella

Habitat: Found in a variety of habitats including next to water and on north-facing slopes. Nekola and Cole (2010) noted that this species is found in a variety of habitats from xeric grasslands to fens.

Distribution: From Wisconsin to Kentucky and New York to North and South Dakota

Hawaiia minuscula (Binney 1840)

Common name: Minute Gem

Width: ~2 mm

Whorls: ~4

Characteristics: Top of shell with striations, but bottom of shell smooth

Habitat: Found near water and in moist depressions.

Distribution: From Montana to Florida and California to New York. Known from the Black Hills.

Nesovitrea binneyana (Morse 1964)

Common name: Blue Glass

Width: ~4 mm

Whorls: ~4

Characteristics: Last whorl is about twice as wide as previous whorl

Habitat: Found near springs at Devils Tower. Anderson (2004) stated that this species can be found near water.

Distribution: From Montana to Kentucky and California to New York. Known from the Black Hills.

Succinea

Common name: Amber Snail

Height: <15 mm

Whorls: 2-4

Characteristics: Aperture height exceeds half the shell height

Habitat: Found near water and in moist depressions.

Distribution: Found across the United States. Three species are known from the Black Hills.

Taxonomy: Due to the lack of a key for the genus *Succinea*, I did not identify these snails to species. I used Nekola (no date) to identify these snails to genus.

Vallonia gracilicosta/albula (Reinhardt 1883/Sterki 1893)

Common name: Multirib Vallonia/Indecisive Vallonia

Width: <3 mm

Whorls: ~3.5

Characteristics: Thickened white lip, 45-50 ribs on outer whorl.

Habitat: Found in a variety of habitats across Devils Tower.

Distribution: From Maine to Texas and California to New York. Known from the Black Hills.

Taxonomy: No key available to distinguish *V. gracilicosta* from *V. albula*, but both species are known from Wyoming.

Vallonia perspectiva (Sterki 1893)

Common name: Thin-Lip Vallonia

Width: ~2 mm

Whorls: ~3

Characteristics: Lip of aperture not thickened or white.

Habitat: In moist depressions.

Distribution: North Dakota to Texas and New Mexico to New Jersey. Known from the Black Hills.

Vertigo binneyana (Sterki 1890)

Common name: Cylindrical Vertigo

Height: <2.5 mm

Whorls: ~5

Characteristics: Brown shell, 5 teeth in aperture.

Habitat: Found near water at Devils Tower. Nekola and Cole (2010) report this species from mesic grassland and woodlands.

Distribution: Manitoba to New Mexico and Montana to Iowa.

Vitrina pellucida (Muller 1774)

Common name: Western Glass Snail

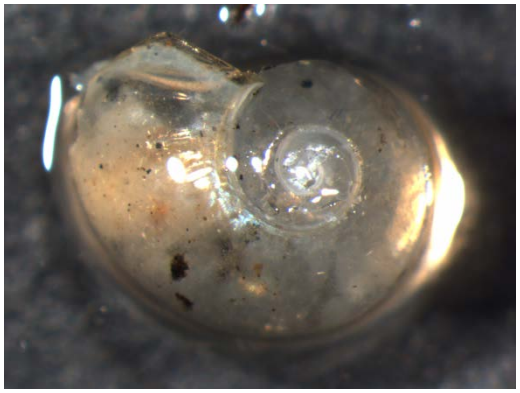
Width: ~6 mm

Whorls: ~3

Characteristics: The last shell whorl is much larger than penultimate whorl.

Habitat: Found in moist depression. Anderson (2004) noted that this species is found under logs and litter in moist areas.

Distribution: From Alaska to Texas and California to South Dakota. Known from the Black Hills.



Zonitoides arboreus (Say 1816)

Common name: Quick Gloss

Width: ~6 mm

Whorls: ~5

Characteristics: Aperture is oval shaped and shell color is yellow.

Habitat: Lives in a variety of habitats from drier hillsides to floodplains.

Distribution: From Maine to Florida and Oregon to New York. Known from the Black Hills.

Zonitoides nitidus (Muller 1774)

Common name: Black Gloss

Width: ~5 mm

Whorls: ~5

Characteristics: Aperture is round, shell is brownish-red.

Habitat: Found in moist habitats in floodplains, nears springs, and in tree holes.

Distribution: From Maine to Kentucky and Oregon to New York.

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