

Developing an Informative Hawaiian Land Snail App



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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)

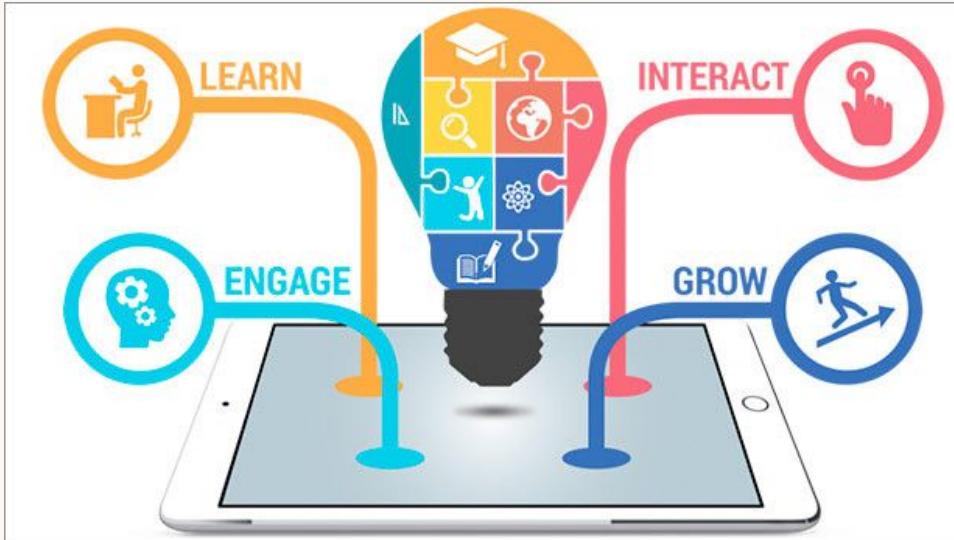
Non-native land snails are a large problem



53 non-native snail species
hawaiisnails.org



Educational apps can help conservation



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

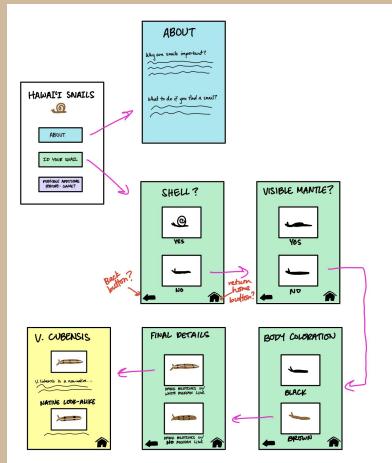
- Conservation apps for nature (Jepson et. al, 2015)
- E-learning: modern learning approach using mobile devices (Taufiq et. al, 2017)

01

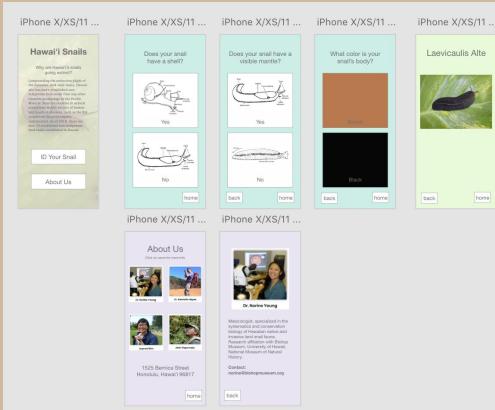
Designing the app

Adobe XD

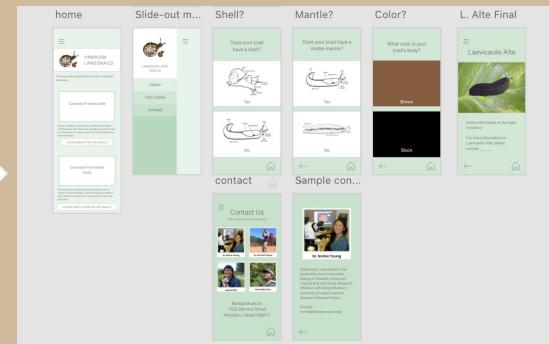
Creating sketches & mock-ups



Notability

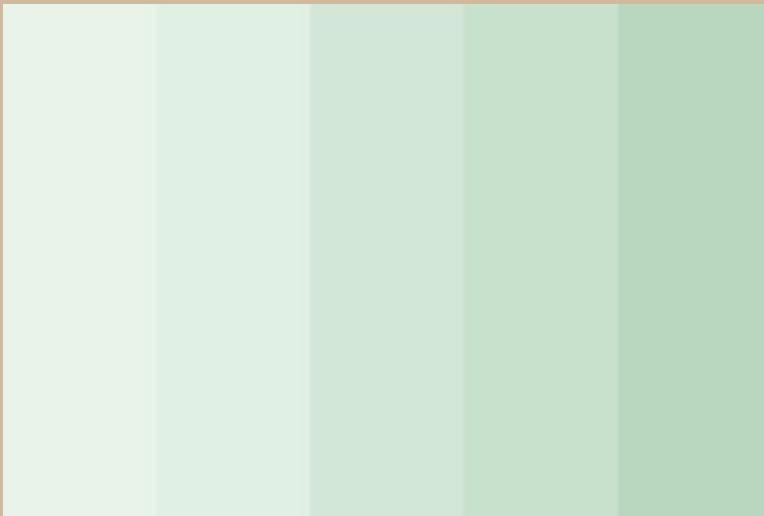


UI/UX Design
Research



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

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“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 "Does your snail have a shell?" with two options: "Yes" (with an illustration of a snail with a shell) and "No" (with an illustration of a shell-less slug). Both options have a home icon at the bottom.
- Mantle?** A question "Does your snail have a visible mantle?" with two options: "Yes" (with an illustration of a snail with a visible mantle) and "No" (with an illustration of a snail with an extended foot). Both options have a home icon at the bottom.
- Color?** A question "What color is your snail's body?" with two options: "Brown" (represented by a brown square) and "Black" (represented by a black square). Both options have a home icon at the bottom.
- L. Alte Final** A slide-out menu titled "Laevicaulis Alte" showing a close-up image of a dark-colored snail. The menu includes text: "Either information on the type of snail or For more information on Laevicaulis Alte, please contact _____". It also features a back arrow and a home icon.
- Contact** A contact page titled "Contact Us" with a "Click on name for more information" note. It lists four names with small profile pictures: Dr. Norine Young, Dr. Kristopher Young, Jayneen Kaino, and John Beardsley. Below the names is a paragraph about Dr. Norine Young's expertise in malacology and her research affiliation with Bishop Museum. It also provides contact information: Bishop Museum, 1525 Bernice Street, Honolulu, Hawai'i 96817, and an email address: norine@bishopmuseum.org. It includes a back arrow and a home icon.
- Sample contact** A sample contact page showing a video thumbnail of Dr. Norine Young speaking, followed by a short bio and contact information: "Malacologist, specialized in the systematics and conservation biology of rare and invasive land snail fauna. Research affiliation with Bishop Museum, University of Hawai'i, National Museum of Natural History." It also includes a back arrow and a home icon.

- 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

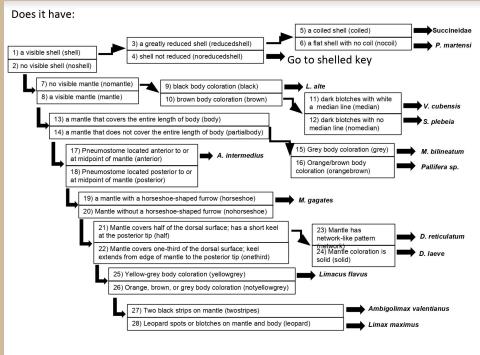
Udemy's The Complete Web Developer Course 2.0

The screenshot shows the DOM tree for a page titled "NON-NATIVE SNAILS". The tree includes nodes for the header, body, and various sections like "IDENTIFY YOUR NON-NATIVE SNAIL", "Cypraea apertifrons", and "COCOA BEAN POD BEETLE". The "NON-NATIVE SNAIL" section contains a "CARROTS START" button and a "CARROTS END" button. The "COCOA BEAN POD BEETLE" section contains a "BEETLES START" button and a "BEETLES END" button. The "IDENTIFY YOUR NON-NATIVE SNAIL" section contains a "IDENTIFY YOUR NON-NATIVE SNAIL" button.

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

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

Dichotomous Key

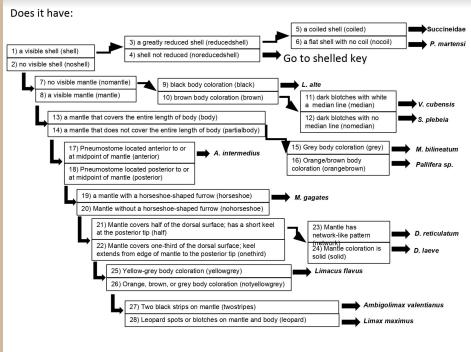


Filter



Greatest change & challenge throughout project

Dichotomous Key Filter



Non-native snail dichotomous key

[Reset](#) [ID key](#)

Ambigolimax valentianus

Arion intermedius

Deroceras laeve

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", "Little is known regarding its ecology but known to eat detritus and plants.", "This species is an agricultural pest and may carry Angiostrongylus cantonensis."],
    ['Ampullaria solida','Ampullaria.solida.volventianus.jpg','threelobed hand garden slug, greenhouse 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 pharynx. The body is tan in color.", "The body is tan in color."],
    ['Bradybaena similaris','Bradybaena.similaris.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. The body is tan in color.", "The body is tan in color."],
    ['Arlon intermedius','Arlon.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. The body is tan in color.", "The body is tan in color."],
    ['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 forests.", "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 to 6 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. Alabama, Florida, Georgia, Mississippi, South Carolina, South Africa)", "Little is known regarding its ecology.", "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.", "Lesser Antilles, Greater Antilles", "Florida, 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

A portion of the non-native
snail array

Bradybaena similaris



Common Name: Asian trampsnail

Description: Adults are about 12 to 16 mm in shell width with about 5 to 6 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.

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, Georgia, Mississippi, South Carolina, South Africa)

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.

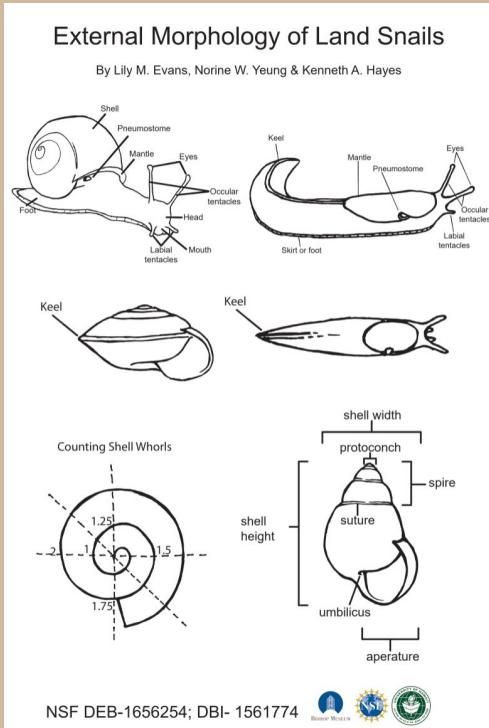
Habitat: Found in low elevational areas (less than 500 m), including agricultural areas, grasslands and urban areas.

Native Range: S. America

Invasive Range: Pacific islands, Europe, Asia

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

Learned a lot about snails!



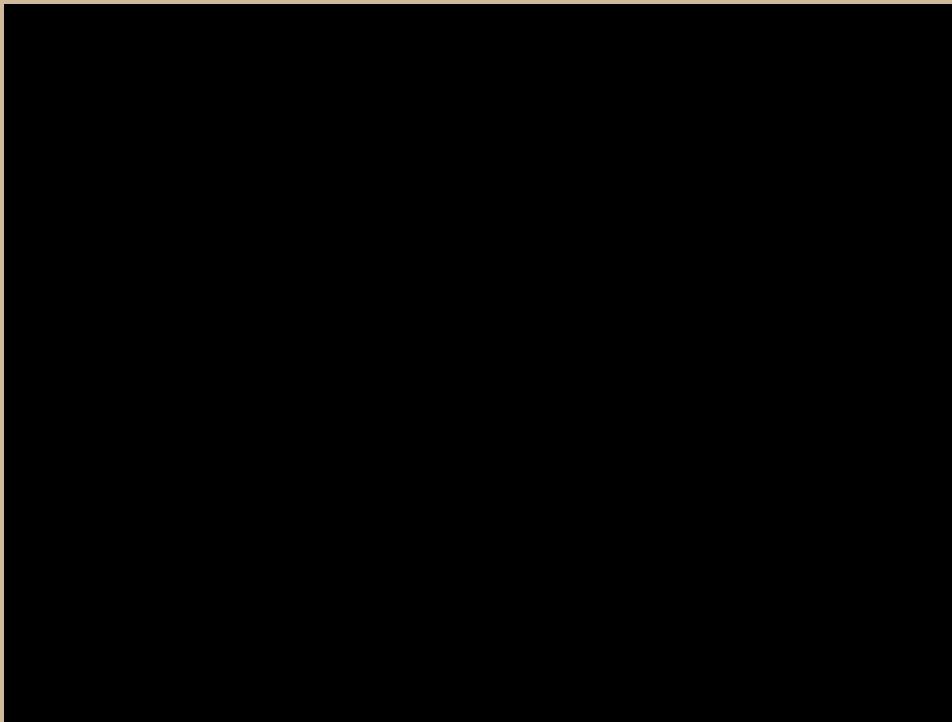
04 Uploading app

Hybrid app -> Monaca

Monaca



App Demo



Impact

The screenshot shows the main screen of the app. At the top left is a menu icon (three horizontal lines). In the center is a logo featuring two snails and the text "HAWAIIAN LAND SNAILS". Below the logo is a descriptive text block: "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 is a paragraph: "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 is a white button with the text "ID & LEARN ABOUT NON-NATIVE SNAILS". At the very bottom is a small image of a snail shell labeled "Tornatellides" and a circular navigation 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 a shell. Navigation icons for back, forward, and search are visible at the bottom.

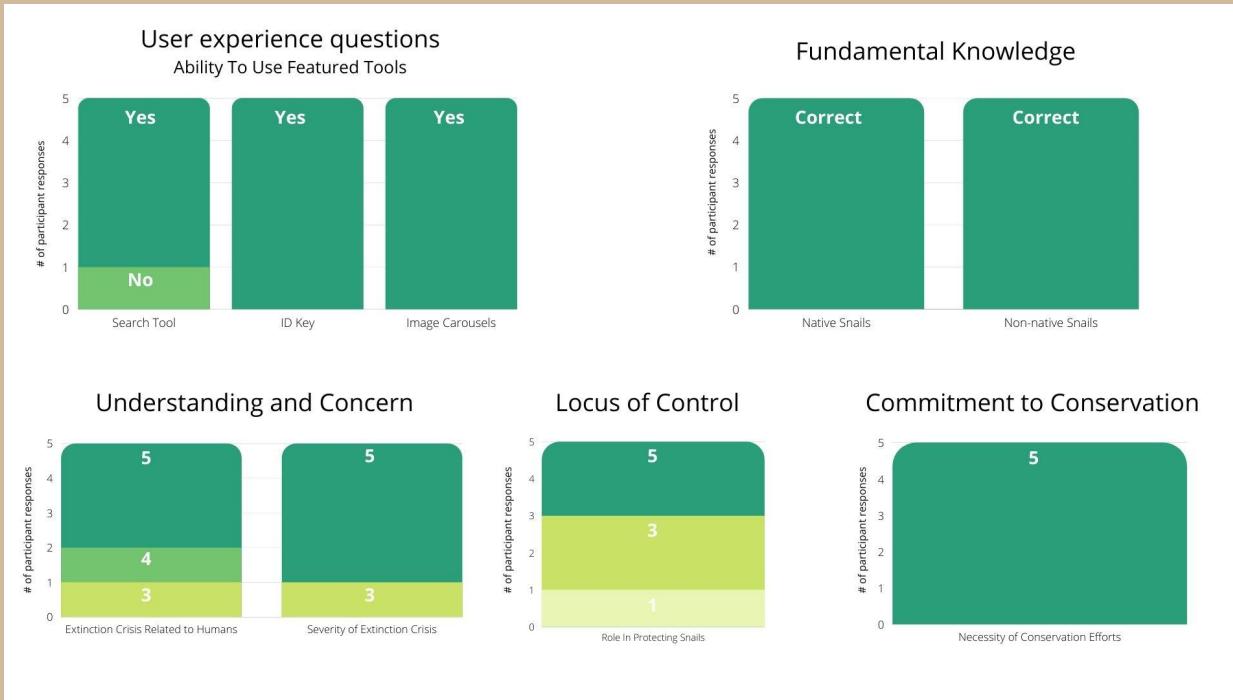
Survey to test impact

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!

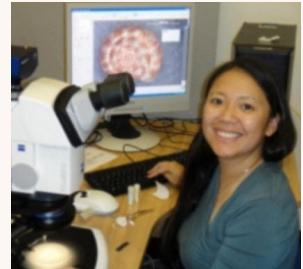
Thank you so much!



Dr. Hayes
Bishop Museum



Dr. Chan
'Iolani School



Dr. Yeung
Bishop Museum



Mrs. Okumura
'Iolani School

Thank you,
Hawaii Conservation
Conference!

References

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Thank you for watching!

Any questions?