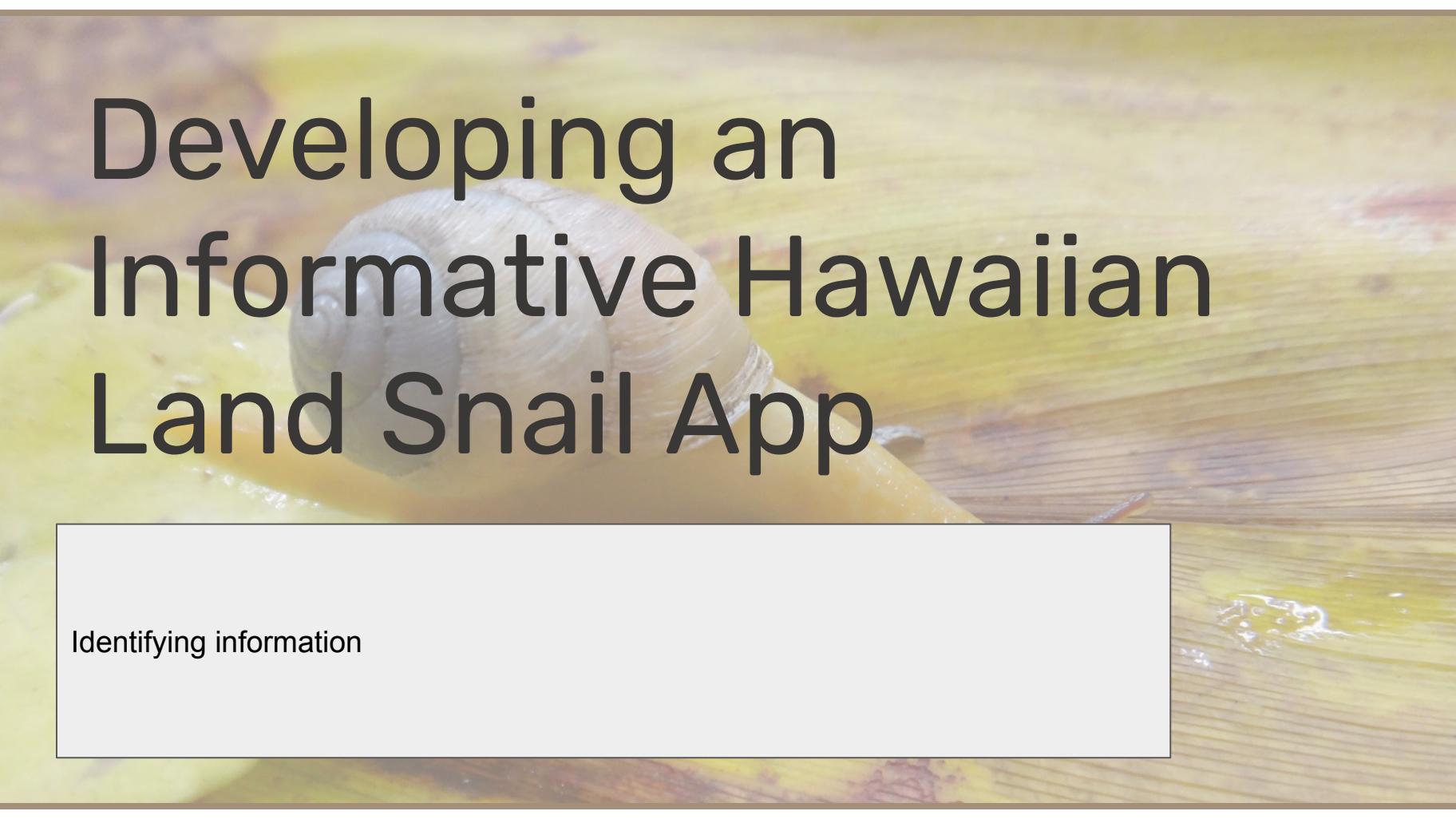


Developing an Informative Hawaiian Land Snail App



Identifying information

Why is creating a snail app necessary?

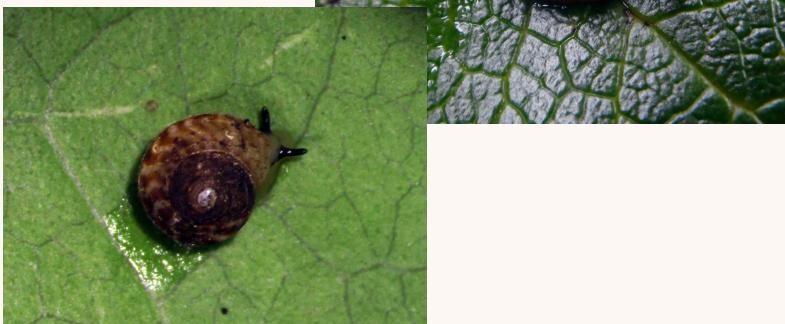
Hawaii's native land snails are incredibly diverse



More than 750
native species!
hawaiisnails.org



Hawaii's native land snails are rapidly going extinct



- 90% of 750 have already gone extinct
- Native Pacific Island land snails are the “most imperiled group with the most recorded extinctions since the 1500s” & account for 40% of undocumented animal extinctions (Yeung et. al, 2018)
- Non-native land snails are invasive in natural habitats & carry diseases (hawaiisnails.org)

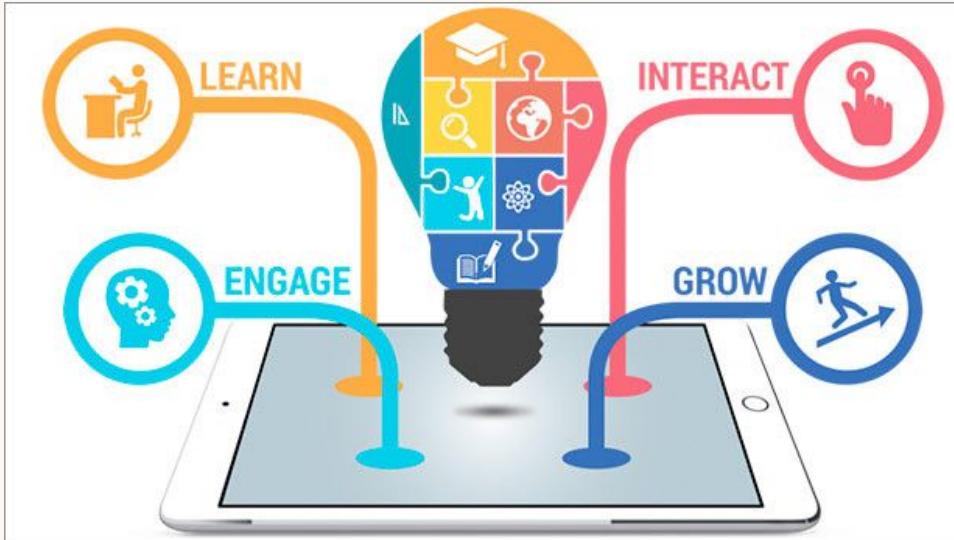
Non-native land snails are a large problem



53 non-native snail species
(hawaiisnails.org)



Educational apps can help conservation



- Conservation apps for nature (Jepson et. al, 2015)
- E-learning: modern learning approach using mobile devices (Taufiq et. al, 2017)

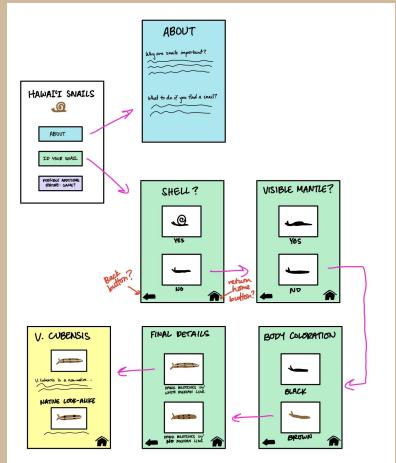
<https://bestmediainfo.com/2019/07/marketing-of-educational-apps-for-kids-is-not-a-child-s-play/>

01

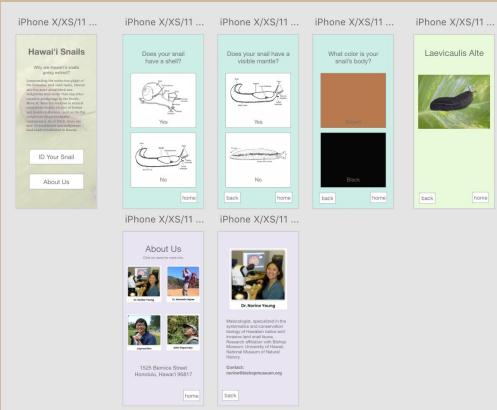
Designing the app

Adobe XD

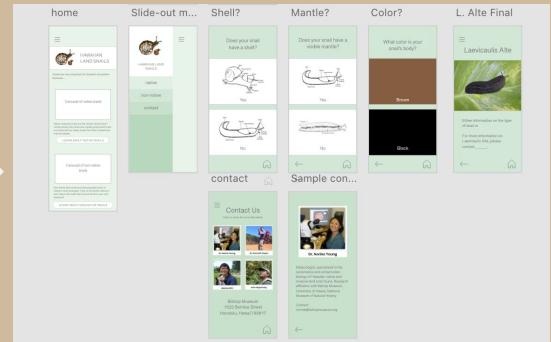
Creating sketches & mock-ups



Notability

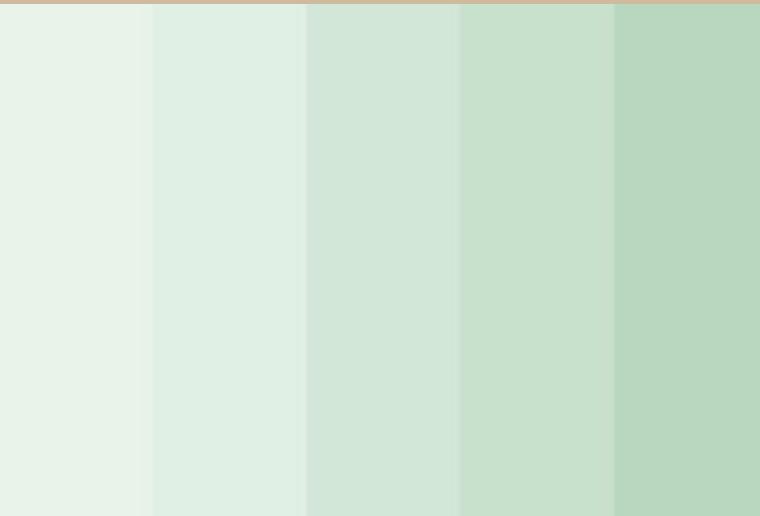


UI/UX Design
Research



Adobe XD:
user experience design tool for apps

“Final” Design Choices



- Color palette
- Slide-out Menu
- Information & Contact Pages
 - Changed a lot throughout the coding process

“Final” Design Choices



- Color palette
- Slide-out Menu
- Information & Contact Pages
 - Changed a lot throughout the coding process

“Final” Design Choices

The image displays a 2x3 grid of mobile application screens, likely from a wireframe or design prototype. Each screen has a light green header bar with a back arrow and a home icon.

- Shell?** A question screen: "Does your snail have a shell?" with "Yes" and "No" buttons. Below each button is a diagram of a snail with its shell labeled.
- Mantle?** A question screen: "Does your snail have a visible mantle?" with "Yes" and "No" buttons. Below each button is a diagram of a snail with its mantle labeled.
- Color?** A question screen: "What color is your snail's body?" with "Brown" and "Black" buttons. Below each button is a solid-colored square.
- L. Alte Final** (Large Alte Final): A result screen for "Laevicaulis Alte". It shows a black snail on a green leaf. Text below says: "Either information on the type of snail or For more information on Laevicaulis Alte, please contact _____".
- Contact**: A contact page with a "Contact Us" section. It lists names like Dr. Norine Young, Dr. Kristopher Young, Jayneen Kaino, and John Stoddard, each with a small profile picture. Below this is a detailed bio for Dr. Norine Young, her contact information (Email: norine@bishopmuseum.org), and the address: Bishop Museum, 1525 Bernice Street, Honolulu, Hawai'i 96817.
- Sample contact**: A sample contact page showing a video thumbnail of Dr. Norine Young speaking, followed by her bio and contact info.

- Color palette
- Slide-out Menu
- Information & Contact Pages
 - Changed a lot throughout the coding process

02

Coding the app

HTML/CSS/JS, Brackets, Chrome, Bootstrap

Resources

App was coded in HTML, CSS & JavaScript



https://www.real.discount/wp-content/uploads/2017/02/764164_de03_2.jpg

Udemy's The Complete Web Developer Course 2.0

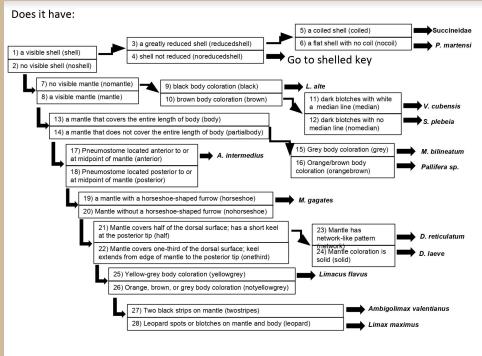
```
<!DOCTYPE html>
html {
    ...
}
body {
    ...
}
#header {
    background-color: #f0f0f0;
    color: black;
    font-size: 1.2em;
    padding: 10px;
}
#header h1 {
    margin: 0;
}
#header h1 a {
    color: inherit;
    text-decoration: none;
}
#header h1 a:hover {
    text-decoration: underline;
}
#header .nav {
    list-style-type: none;
    padding-left: 0;
}
#header .nav li {
    display: inline-block;
    margin-right: 10px;
}
```

```
.header {
    background-color: #f0f0f0;
    color: black;
    font-size: 1.2em;
    padding: 10px;
}
.header h1 {
    margin: 0;
}
.header h1 a {
    color: inherit;
    text-decoration: none;
}
.header h1 a:hover {
    text-decoration: underline;
}
.header .nav {
    list-style-type: none;
    padding-left: 0;
}
.header .nav li {
    display: inline-block;
    margin-right: 10px;
}
```

Brackets & Chrome: allowed me to edit & test my code

Created a “Dichotomous Key Filter” to identify non-native snails

Dichotomous Key

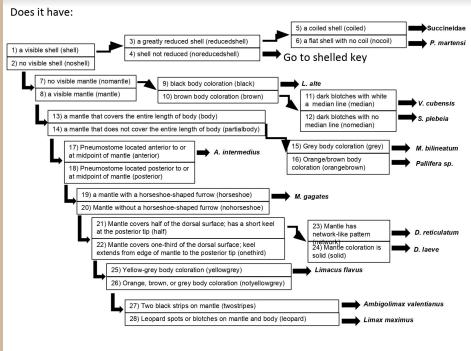


Filter



Greatest change & challenge throughout project

Dichotomous Key Filter



Non-native snail
dichotomous key

Use dichotomous key below to filter. You may exit & re-enter at any time.

Search | X

Search | Undo

Search for names... ID key

Ambigolimax valentianus

Arion intermedius

Deroceras laeve

Limax maximus

No Mantle

Mantle

a visible shell

a visible mantle

no visible shell

no visible mantle

03

Inputting snail info

Thank you to Dr. Hayes & Dr. Yeung for the photos
and information!

Stored data in 2-D arrays

```
var nonnativeSnailArray = [
    ['Allopeas clavatum','Allopeas.clavatum.jpg','spike awlsnail','Adults are about 8 to 10 mm in shell length with 5 to 7 whorls. Shells are subcylindrical and tan in color. Bodies are yellow.', 'Found in low elevational areas (less than 500 m), including agricultural areas, grasslands and urban areas.', 'Little is known regarding its ecology but known to eat detritus and plants.', 'This species is an agricultural pest and may carry Angiostrongylus cantonensis.'],
    ['Allopeas gracile','Allopeas.gracile.jpg','gracile awlsnail','Adults are about 10 mm in shell length with 7 to 9 whorls. Shells are subcylindrical and tan in color. Bodies are yellow.', 'Found in low elevational areas (less than 500 m), including agricultural areas, grasslands and urban areas.', 'Unknown', 'This species is an agricultural pest and may carry Angiostrongylus cantonensis.'],
    ['Ampullaria solida','Ampullaria.solida.jpg','mudpolmon, valentianus,slug','Adults can reach to about 8 to 7.5 cm long. The pneumostome is located in the posterior third on the mantle. The mantle has multiple ridges that appear to be a finger-print like pattern. The mantle has a dark median band with a pair of dark lateral bands. There is a dark brown postorbital band on the right side of the mantle. The shell is elongated and somewhat spiraled. Body coloration is yellow-gray to yellow-violet with a pair of dark bands on each side of the midline and may have a dark band lower down. The mucus is non-sticky, watery, and colorless.', 'Found commonly in greenhouses but also recorded in high elevation (greater than 500 m) non-tropical forests in Hawaii.', 'Berling Peninsula, Worldwide (except Antarctica)', 'This species is hermaphroditic and oviparous, may lay as many as 60 eggs per clutch.', 'This species is a pest in greenhouses and is known to carry Angiostrongylus cantonensis.'],
    ['Arlion intermedius','Arlion.intermedius.jpg','Hedgehog slug ','Adults are 1.5 to 2.5 cm in length. The pneumostome is located in the anterior half of the mantle. The mantle covers the head and foot and is tan in color with darker areas along the edges. Body coloration is tan to dark tan with grey touches and a yellow to orange colored sole.', 'Found in upper elevational (greater than 500 m) agricultural areas, grasslands, and forests', 'Western Europe', 'North America, Hawaii, New Zealand, Sri Lanka, and Central Europe', 'This omnivorous species can cross or self-fertilize and lays one clutch of eggs per year. It is a hermaphrodite and oviparous. It is a serious agricultural pest and is also an extreme threat to native plants and seedlings. It may carry Angiostrongylus cantonensis.'],
    ['Beckiana beckiana','Beckiana.beckiana.png','awlsnail','Adults are about 12 mm in shell length with 7 to 9 whorls. Shells are subcylindrical and tan in color. Bodies are yellow.', 'Found in low elevational areas (less than 500 m), including agricultural areas, grasslands and urban areas.', 'Little is known regarding its ecology but known to eat detritus and plants.', 'This species is an agricultural pest and may carry Angiostrongylus cantonensis.'],
    ['Bradybaena similaris','Bradybaena.similaris.jpg','Asian trampsnail ','Adults are about 12 to 16 mm in shell width with about 5.5 whorls. Shell is globose shaped and can be sinistral or dextral. Shell color is variable, ranging from yellow-tan to pale brown, sometimes with chestnut colored banding.', 'Found in agricultural areas and found lower than 500 m in elevation in Hawaii. Usually found under rocks or in rock crevices.', 'Southeast Asia', 'Southeast Asia (e.g. Thailand, Indonesia, Philippines, Vietnam, Laos, Cambodia, South Korea, South Africa)', 'This species is herbivorous. It is a hermaphrodite and can lay up to about 200 eggs per clutch. This species is a serious agricultural pest and may carry Angiostrongylus cantonensis.'],
    ['Bulimulus guadalupensis','Bulimulus.guadalupensis.jpg','The Guadalupe snail, West Indian Bulimulus, Snubnose sculpin','Adults do not exceed 24 mm in height. Shell is subcylindrical and off-white to brown in color, sometimes with brown or white striping.', 'Found on shrubs and trees and common on limestone and other rocks. Commonly found in gardens and agricultural areas, including tropical, subtropical, and temperate regions.', 'Lesser Antilles, Florida Keys, Caribbean (e.g. Saint Martin, Saint Barthelemy, Saint Kitts, Barbados, Puerto Rico, Jamaica)', 'Little is known regarding its ecology.', 'This species is an agricultural pest and may carry Angiostrongylus cantonensis.'],
    ...
]
```

Used data to
fill in app

Bradybaena similaris



Common Name: Asian trampsnail

Description: Adults are about 12 to 16 mm in shell width with about 5 to 9 whorls. Shells are subcylindrical and tan in color. Bodies are yellow.

Habitat: Found in agricultural areas and found lower than 500 m in elevation in Hawaii. Usually found under rocks or in rock crevices.

Native Range: Southeast Asia

Invasive Range: Southeastern U.S. (e.g. Alabama, Florida)

Subulina octona



Common Name: Thumbnail awl snail, Miniature awl snail

Description: Adults are about 12 mm in shell length with 7 to 9 whorls. Shells are subcylindrical and tan in color. Bodies are yellow.

Habitat: Found in low elevational areas (less than 500 m), including agricultural areas, grasslands and urban areas.

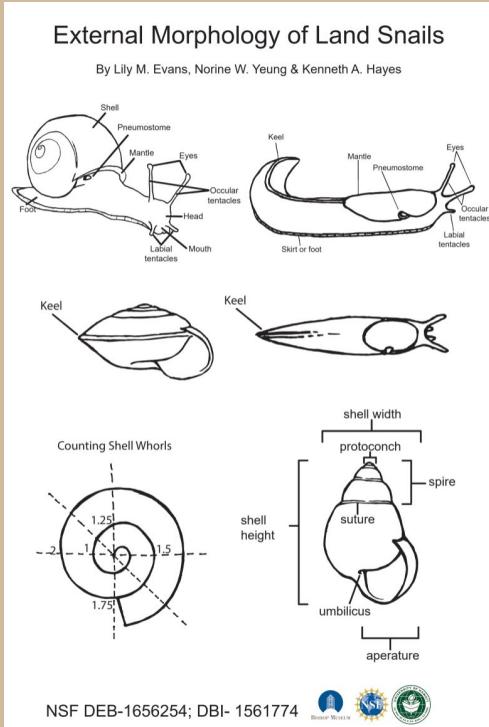
Native Range: S. America

Invasive Range: Pacific islands, Europe, Asia

Ecology: Little is known regarding its ecology but known to eat detritus and plants.

A portion of the non-native
snail array

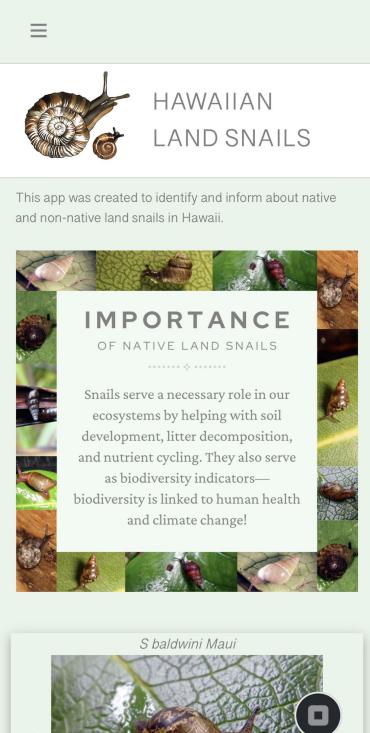
Learned a lot about snails!



04 Uploading app

Hybrid app -> Monaca

Monaca



This app was created to identify and inform about native and non-native land snails in Hawaii.

IMPORTANCE OF NATIVE LAND SNAILS

Snails serve a necessary role in our ecosystems by helping with soil development, litter decomposition, and nutrient cycling. They also serve as biodiversity indicators—biodiversity is linked to human health and climate change!

S. baldwini Maui



HAWAIIAN LAND SNAILS

AILS

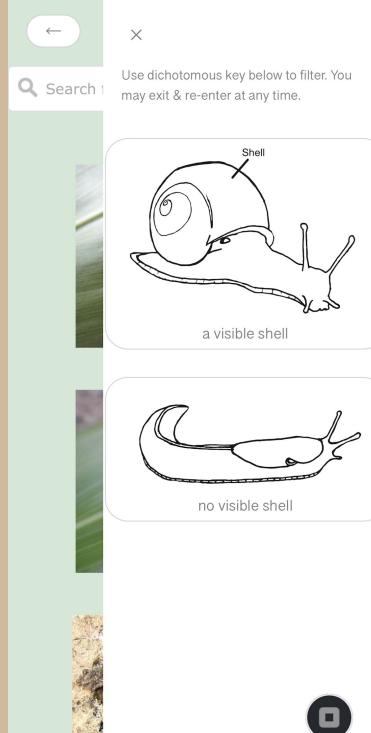
native

non-native

contact

Coming soon!

Snails are the most diverse group in Hawaii. There are over 750 species. Unfortunately, the number of snail species has been declining since the 1980s. This decline is due to habitat loss, introduced predators, and climate change.



Use dichotomous key below to filter. You may exit & re-enter at any time.

a visible shell

no visible shell

Impact

The screenshot shows the main screen of the app. At the top left is a navigation menu icon. In the center, there's a logo featuring two snails and the text "HAWAIIAN LAND SNAILS". Below this, a descriptive text block states: "This app was created to identify and inform about native and non-native land snails in Hawaii." To the right of this text is a photograph of a small snail on a green leaf, labeled "Cyclotropis sp.". Below the photograph is a button with the text "Click on non-native snail to learn more". Further down, a paragraph explains: "Non-native land snails are what populate much of Hawaii's snail landscape. Click on the button below to identify and learn about the snails that may be found in your own backyard!" At the bottom of the screen is a white button with the text "ID & LEARN ABOUT NON-NATIVE SNAILS". At the very bottom, there's a small image of a snail shell labeled "Tornatellides" and a circular control button.

Raise awareness about the necessity of endangered native snail conservation

Non-native species identification hopefully leads to conservation of native species

The screenshot shows a search interface with a magnifying glass icon and the word "Search". A message at the top says: "Use dichotomous key below to filter. You may exit & re-enter at any time." Below this are two options: "a visible shell" (with an illustration of a snail showing its shell) and "no visible shell" (with an illustration of a snail without its shell). A vertical sidebar on the left shows a photograph of a snail on a leaf, and a circular control button is at the bottom right.

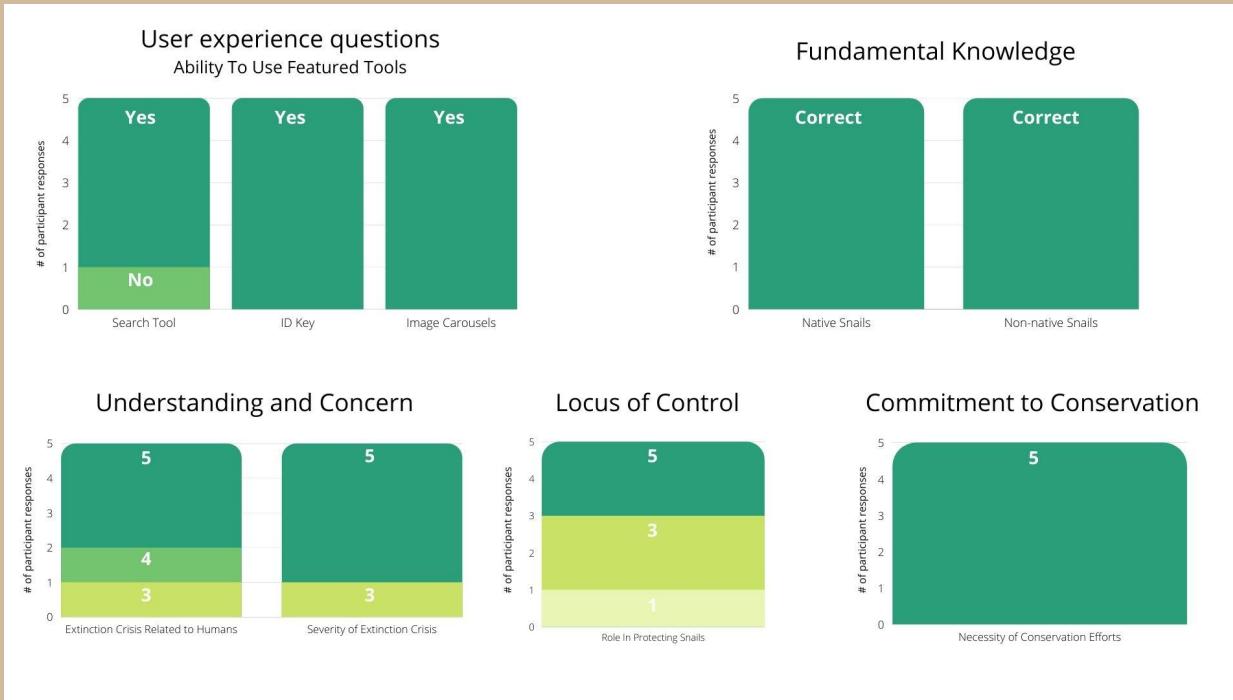
Survey to test impact

Dimopoulos et al., 2008



- Fundamental Knowledge
- Understanding and Concern
- Locus of Control
- Verbal Commitment to Conservation
- Additional User-Experience questions

Survey Results



Participant Responses



- “I think this app was good at teaching about Hawaiian land snails, because it was really easy to use. I never knew how many non native land snails there were until I saw the whole list of snails on the app.”
- “Yes, I have learned that there has been a great loss of diversity and lack of conservation. This app will spread awareness and help people like me realize the importance of this issue.”
- “I learned that snails are actually important and vital to our ecosystems.”

Conclusion & Reflection



- Developed an app available on the App Store called “Hawaiian Land Snails”
- I learned a lot about snails and hope I shared my newfound knowledge and appreciation with app users!
- I am so grateful to have been able to learn more about computer science, conservation, and research!

Thank you,
Hawaii Conservation
Conference!

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Thank you for watching!

Any questions?