AN INTERNSHIP REPORT FOR THE INSTITUTE OF ENVIRONMENTAL SCIENCE GLOBAL VISION INTERNATIONAL & IMAGO EARTH CENTER

by Gwyneth Rhiannon Hoeweler

Included in this paper are accounts of my two internships undertaken in the fulfillment of my Master of Science degree from the Institute of Environmental Sciences; the first with Global Vision International (GVI) and the second with Imago Earth Center. As part of my GVI internship I conducted field research on the Meso-American coral reef and taught English in a small Mexican community, with emphasis placed on environmental education. The internship at Imago provided me with the opportunity to work as a naturalist educator with local Cincinnati school children in Price Hill. Further work at IMAGO included research on the energy efficiency of the IMAGO building, presenting my recommendations for increasing the energy efficiency to Imago’s leadership, and then implementing those ideas.
An Internship Report

Submitted to the
Faculty of Miami University
in partial fulfillment of
the requirements for the degree of
Master of Environmental Science
Institute of Environmental Science

by
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Miami University
Oxford, OH
2008

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I would also like to thank the staff of Imago and Global Vision for allowing me to work and learn in their respective organizations. I gained invaluable knowledge, grew immensely as an individual at each place of work, and had some of the best moments of my life at each job.

Finally but most importantly, I want to thank my family. Without their patience, support and encouragement I would not have been able to go through the sequence of stages required to earn my degree. A special thanks to my husband, Brad, and my mother, Barbara, for letting me bounce ideas off of them, listening and reading all of my thoughts, and giving constructive criticism wherever it was needed. Thanks a million to my son, Macallan, for teaching me patience when I had run out and always understanding when it didn’t seem as though he was my number one priority.
Introduction

Miami University contains, within its College of Arts and Science, the Institute of Environmental Sciences (IES) which is one of the oldest Master of Environmental Sciences professional degrees in the U.S. The curriculum emphasizes a style of teaching that stresses an interdisciplinary, problem solving approach to the environmental field as a whole.

I have completed all the class work needed to obtain a Masters of Environmental Sciences degree, M. En., from IES with a concentration in Biological Conservation. The degree requires one year dedicated to core courses, a second year of elective classes dedicated to the chosen area of concentration and finally, a research requirement. I elected to fulfill the research requirement via two internships; the first with Global Vision International (GVI) and the second with Imago Earth Center. The internship for GVI allowed me to conduct field research on the Meso-American coral reef, while teaching English in a small Mexican community with emphasis placed on environmental education. The internship at Imago provided me with the opportunity to work as a naturalist educator with local Cincinnati school children in Price Hill. I also researched and presented my recommendations to Imago’s leadership on making the building space at Imago more energy efficient, and then implemented a number of those ideas.

IES is known for its commitment to its problem solving model and for creating employees who thrive in the job market where team work is essential. My experiences at both GVI and Imago were crash courses in complex team and problem solving situations in the field on a daily basis. Specific classes that benefitted my work in the field included Tropical Marine Ecology of the Bahamas and Florida Keys, Public Service Project, Environmental Methodology, and Environmental Measurements. These classes developed my skills in team work, problem solving methodology, and an intense interest in marine biology that would never have evolved otherwise.

At GVI teamwork was essential to the successful completion of our work, to ensure personal safety, and to make the time spent with one another bearable. GVI was 3 months of 24 hour a day interaction with 15 multi-national colleagues of all ages and
backgrounds on a base that is the size of a small house. The limited resources, dynamic goals and diverse group at GVI made problem solving skills essential. Our problem solving skills were tested on base, in the community, and below water. Our instructors pushed us to our limits to ensure we would respond accordingly if push came to shove. These skills were put to the ultimate challenge when we were forced to evacuate divers early as a result of technical difficulties or had to provide first aid to a colleague while he suffered a seizure.

My time at Imago further challenged and developed my team building, and problem solving skills, and, in addition, introduced me to various aspects of running a non-profit organization. Despite the vast differences between the environments at GVI and Imago, Imago presented its own unique set of challenges. Working with a limited budget, a small group of environmental educators and groups of school children constantly provided a new array of circumstances in which to apply the IES problem solving model helped me to deal with.

Ultimately both of these internships were invaluable tools in helping put my IES education to use in real world situations.

**Global Vision International**

Global Vision International is a non-political, non-religious organization, which through its alliance with aid-reliant organizations throughout the world provides opportunities to volunteers to fill a critical void in the fields of environmental research, conservation, education and community development\(^1\). The organization was formed in 1998 and they have current projects in over 30 countries. Ultimately, GVI provides volunteers to local communities headed up by interns and permanent staff to participate in environmental research and community development where it is most needed as determined by consulting with the local communities.

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\(^1\) [www.gvi.co.uk](http://www.gvi.co.uk)
Global Vision International Mission Statement:

“To promote the advancement of sustainable development through the creation of partnerships, promotion of local and global education opportunities and via direct financial support”

GVI accomplishes these three goals through maintaining numerous partnerships with local and global organizations. They provide volunteers and financial support to foster local and global education and to conduct research that is of necessity and value to the local communities where GVI sites are established. In 2006 through funding and equipment GVI contributed $4,000,000 went directly into the field. Volunteers are trained/educated on the issues currently affecting community development and conservation. They are then expected to not only educate the local communities where they are volunteering, but to take that knowledge forward and pass it on in their respective communities. Expectations of full credit to all local partners for research and any progress or achievements for the area are of critical necessity for GVI to ensure longevity of initiatives and success in the area for the future.

Area of interest for my internship:

Mahahual, Mexico is a Mayan community located in the southern portion of the Yucatan Peninsula in the state of Quintana Roo. The field research station where the internship was located is jointly run by GVI and the State University of Quintana Roo, just south of the Sian Ka’an Biosphere Reserve on the Caribbean coast. The area contains abundant coral reef and wetland areas with dense jungle located inland. Mahahual is the site of a newly found port for cruise ships and is inundated with tourists numerous times each week. In 2006, the number of cruise ships visiting the area each year was around 225, however, at that time it was also believed the village would soon grow to provide for 450 ships per year. The Mesoamerican Reef (area of study), the second largest barrier reef in the world, runs from the northern tip of the Yucatan Peninsula at Isla Contoy down to the Bay Islands of Honduras. The addition of this particular research site was the result of the success of another GVI research site in Pez

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2 www.gvi.co.uk
3 ibid
Maya (started in 2003) at the Sian Ka’an Biosphere Reserve. GVI was approached by Amigos de Sian Ka’an (ASK) to partner with them at Pez Maya, then at Mahahual, and through those successes to partner with them again in Tulum teaching TEFL. The University of Quintana Roo’s (UQRoo) program for Integrated Management of Coastal resources partnered with ASK to build the fully functioning research base Estacion Costa Maya where GVI resides in Mahahual. The strong relationship between ASK and GVI is necessary to ensure the success of all three of these programs in the Yucatan. ASK has the scientific knowledge and capacity to carry out complex research but needs GVI to ensure constant and periodical data is gathered over long periods of time. Starting the research collection process in the Yucatan with the pilot program at Pez Maya and building each of these 3 programs slowly, GVI and ASK were able to refine the methodologies to allow for better data collection, and assure the surveys collected could be “repeated with consistently accurate, safely collected results comparable to the rest of the MBRS region. . . “4.

The Sian Ka’an Biosphere Reserve has been classified as a World Heritage Site by UNESCO under criteria VII and X. Criteria VII dictates that the area contains a broad range of both formations and features, which it does by its sheer size (second largest barrier reef) and by its diverse ecosystems. The Reserve provides habitat for a broad range of plant and animal species, along with some endemic species; all criteria for section X. Sian Ka’an is 1.3 million acres, 99% of this land is owned by the government and 1% is privately owned. Within that acreage there are 3 large zones where human activity is limited to scientific research. GVI and their partner Amigos de Sian Ka’an have been granted a research license to scuba dive and conduct research in the Reserve. Recreational scuba diving is prohibited. There is also a buffer zone where 2,000 inhabitants are permitted to carry out low impact human activities and sustainable development. There is a fee to enter the Reserve via its 5 entrances5. Mahahual was chosen to compare/contrast with Pez Maya due to their distinct social, physical, and

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5 whc.unesco.org
economic aspects. Pez Maya is home to few individuals, has very little infrastructure, and receives very few tourists. Mahahual on the other hand, is home to a larger, growing population with sizeable influxes of tourist activities and a cruise ship pier. Mahahual reefs are of significant value to the local fishing village and to the health of the overall reef system.

Figure 1. Mesoamerican Barrier Reef
Figure 2. Yucatan Peninsula with Mahahual’s location
Internship Responsibilities

My internship was supervised by Andy Cameron, the Expedition Manager, and Monique Mancilla, the Head of Science and Community. The three main objectives of the Mahahual expedition, as declared priorities by the primary partners Amigos de Sian Ka’an and The University of Quintana Roo, are:

2. Integrated Solid Waste Management Strategy for Mahahual and Costa Maya.
3. Marine Education and Awareness Programs.”

The first objective and the most important component of my responsibilities included fish monitoring surveys and subsequent data transfer to the computer for statistical evaluation. The second objective was a program that was put in place to reduce, compost, or recycle the amount of waste and alter the current, out of date practice, of waste management. In focusing on waste management GVI hoped to mitigate some of the harmful effects of the increased waste on the environment and human health in the area. The last portion of the objectives covered the need for environmental education in the area. Environmental education was used to ensure better awareness of the marine environment not only among local populations but also amongst visitors to the area. Conversational English was also a large educational priority of the program to allow local peoples the opportunity to gain financially from the influx of tourists to the area.

To fulfill all of those objectives my role, and that of my team, was to:

- Record sea turtle, stingray, and whale shark sightings.
- Record any unsafe or environmentally damaging activity in the lagoon.
- Teach English as a Foreign Language (TEFL) to school children, local businessmen, and residents who participated in programs that were focused on community awareness and education about natural surroundings and their benefits.
- Gain education and participate in tests with regard to health and safety, for measures both above and below the water.

6 www.gvi.co.uk
• Work in collaboration with local partners (Amigos de Sian Ka’an, University of Quintana Roo, and the National Commission for the Protection of Natural Areas) to share all data collected on projects which helped them fulfill their mission.

• Obtain Rescue Diver, Dive Master, and Underwater Photography Specialist Certification.

• Work around the base, including using the tank compressor to fill tanks, taking care of dive equipment, and learning species for accurate identification.

The many different roles that were expected of each member of the research team made for 12 hour work days, 6 days a week. The training and education to fulfill all of those roles took place in stages and occurred throughout the 3 month period. When we as individuals became sufficiently trained in conducting data collection and species identification, we were expected to pass the knowledge along to the research members who came into the group half way through the expedition. Our unique role in the community demanded that we maintain high standards and remain professional at all times, even in the few free hours that were designated to us each week.

Another element that GVI employed to help work towards their goals was the National Scholarship Program (NSP). They provide one or two scholarships to nationals during each Expedition and, if suitable, offer them a staff placement for future Expeditions. This allows the education and information gained during the Expedition to stay in the country of origin. It also provides Mexican residents a chance to gain valuable experience in the field, furthering their capabilities in the environmental job market and using it to promote sustainability.

Fish and Coral Monitoring

The fish and coral monitoring that occurred at both Pez Maya and Mahahual was the Mesoamerican Barrier Reef System Synoptic Monitoring Program (MBRS SMP). The design and implementation of MBRS SMP was a collaborative effort by regional and national scientists and representatives of the four countries where the MBRS waters are located. Implementing this system as GVI’s preferred method of monitoring guarantees
that the data collected can be accurately and efficiently compared and contrasted with other locations along the coast. Conducting long term research of this nature allows for comparative analysis with other locales, before and after large natural events such as hurricanes, and highlights the ebb and flow that naturally occurs in any ecosystem.

Prior to reporting to work at the research base in Mahahual, a lot of studying and documentation was required. Upon recruitment and consequent firm commitments made by each member of the research team to participate, GVI delineated which candidates would study coral and which would study fish. Informational booklets were sent to each team member with the common and scientific names of all the species eight weeks before the Expedition date. Each member was responsible for studying these in depth prior to arrival. Coral team members learned about 50 hard coral species and fish team members learned about 200 adult fish species along with about 20 of their juvenile counterparts. I was designated a fish researcher and thus read through the list and looked at pictures of each fish in the book *Reef Fish Identification Florida Caribbean Bahamas* by Paul Humann and Ned DeLoach. To assist my learning further I made a Power Point presentation that included each fish picture along with both their scientific and common names.

Upon arrival in Mexico we began fish and coral identification drills immediately. On land we looked through the Paul Humann books and worked with flashcards quizzing each other. In the water, once we had passed all of our physical tests, we began breaking into coral and fish groups to identify different species. Initially we snorkeled throughout the lagoon alongside a resident member of staff who was pointing out different species and identifying them.

After we began our underwater tests ensuring our diving capabilities, we then began identifying fish during dives. A resident member of staff descended with us and carried an underwater slate. Tim and Monique were the two members of staff that were expert fish identifiers and they would point to a fish after which they would name the fish on the slate for the rest of us to see. This role was reversed and we became the identifiers of the fish that Monique or Tim pointed to, after they felt we were confident enough to recognize most of the species. The same method was used for the researchers identifying coral. The identifying dives continued until we became quite confident and were
accurately naming fish a large majority of the time. To begin data collection we were expected to pass a computer test and an underwater test identifying different species. The computer test was to be passed with a score of 95% (due to differences in picture quality) and the underwater component was passing with a score of 100%. We all failed our first attempt on the computer. I was frustrated, considering I would have passed had I correctly identified one more fish. We all passed the second time we took the computer portion of the test. We continued with fish identification dives and then began working towards identifying the twenty juveniles needed for data collection. Due to complications we lost 2 members of the fish research group and fell to 3 researchers and 2 members of staff well-versed in fish identification. This meant that we, as fish data collectors, were in high demand and guaranteed we would be diving frequently and thus could not risk getting sick, ear infections, etc.

We were also expected to understand some of the intricacies and the interconnectedness of our surroundings. Every couple of days during the initial two weeks of training we were given lectures on different aspects of the Mesoamerican Reef, the mangroves, weather, etc.

Figure 3: Photo Practicing Navigation with a Compass on Land Prior to Monitoring in the Water
Two weeks into our work, each of the three members of the fish research team, passed the underwater test. Once we had completed that component of training it was time to dive with our monitoring equipment which included a slate, pencil, watch, compass, measuring tape, pvc pipe shaped like a T, and later, well into the research, the surface marker buoy (smb). That dive and subsequent monitor training dives were extremely difficult. Diving with all of that extra equipment and maintaining structure instead of just free diving was very challenging initially. The goal was to complete a transect in 13-17 minutes and maintain 1 foot of distance between yourself and the reef. At a deep 20m site this allowed for only 2 transects and completion of each transect in 13 minutes.

In Mahahual, GVI is responsible for collecting baseline data at 8 different dive sites. At these 8 different dive sites Faro Viejo (FV), Los Preciones Canones (LPC), Los Escalones (LE), Bucaneros (BUC), Rio Bermijo (RB), Pirates del Caribe (PDC), Paytocal (PAY), Las llamavados (LL) there are three different depths at which data is collected 5, 10, and 20 meters. At each of those 3 depths there are 8 recorded data sheets for coral and 8 for fish, along with one rover dive for both fish and coral. These 8 different sites are broken into 4 different phases and each site is studied twice annually. Therefore, Phase 1 (January –March) and Phase 3 (July-September) research is conducted at RB, PDC, PAY, and LL and Phase 2 (April-June) and Phase 4 (October-December) research
takes place at FV, BUC, LPC, and LE. I worked during phase 2 and subsequently at those designated sites.

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Table 2. Names, Depth, & GPS points of permanent monitoring sites for GVI Mahahual (GVI, p.30)
Data collection took place along 30 meter transects for both coral and fish researchers. Each transect was randomly chosen along predominantly spur and groove coral formations. Sandy areas were largely avoided because data collected was for coral reef associated fish, not those associated with open ocean or found in sandy bottoms. Each fish transect contained two members of the fish research team, one an adult fish recorder and the other a juvenile fish recorder. The tape measure, with a 2 lb weight attached, was carefully laid down at the beginning of the transect and a depth and time measurement was taken. The researchers formed a line where the adult fish recorder lead and the juvenile fish recorder followed with the tape measure in hand. The adult fish monitor recorded the number of indicator species seen within a 2 meter length and width area, indicated using a 1m T shaped pvc pipe that was divided into 10cm gradations for accuracy. Once the fish was identified the length was estimated. The exception in the adult fish count were parrotfish and grunts, if they measured less than 5cm in total length, they were not documented and were classified as juveniles. The size brackets for documentation purposes were smaller than 5cm, 5-10cm, 10-20cm, 20-30cm, 30-40cm, and greater than 40cm. At the end of each 30m transect the depth was once again documented and both team members waited 3 minutes before turning to count juveniles along the return. The main objective of that count was to detail only recruitment from that particular season. Prior to starting the recording, the depth and time were once again recorded. Upon return along the same transect the juvenile fish recorder documented the species spotted and the number of species present. During the return the adult fish recorder wound the measuring tape back up and recorded the depth at the end of the transect. Both members of the team then found another transect at least 5m away and the process started all over again.

Figure 4: Fish Monitoring
Figure 5 & 6: Incidental Sightings
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*Figure 7: Adult Fish Data Record Sheet*
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<td>Acantias carpio, Blue Tong</td>
<td>5</td>
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<tr>
<td>Acanthias crocea, Red Fish</td>
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<tr>
<td>Acanthias capensis, Poor-Eye Butterfly</td>
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<tr>
<td>Acanthias jenkinsi, Fairy Baitfish</td>
<td>3</td>
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<tr>
<td>Acanthias rubripinnatus, Spanish Begg</td>
<td>3.5</td>
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<tr>
<td>Acanthias tetrataenia, Slippery Dick</td>
<td>3</td>
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<tr>
<td>Acanthias carolinus, Blackened Wrasse</td>
<td>3</td>
<td></td>
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<tr>
<td>Acanthias cephalotes, Rainbow Wrasse</td>
<td>3</td>
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<tr>
<td>Acanthias elongata, Steephead</td>
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<td>Acanthias nigripinnatus, Blue Cross</td>
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<tr>
<td>Acanthias nigripinnatus, Longline Bonito</td>
<td>3.6</td>
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<tr>
<td>Acanthias spinicaudus, Dusky Damsel</td>
<td>2.5</td>
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</tr>
<tr>
<td>Acanthias spinicaudus, Flounder</td>
<td>2.5</td>
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<td>Acanthias spinicaudus, Smartphone</td>
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<tr>
<td>Acanthias spinicaudus, Tropical Damsel</td>
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<tr>
<td>Acanthias spinicaudus, Cocoa Damsel</td>
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<td>Acanthias spinicaudus, Striped Perch</td>
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<td>Acanthias spinicaudus, Primrose Perch</td>
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<td>Acanthias spinicaudus, Greenback Perch</td>
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<td>Acanthias spinicaudus, Redband Perch</td>
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</tr>
<tr>
<td>Acanthias spinicaudus, Spotlight Perch</td>
<td>3.5</td>
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</tr>
</tbody>
</table>
Rover dives, as was stated, occurred at each dive site and at each of the 3 different depth measurements. They were conducted with one member of the fish research team and one member of the coral research team. The dive was conducted in an expanding square with the fish member leading the team. In a roving dive every species in the area that was spotted was recorded and the number of each species was counted. The categories used for rover dives were single (1 fish), few (2-10), many (11-100), and abundant (greater than 100 fish). These were spectacular dives and the most desirable for which to be chosen and in which to participate. They were much more like free dives and they allowed you to work on all of your fish or coral knowledge not just a mandated focus on the indicator species.

After completion of each and every dive we were required to transfer data from our underwater slates to the documents in Figures 7, 8, and 9. All documents were stored in file cabinets at the research base. Once a site was complete, meaning 8 fish and coral data sheets, and one rover dive, the data was recorded in the computer. Towards the end of the Expedition even the sites that did not have complete data sets were entered into the computer data set for future analysis by GVI and their partners.

The last published analysis from GVI of data is from 2005. As shown below, it compares the data from Pez Maya, Mexico and reveals the difference in coral and fish density between both sites. This data suggests that for all three depths and over all recorded sites, the fish stocks at Mahahual have significantly lower biomass than those of Pez Maya.

**Adult Fish Biomass Comparison 2005**

<table>
<thead>
<tr>
<th>Depth</th>
<th>Mahahual (kg/100m2)</th>
<th>Pez Maya (kg/100m2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5m</td>
<td>0.561 +/-0.098</td>
<td>0.932 +/-0.154</td>
</tr>
<tr>
<td>10m</td>
<td>1.087 +/-0.168</td>
<td>1.538 +/-0.267</td>
</tr>
<tr>
<td>20m</td>
<td>1.152 +/-0.186</td>
<td>1.905 +/-0.346</td>
</tr>
<tr>
<td>Total</td>
<td>0.929 +/-0.091</td>
<td>1.436 +/-0.152</td>
</tr>
</tbody>
</table>

*Table 3: Comparison of Adult Fish Biomass between Mahahual & Pez Maya (Rix, p. 63)*
<table>
<thead>
<tr>
<th>Location</th>
<th>Site ID</th>
<th>Recorder</th>
<th>Date</th>
<th>Depth</th>
<th>Bearing</th>
<th>Latitude</th>
<th>Longitude</th>
</tr>
</thead>
<tbody>
<tr>
<td>Angelfish</td>
<td>SFMA</td>
<td>Ctenogryllus argyra, Cheratocephalus</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SFMA</td>
<td>Holacanthus ciliaris, Queen Angelfish</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>SFMA</td>
<td>Holacanthus tricolor, Barred Angelfish</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>SFMA</td>
<td>Pterocentrus crenatus, Gray Angelfish</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>SFMA</td>
<td>Pterocaesio pavo, French Angelfish</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Barracuda</td>
<td>SFMA</td>
<td>Sphyraena barracuda, Great Barracuda</td>
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<td></td>
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<tr>
<td>Basset</td>
<td>SFMA</td>
<td>Gramma loreto, Fair Basslet</td>
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<tr>
<td>SFMA</td>
<td>Gramma melanura, Blackchin Basslet</td>
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</tr>
<tr>
<td>Bigeye</td>
<td>SFMA</td>
<td>Hypoplectrus cernuus, Glassyeye Snapper</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>SFMA</td>
<td>Pterocaesio crenatus, Bigeye</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blennies</td>
<td>SFMA</td>
<td>Acantuba maria, Secretary Blenny</td>
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</tr>
<tr>
<td>SFMA</td>
<td>Labroides dimidiatus, Arrow Blenny</td>
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<tr>
<td>SFMA</td>
<td>Labroides reidingeri, Red Blenny</td>
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<tr>
<td>SFMA</td>
<td>Ophiodon alutacea, Redtail Blenny</td>
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<tr>
<td>Bonefish</td>
<td>SFMA</td>
<td>Albula nigra, Boneshark</td>
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<tr>
<td>Bonefish</td>
<td>SFMA</td>
<td>Passerina cirrhosa, Striped Bonefish</td>
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<td></td>
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</tr>
<tr>
<td>SFMA</td>
<td>Acantuba maria, Secretary Blenny</td>
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</tr>
<tr>
<td>SFMA</td>
<td>Acantuba maria, Secretary Blenny</td>
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</tr>
<tr>
<td>SFMA</td>
<td>Holacanthus tuberculatus, Smooth Tangyfish</td>
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<td>SFMA</td>
<td>Lactophrys bicaudalis, Spotted Tuna Fish</td>
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<td></td>
</tr>
<tr>
<td>Triggerfish</td>
<td>SFMA</td>
<td>Choerodon asper, Longnose Triggerfish</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>SFMA</td>
<td>Choerodon asper, Longnose Triggerfish</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SFMA</td>
<td>Choerodon vittatus, Spotfin Triggerfish</td>
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</tr>
<tr>
<td>SFMA</td>
<td>Choerodon nigrodorsalis, Reef Triggerfish</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SFMA</td>
<td>Choerodon nigrodorsalis, Reef Triggerfish</td>
<td></td>
<td></td>
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<td></td>
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Figure 9. Rover Dive Data Record Sheet
<table>
<thead>
<tr>
<th>Gatherers</th>
<th>Hogfish</th>
</tr>
</thead>
<tbody>
<tr>
<td>S. F. M. A.</td>
<td>Coryphopterus doris, Company Goby</td>
</tr>
<tr>
<td>S. F. M. A.</td>
<td>Coryphopterus edulis, Pallid Goby</td>
</tr>
<tr>
<td>S. F. M. A.</td>
<td>Coryphopterus gigas, Paddle Goby</td>
</tr>
<tr>
<td>S. F. M. A.</td>
<td>Coryphopterus monogrammi, Peppered Goby</td>
</tr>
<tr>
<td>S. F. M. A.</td>
<td>Coryphopterus perspicax, Masked Shark Goby</td>
</tr>
<tr>
<td>S. F. M. A.</td>
<td>Gobiodon natalis, Goldspot Goby</td>
</tr>
<tr>
<td>S. F. M. A.</td>
<td>Gobiosoma argenteum, Noon Goby</td>
</tr>
<tr>
<td>S. F. M. A.</td>
<td>Gobiosoma precissae, Broadnose Goby</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Groupers</th>
<th>Hogfish</th>
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</thead>
<tbody>
<tr>
<td>S. F. M. A.</td>
<td>Epinephelus aeneus, Black Hump</td>
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<td>S. F. M. A.</td>
<td>Epinephelus ephippium, Greybar</td>
</tr>
<tr>
<td>S. F. M. A.</td>
<td>Epinephelus guineensis, Congo</td>
</tr>
<tr>
<td>S. F. M. A.</td>
<td>Epinephelus plurimaculatus, Red Hind</td>
</tr>
<tr>
<td>S. F. M. A.</td>
<td>Epinephelus tukula, Gibby Grouper</td>
</tr>
<tr>
<td>S. F. M. A.</td>
<td>Epinephelus venosus, Nassau Grouper</td>
</tr>
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<td>S. F. M. A.</td>
<td>Hyperscaperuss variatus, Black Grouper</td>
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<td>S. F. M. A.</td>
<td>Hyperscaperuss multifasciatus, Yellowmouth Grouper</td>
</tr>
<tr>
<td>S. F. M. A.</td>
<td>Hyperscaperuss atlanticus, Tiger Grouper</td>
</tr>
<tr>
<td>S. F. M. A.</td>
<td>Hyperscaperuss punctatus, Tullu's Grouper</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Grunts</th>
<th>Hogfish</th>
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</thead>
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<td>S. F. M. A.</td>
<td>Anisodus bighead, Black Bream</td>
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<td>S. F. M. A.</td>
<td>Anisodus variegatus, Parasit</td>
</tr>
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<td>S. F. M. A.</td>
<td>Haemulon ideus, White Bream</td>
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<tr>
<td>S. F. M. A.</td>
<td>Haemulon meleagris, Tennis</td>
</tr>
<tr>
<td>S. F. M. A.</td>
<td>Haemulon caranx, Center Grill</td>
</tr>
<tr>
<td>S. F. M. A.</td>
<td>Haemulon chrysargyreus, Diamondbass Greasy</td>
</tr>
<tr>
<td>S. F. M. A.</td>
<td>Haemulon flavolineatum, French Grill</td>
</tr>
<tr>
<td>S. F. M. A.</td>
<td>Haemulon meleagris, Spanish Grill</td>
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<td>Haemulon melanurus, Cetomacchi</td>
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<td>S. F. M. A.</td>
<td>Haemulon parra, Father's Challenge</td>
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<td>S. F. M. A.</td>
<td>Haemulon squamosa, White Grill</td>
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<tr>
<td>S. F. M. A.</td>
<td>Haemulon tricolor, Breamhead Grill</td>
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<tr>
<td>S. F. M. A.</td>
<td>Haemulon tricolor, Striped Grill</td>
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<tr>
<th>Hamlets</th>
<th>Hogfish</th>
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</thead>
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<td>S. F. M. A.</td>
<td>Hippocampus holubi, Yellowfin Hamlet</td>
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<td>S. F. M. A.</td>
<td>Hippocampus rhombeus, Edithvale Hamlet</td>
</tr>
<tr>
<td>S. F. M. A.</td>
<td>Hippocampus ingens, Blue Hamlet</td>
</tr>
<tr>
<td>S. F. M. A.</td>
<td>Hippocampus capensis, Golden Hamlet</td>
</tr>
<tr>
<td>S. F. M. A.</td>
<td>Hippocampus guttulatus, Box Hamlet</td>
</tr>
<tr>
<td>S. F. M. A.</td>
<td>Hippocampus ingens, Indigo Hamlet</td>
</tr>
<tr>
<td>S. F. M. A.</td>
<td>Hippocampus capensis, Black Hamlet</td>
</tr>
<tr>
<td>S. F. M. A.</td>
<td>Hippocampus guttulatus, Box Hamlet</td>
</tr>
<tr>
<td>S. F. M. A.</td>
<td>Hippocampus ingens, Indigo Hamlet</td>
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</thead>
<tbody>
<tr>
<td>S. F. M. A.</td>
<td>Amblyrhynchos priscus, Redspotted Sawfish</td>
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Figure 9. Rover Dive Data Record Sheet
<table>
<thead>
<tr>
<th>Family</th>
<th>Species</th>
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<tbody>
<tr>
<td>Rays</td>
<td>S. F. M. A. Antennarius commersoni, Spotted Eagle Ray</td>
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<td></td>
<td>S. F. M. A. Urolophias janus, Yellow Stingray</td>
</tr>
<tr>
<td></td>
<td>S. F. M. A. Desmonectes americana, Southern Stingray</td>
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<tr>
<td>Rakerfish</td>
<td>S. F. M. A. Neochirus australis, Peary Rakerfish</td>
</tr>
<tr>
<td></td>
<td>S. F. M. A. Neochirus undulatus, Easy Rakerfish</td>
</tr>
<tr>
<td>Remora</td>
<td>S. F. M. A. Echeneis acutus, Sharknicker</td>
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<td>Seabass</td>
<td>S. F. M. A. Pterois miles, Cheetah Fish</td>
</tr>
<tr>
<td></td>
<td>S. F. M. A. Serranidae, Tabacco Fish</td>
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<td>S. F. M. A. Serranidae, Blackspotted Bass</td>
</tr>
<tr>
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<td>S. F. M. A. Serranidae, Cheek Bass</td>
</tr>
<tr>
<td>Sphyridae</td>
<td>S. F. M. A. Sphyridae - Australian, Dogfish</td>
</tr>
<tr>
<td>Snappers</td>
<td>S. F. M. A. Lutjanus auratus, Nanton Snapper</td>
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<td>S. F. M. A. Lutjanus auratus, Gray Snapper</td>
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<td>S. F. M. A. Lutjanus laevis, Pink Snapper</td>
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<td>Squidfish</td>
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<tr>
<td>Squidfish</td>
<td>S. F. M. A. Hamigone hamigone, Epaulett Fish</td>
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<td></td>
<td>S. F. M. A. Sepiidae hamigone, Epaulett Fish</td>
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<tr>
<td></td>
<td>S. F. M. A. Sepiidae hamigone, Epaulett Fish</td>
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</tbody>
</table>

**Figure 9: Rover Dive Data Record Sheet**
The collection of data for baseline characterization did, and will continue to, assist local authorities in assessing the current health of the reef and the future changes over an extended period of time. Tracking the changes is critical to assess the reef in a longitudinal manner to decide how an increase in pressure from the influx in human numbers and associated waste is altering the reef. Increased tourism and the associated infrastructure accompanying larger numbers, runoff from farming practices and other activities, and aquaculture are some of the main issues associated with jeopardizing/accentuating the stress being placed on the health of the reef. There is great hope that the scientific information being collected and analyzed by GVI and their local partners will help in the designation of the reef as a zoned protection area.

Another monitoring responsibility was to document any mega-fauna sighted. There are four species of turtles found in the Mahahual area. These species include the Hawksbill, Green, Leatherback, and the Loggerhead. As part of our training we were introduced to the physical characteristics that differentiate each species. Incidental sightings in the boat, out in the lagoon, and on dives were to be noted in the base log with a description of location, time, date, species identification, sex, and depth if any and or all were known. The information was to be used for community educational purposes, to monitor fluctuations in the population, and establish seasonal variations. Any incidental sightings that occurred during our dives were to be documented in the same manner as the turtles. Many sting rays, dolphins, and a large Whale Shark were all sighted during our Expedition.

**Health and Safety Education and Subsequent Examinations**

One of the first and most important components of our training included Emergency First Response Primary Care (CPR) and Secondary Care (First Aid) certification. The training was conducted immediately upon arrival in conjunction with physical fitness tests to ensure adequate swimming abilities. The swimming tests included a 400m swim out to the reef and 10 minutes treading water. Due to the large amount of physical activity that took place on a daily basis along with the toll diving takes on your body, the education and tests were essential, to maintain health standards.
and guarantee the safety of everyone living on base. Unfortunately, our health and safety skills were put to the test when one of the research team had a seizure during the first week. Two other members of the team and I, were the only people present to deal with the situation. It highlighted the need for everyone at base to learn the in-depth procedures needed for dealing with emergency situations.

There were eight skills learned in CPR which included:

- Scene Assessment
- Barrier Use (Latex or Mouthpieces)
- Primary Assessment
- Rescue Breathing
- One Rescuer Adult CPR
- Serious Bleeding Management
- Shock Management
- Spinal Injury Management
- Automated External Defibrillator (AED) Use
- Conscious Choking Adult, And
- Emergency oxygen use

Secondary Care or First Aid taught us to use its teachings if EMS is unavailable or is slow in assistance. First Aid included information on; assessing the injury, illness assessment, bandaging, and splinting used in dislocations and fractures. Again these teachings proved critical even after our research ended. I, along with a few of my fellow teammates, traveled through Mexico and Belize once the phase was over. During one of the dives in Belize the boat they were in was hit by lightning and prior to the emergency services of the area arriving, CPR was conducted for 4 hours on one of the Dive Masters on the boat.

CPR most importantly taught us as Emergency First Responders (EFR) about the ABCD’S of emergency care.

- A- Assess Scene, Alert EMS, and Airway open
- B-Breathing, Check patient’s Breathing, Begin Rescue Breathing
- C- Circulation, Chest Compressions
- D-Defibrillation
The course also covered liability issues, responsibilities of an EFR, protecting self while conducting CPR and First Aid, and focused on role playing and controlled scenarios used to test our skills in dealing with lifelike emergency situations. We were also expected to complete knowledge reviews and perform written tests to assess our knowledge. All of the information gained from CPR and First Aid was also used and applied to our Rescue Diver and Dive Master training.

**Diving Certifications Education and Subsequent Examinations**

Participation at Mahahual required each diver to arrive on base with Open Water scuba diving certification. To enhance the diving qualifications of each researcher they trained and certified all divers to the Advanced Open Water status while in Mahahual. The other certification taught during the stay was Underwater Photography Specialist. I went to Mahahual with an Advanced Open Water certification so did not have to participate in that portion of training. However, we were also given the opportunity to advance our certification level to Dive Master and in the process to become a Rescue Diver as well. Allowing myself to gain the most of out the experience I decided to challenge myself to become certified as both a Rescue Diver and a Dive Master. I viewed obtaining Dive Master certification as potentially being helpful when pursuing future job opportunities in coral reef research or educational outlets.

*Underwater Photography Specialist*

Receiving certification as an Underwater Photography Specialist required the diver to complete 2 dives with a camera, to receive training in underwater camera maintenance and cleaning, and to complete reading and a knowledge review in the Advanced Open Water manual. The camera we used for certification was a small

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7 Emergency First Response Primary Care and Secondary Care Participant Manual, Product # 70091, Version 2.0, 2005. Published: Santa Margarita, CA. Publisher: Emergency First Response Corp., pg 1-60. (1.4)
point and click with a housing/casing for use while diving. The knowledge review provided not only basic camera knowledge, and techniques for use, but also relayed information regarding photographic qualities underwater. A large slice of the information pertained to lighting, angles, and distance from the object of interest. After gaining insight into such techniques we put the information to the test with the first of the two dives. After the dive and consequent download of the pictures we met with a member of staff to analyze how we might better take pictures with the next dive. With the second dive we were to make use of the constructive criticism and take better pictures. Once the second dive was complete and the pictures downloaded along with one more critique we became certified as Underwater Photography Specialists.

**Rescue Diver**

Rescue Diver certification is the last stage of scuba diving training prior to becoming a professional diver. The goal of the certification process was to provide us with real life scenarios and teachings and enable us as divers to deal with and overcome emergency situations encountered during diving. The most important lesson stressed was to guarantee the safety of yourself during all measures taken to save the life of another. Rescue Diver training is taught not only because it is extremely helpful in coping with diving emergencies but also when dealing with everyday emergencies. The teachings highlighted staying calm, assessment of the situation, and evaluation of every alternative. Studying to become a Rescue Diver involved not only drills and practical applications but also working through the PADI manual and completing all of the knowledge reviews at the end of each chapter. After completion of the knowledge reviews answers were thoroughly checked. If any questions were missed we collectively investigated why and determined the correct answer. The book also covered; equipment and it’s distinct areas of problems, different animal encounters that can pose threats along with treatments if encountered, dealing with responsive and unresponsive divers at and below the water, different tow methods, thermal problems, missing diver procedures, detecting embolism and decompression sickness, in-water rescue
breathing techniques, oxygen handling and administration, along with liability issues, and different carry techniques for shallow and deep water exits.

The training we participated in led us into the lagoon. We either learned 100 yards away from shore with a depth of 15 feet or in the shallows where we waded through sea grass. Each of the areas covered required us to read, study, complete knowledge reviews, practice skills, and consequently to be tested on each skill. Upon completion of all of the skills and passing a written test we were awarded Rescue Diver certification.

_Dive Master_

A lot of the skills learned as a Rescue Diver overlapped with the skills necessary to become a great Dive Master. Dive Master (DM) required that the individual become much more responsible for a larger number of individuals and to display superb underwater communication skills. Another large component of training required a skills test that was difficult even for the most in-shape participant. The skills requirement included a timed 400m swim, 800m snorkel, 100m tow, and a 15 minute tread, of which, the last 2 minutes your arms were to be held out of the water. Each of these four skills tests were worth 5 points adding up to a total of 20. To become a DM you had to pass with a score of at least 12. This was the hardest physical challenge I have come across in my life. Treading water and the 800m snorkel were not as difficult, but the 400m swim and the 100m tow were exhausting. The tow could have been completed in any style you preferred (underarm tow, modified tired swimmer’s carry, or the tank valve tow), however, both parties had to be in full dive gear, with weights, and you had to rely on your regulator for air. I was barely able to pass this portion of the Dive Master criteria and I had to train every morning prior to my regular activities with 7 other researchers.

Training to become a DM required that each candidate become a leader and allowed us to experience responsibility for a large group of individuals in the water. Part of the instruction was going to a dive site and leading individuals through all components of a dive. The first of the components was the dive site briefing where the DM candidate gave a brief description, history, and a list of any significant facts
related to the site. Along with the briefing a buddy check was completed to make sure all equipment was functioning okay and in order. The last portion of the above water section was making sure everyone knew hand signals, dive time, depth, and method of entry that the participants were to use. After entry into the water, but before descending, a final check of the last minute details occurred, otherwise known as a five point descent, including the location, current time, the currents direction. Upon descent the DM candidate was then expected to keep the group in close proximity to one another and to the DM throughout the course of the dive. During the dive the DM candidate was also expected to maintain control of the group, point out flora and fauna of interest, and deal with any problems that may have arisen. While conducting the dive the DM candidate was to remain in control of where the dive was lead and ensure the divers arrival at the surface close to the boat. During these practice dives (otherwise known as “mess you up dives”) we were also tested on our skills at coping with minor emergencies. The Instructor met with each DM candidate prior to the dive to provide them with multiple scenarios that they were to pull while underwater. When in the lead DM position we were expected to quickly handle each situation as it was presented. An example of a scenario might have been someone signaling that they were out of air. The DM candidate then had to maintain control of the group and allow the distressed diver to breathe off of their octopus or buddy breath with the affected party. Once the dive was finished and prior to ascending there was a proper five point ascent system that had to be followed that included signaling, watching your time, equalizing the ears, looking up and around, and finally ascending. Once the DM candidate was on board the boat, along with the fellow divers, a brief overview of the site followed by a discussion occurred.

We also spent a lot of time on demonstration quality instruction in the lagoon, and out in the sandy bottoms of Dolphin Bay. During demonstration quality instruction the DM candidates were expected to perform a demonstration that would be used to train new scuba divers on techniques needed while diving. The difficulty was performing a task underwater and only being able to use hand signals with no verbal interaction. Therefore the demo quality had to be done in an
exaggerated fashion and done slowly. Essentially it was like playing charades without the other person guessing the answer. These demonstrations are done so that if any of these issues were to arise in a real life setting divers would know how to overcome the problem at hand. Once the DM candidates finished demonstrating, the other DM’s in the “class” were expected to repeat what they had just witnessed. Many times this highlighted how well or how poorly we had demonstrated. The techniques included in demo quality instruction were:

- Recovering a regulator and clearing
- Mask removal, replacement and Clearing
- Buddy breathing
- Buoyancy
- Fin pivot
- Free flow regulator breathing

We were also evaluated on other skills including:

- How well we worked with our equipment
- Deep water entries
- Buoyancy check at the surface
- Regulator-to-snorkel and snorkel-to-regulator exchange
- Controlled emergency swimming ascent
- Hovering for 30 seconds –mid-water
- Swimming underwater without a mask
- Buddy breathing while stationary and while swimming
- Air depletion exercise and alternate air source use stationary for 30 secs.
- Alternate Air Source Ascent

Towards the end of my experience in Mahahual, DM candidates were also expected to either establish a new Emergency Action Plan (EAP) or modify and update an existing one. I chose to modify an existing EAP for “A Captain Overboard”. The document needed some updating. The emergency contacts were either old or they were no longer around. That meant the order of organizations able to provide the most help was also out of date. The old EAP also needed some restructuring of the assessment of the emergency and, therefore, the action required.

Another difficult component of DM training was successful completion of a “kit” exchange. I had to complete this particular element of
training with a fellow DM candidate, Bel, in the lagoon at a 10 meter sandy spot. The exercise allowed us to exercise control underwater, maintain calm, and trust in ourselves and our fellow dive partners. The kit exchange took place on the bottom with each person breathing off of one regulator. Both DM candidates had to transfer mask, fins, snorkel, and scuba gear to the other partner while the other partner did the same. After completion each partner had to ascend back to the boat wearing the other DM candidates dive gear. Bel had panicked in an earlier attempt and aborted the dive ascending quickly to the boat. Fortunately for me we were able to successfully complete the scuba equipment exchange. It was a milestone and a difficult portion of obtaining certification. Although the Instructor was watching and close by if anything should come to pass breathing off of one regulator while trying to exchange all of the articles was difficult. This was especially true when we transferred masks from one partner to the other. Another note of difficulty for me was due to my weights being integrated in my BCD. As a result, when transferring BCD’s between myself and Bel, I became quite buoyant and had to resist from ascending. Fortunately that particular requirement was not timed and thus helped in maintaining the sense of calm.

We were also tested on practical knowledge which included the direction of the current and the weather. As DM candidates we were expected to have common sense knowledge about how the current was flowing, the wind speed and its direction, and if weather was sensible for diving. Andy, took each of us aside and quizzed us on our knowledge and sensibilities before some of the dives.

Included in understanding currents our navigational skills were also put to the test. Not only was that put to the test in our navigational dives but also during our “mess you up” dives discussed earlier. The navigational dives used our knowledge gained in rescue diver training for conducting search patterns. We were taken to the sandy and desolate bottom of Dolphin Bay and expected to navigate using underwater cues like ripples in the sand, the current, taking note of location prior to descent, compass, etc. This was critical for my confidence as I frequently have difficulties above water navigating, let alone without gas stations, schools, and street signs used as landmarks which I use instead of an internal navigational
I also had to study the Encyclopedia of Recreational Diving, complete the Diving Knowledge Workbook, and read through the PADI Divemaster Manual. After completing all of the knowledge reviews found in the manual we examined each answer and discussed any missed. We were all tested on our gained knowledge through a series of eight Divemaster tests, with a passing score of 75%. The eight tests included Physics, Physiology and First Aid, Equipment, Decompression Theory and the RDP, General Skills and the Environment, Supervising Activities for Certified Divers, Supervising Student Divers in Training, and PADI Divemaster Conducted Programs. I passed all of my exams on the first attempt. However, the physics exam I barely passed, with a score of 75%.

Finally, we were expected to draw a topographical reef map. This was a requirement of PADI Divemaster training and was also a great reference tool for GVI. Mahahual’s reefs have been researched periodically but not extensively. The mapping along with GPS points allowed the staff and interested local NGO’s the opportunity to have an idea of the shape, contours, depth, and view of the local reef. Upon descent we sketched an outline of the reef on an underwater slate. Upon reaching depth we then began to fill in points of interest, large mounds of coral, and got depth measurements for those particular spots. We also got depth readings for the base of those formations and put down particulars of interest like water temperature, currents, date, etc. Once the information was gathered we ascended and headed back to base to complete the map. At the research base the map was transferred from the slate to a piece of paper and given a legend with a compass. We also colored the map to delineate sand from coral and highlighted the contours of the reef. All of these maps were kept at base for future reference.

**Teaching English as a Foreign Language (TEFL)**

Teaching English as a Foreign Language (TEFL) was another large portion of the responsibilities we conducted each week. Initially, we were expected to listen to lectures and give feedback on training so we could become English teachers to the local population. The first couple of weeks Monique gave us ideas for class, taught us techniques to better enhance our teaching, and provided us with
a basic background in teaching TEFL. We were also given suggestions on games to play, ways to engage the students, and given confidence that we could actually provide this valuable service without any teaching background. The guidelines and approaches were very beneficial once we were able to put them to practice. Teaching us the guiding principles of TEFL really helped because a majority of the students we taught held very small English vocabularies and few of us were fluent in Spanish.

After our training to become teachers we taught both Tuesday and Thursday nights to adults which included merchants, residents, and fishermen and on Friday mornings at the Vincente Kau Chau Primary School. All of these classes were aimed at beginning English students or pre-intermediate. My Friday morning class was composed of 5 & 6 year olds in kindergarten. I taught the class with two other members of the research team. The first class we conducted a beach clean up with the other classes at the primary school. The other classes we worked on simple English words that they were currently studying in Spanish. Examples included: numbers, colors, days of the week, animals, greetings, etc. This was a fun part of teaching TEFL however, there were a couple of minor setbacks. The teacher, also eager to learn English, would yell out the name of whatever we were studying prior to the children getting a chance. The other minor dilemma was a lack of consistency from week to week due to school holidays and our schedules. Because it took our research group a while to become “qualified” to teach and due to Easter, the summer holidays, and a few other minor school closings we were unable to work with the children as much as GVI would have liked.

Figure 10: Photo teaching the primary school children about turtle research
The other English classes occurred on Tuesday and Thursday nights and were provided for any local resident looking to better their English grammar, vocabulary, or pronunciation. The ages ranged from 9 to late 50’s and the classes were a mix of males and females. The classes were split up according to age and ability. I was chosen, along with a fellow researcher Alice, to work with the younger group. My group consisted of a waitress in her late teens, a teenage boy who sold bracelets to tourists, and a little girl from the primary school who was nine. The attendance in all of our groups was fairly regular but varied according to other obligations and the cruise ship traffic. If I had to name the downside of the job, TEFL was the component that was the most trying for me. However, I did keep in the back of my mind the goal of TEFL, which was to provide much needed English lessons to a community that was overrun frequently with English speaking tourists. To better accommodate those tourists and to ensure financial security for their families, learning English was essential for many of the people of Mahahual. The idea was great but due to the infancy of the program I felt it needed to be tweaked a bit more before it could be as beneficial as it should be. I felt that way because there was no oversight and most times very little feedback on whether what we were teaching was actually beneficial. Considering this activity consumed about four hours each week, without accounting for class preparation time, I felt it should have been more beneficial for the participants.

In the same vein another goal of teaching English to the community was incorporating local environmental education into the fold. This was done but I am not sure it was done as successfully as it could have been. English was the dominant piece with environmental education coming a very distant second. If the classes were a bit more structured or inventive then these two areas could have been mutually beneficial and accentuated environmental components more. Part of the goal of GVI Mahahual was to “utilize language lessons in support of environmental education to encourage sustainable use of the local natural resources so that they are maintained and beneficial long term.” They also wanted to promote sustainable
business practices. I felt both of these areas were sorely missed. However, GVI also intended for the classes to establish and provide visibility for their organization within the community and I believe strongly that TEFL helped achieve that objective.

**Beach Cleans**

Although we only conducted a couple of beach cleans during our stay in Mahahual they were of great importance to GVI. As was mentioned earlier we participated in a beach clean with the children at the primary school. However, we also conducted a beach clean along a ½ mile stretch just in front of the research station. As can be seen in the picture below we collected a lot of trash. We did the beach clean immediately following Easter (Semana Santa) which is a huge Mexican holiday. Many inland families came to Mahahual to camp near the beach and swim in the waters of the lagoon. Unfortunately the mess left behind was not indicative of a strong environmental ethic. The amount of waste averted from the waters of the lagoon was quite large with both beach cleans.

Another measure allowing waste and in particular plastic to be collected occurred every morning along the stretch of beach we maintained for access to the boat. Each morning, other than Sundays, one of our work groups was expected to rake the beach to clear away the seaweed. We were also expected to pick up any trash that had washed ashore. It was quite disheartening to see all of the plastic that had washed ashore from the cruise ships that dumped in international waters. Imagining what that was doing to the marine life and their stomachs was quite disconcerting. GVI used beach cleans to: educate and make the community aware for both locals and tourists, protect marine and terrestrial animals, and for aesthetic purposes therefore increasing tourism and helping to promote sustainable practices.

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9 Ibid (75)
We also sorted the recyclables from the rest of the trash and were able to further the goal of sustainability that GVI promotes.

Figure 11: Photo of our success after a beach clean

**Conclusion**

My internship in Mexico was filled with accomplishments, frustration, excitement, sadness, teamwork, growth, completion, and a new outlook regarding my future in the environmental field. Our team was able to complete data collection at LPC, LE, and BUC but unable at FV. Lack of completion at FV was due to the weather, cruise ship patterns, and the intensity of the site with the strong currents and the distance from base. I found out towards the end of the Expedition that FV very rarely winds up with a complete data set at the completion of a phase. Monitoring at that site is so weather dependant, due to the size of Sukun and therefore the types of drops made, along with the frequency and number of cruise ships at port at any time. During the busier cruise ship season it also became unsafe to try and monitor this site. FV required all the divers and the captain to be very confident in their abilities for the dive to be carried out safely. Consequently, a lot of factors influence monitoring at that particular site. The outlook for future monitoring is not positive, as there are plans to expand the pier to allow for six cruise ships to dock at one time, as opposed to the current limit of three.
The ramifications of a bigger cruise ship pier, good and bad, will be felt throughout the community and also the surrounding communities. One of the big issues will be the influx of temporary laborers drawn from their native homes during the week to the coast seeking money to support families back home. The reef, mangroves, and the overall coastal environment will suffer the consequences of a quickly expanding community with insufficient infrastructure to manage such huge population fluctuations coming to work to support all of the tourists.

My time in Mexico was marked by great accomplishments in diving; working really well as a part of a team, and feeling confident in helping others when in emergency situations. Along with the reef research; we helped teach English to people who rely on it for their income, a few members were able to monitor turtles, we collected data on the weather daily, ran the activities of a base, kept track of all of the Turtles, Rays, and Whale Sharks sighted and their location, and also kept track of illegal activities that occurred in the lagoon (speeding through in a speed boat with a bunch of tourists clinging onto a banana float being towed behind). All of this was accomplished without running water for about a month of the Expedition (bucket showers only, bucket flush toilets, and no running water to clean your teeth, or the bathrooms, when it was your turn), a time without a compressor to fill tanks, no diving due to lack of an emergency vehicle and oxygen, a non-working boat engine for a couple of days, man-eating mosquitoes (bites through 3mm wetsuits), stinging ants, and crazy periods of weather with drenching rain that meant days on end working in workbooks and reading. I wouldn’t trade any of it for the world. It is an experience I will never forget and it has restored my desire to chase my dreams. I know this experience will help me further my career, has helped me build confidence in myself as a researcher, and will be of value across all facets of my life.

![Figure.12 New Mahahual currently. Imagine with 4 more boats!](image)
Goals Accomplished:
1. Dive Master certification
2. Rescue Diver certification
3. First Aid/CPR/EFR credentials
4. Monitoring complete for phase at all sites except for FV.
5. Data entry into the computer for all sites was completed.
6. My Spanish was greatly improved.
7. This trip has provided me with life long friendships and contacts around the world from all different walks of life.
8. I have increased my diving and research experience for future ventures into the underwater world and all of its opportunities in the field.
9. I have regained a great desire to pursue a career which I hope will be related to field work that incorporates diving.
10. Increased knowledge of the TEFL program and the methods for teaching it which also provides a greater understanding of the dynamics of communication.
11. An increased awareness of how to work as part of a team because there isn’t anyway this type of experience can be successful without teamwork.
References


www.gvi.co.uk

whc.unesco.org
GLOBAL VISION INTERNATIONAL – MAHAUAL, MEXICO

Fish Species List

**Family: Butterflyfish – Chaetodontidae**
- Chaetodon striatus – Banded butterflyfish
- Chaetodon capistratus – Four eye butterflyfish
- Chaetodon ocellatus – Spotted butterflyfish
- Chaetodon sedentarius – Reef butterflyfish
- Chaetodon auriga – Adventurer butterflyfish

**Family: Angelfish – Pomacanthidae**
- Centropyge argi – Cherubfish
- Holacanthus ciliaris – Queen angelfish
- Holacanthus tricolor – Rock Beauty
- Pomacanthus paru – French Angelfish
- Pomacanthus arcuatus – Grey Angelfish

**Family: Surgeonfish – Acanthuridae**
- Acanthurus operculatus – Dice Tang
- Acanthurus bahianus – Ocean Surgeonfish
- Acanthurus chirurgus – Doctor Fish

**Family: Jack – Carangidae**
- Caranx ruber – Bar Jack
- Caranx buncholus – Yellow Jack
- Caranx lettus – Horse-eye Jack
- Aletta ciliata – African Pompano
- Trachurus goodii – Palameta
- Trochinos tinctus – Perrett

**Family: Mackerel – Scombridae**
- Scomberomorus regalis – Cero
- Scomberomorus maculates – Spanish Mackerel

**Family: Needlefish – Belonidae**
- Alosa falcinellus – Fat Needlefish
- Trichiurus latus – Hondefish

**Family: Barracuda – Sphyraenidae**
- Sphyraena barracuda – Great Barracuda

**Family: Bonefish – Albulidae**
- Albula vulpes – Bonefish

**Family: Snook – Centropomidae**
- Centropomus undecimalis – Common Snook

**Family: Porgy – Sparidae**
- Calamus calamus – Saucersy Porgy

**Family: Chub - Kyphosidae**
- Kyphosus sectatrix/inclusa - Chub

**Family: Mojarra – Gerreidae**
- Gerres cinereus – Yellowfin Mojarra

**Family: Tarpon - Elopidae**
- Megalops atlanticus – Tarpon

**Families: Silversides, Herrings, Anchovies – Atherinidae, Clupeidae, Engraulidae**

**Family: Grunt – Haemulidae**
- Haemulon flavolineatum – French Grunt
- Haemulon striatum – Striped Grunt
- Haemulon chrysargyreum – Smallmouth Grunt
- Haemulon plumieri – White Grunt
- Haemulon sciurus – Blue/Striped Grunt
- Haemulon carbo – Caister Grunt
- Haemulon aurorivirens – Tomato
- Haemulon leucutrum – Cottonwick
- Haemulon macrostomum – Spanish Grunt
- Haemulon parra – Sailors Choice
- Haemulon album – White Margate
- Anisotremus virgincis – Porkfish
- Anisotremus sulnemis – Black Margate

**Family: Snapper – Lutjanidae**
- Lutjanus analis – Mutton Snapper
- Lutjanus gibbus – Grey Snapper
- Lutjanus cyanopterus – Cobera Snapper
- Lutjanus jocu – Dog Snapper
- Lutjanus nheogori – Mohogany Snapper
- Lutjanus apodus – Schoolmaster
- Lutjanus synagris – Lane snapper
- Ocyurus chrysurus – Yellowtail snapper

**Family: Chromis/Damsel-fish – Pomacentridae**
- Stegastes diacolecus – Longfin Damsel-fish
- Stegastes flavidus – Theaspot Damsel-fish
- Stegastes variabilis – Cocoa Damsel-fish
- Stegastes lascococcus – Beaugregory
- Stegastes oculatus – Dusky Damsel-fish
- Stegastes partitus – Bicolour Damsel-fish
- Microspathodon chrysurus – Yellowtail Damsel-fish
- Abudefduf saxatilis – Sergeant Major

List of Appendices Appendix A Mahahual Fish Species List
Fish Species List – Part 2

**Family: Hamlet/Seabass – Serranidae**
- Hypoplectrus unicolor - Butter Hamlet
- Hypoplectrus puella - Barred Hamlet
- Hypoplectrus indigo - Indigo Hamlet
- Hypoplectrus guttatus - Shy Hamlet
- Hypoplectrus aberrans - Yellowbelly Hamlet
- Hypoplectrus gymnoguttus - Golden Hamlet
- Hypoplectrus chlorurus - Yellowtail Hamlet
- Hypoplectrus nigerius - Black Hamlet
- Hypoplectrus gemma - Blue Hamlet

**Family: Grouper/Seabass – Serranidae**
- Epinephelus itajara - Goliath Grouper
- Epinephelus striatus - Nassau Grouper
- Cephalopholis argus - Gray Grouper
- Epinephelus adscensionis - Rock Hind
- Cephalopholis fulva - Coney
- Epinephelus guttatus - Red Hind
- Mycteroperca venenosa - Yellowfin Grouper
- Mycteroperca bonaci - Black Grouper
- Mycteroperca tigris - Tiger Grouper
- Mycteroperca intercostalis - Yellowmouth Grouper

**Family: Seabass – Serranidae**
- Serranus tigrinus - Mr. Hook Bass
- Serranus tabulatus - Tabasco Goby
- Serranus tortugarii - Chauj Bass
- Paranthias furcifer - Creolefish
- Rhytius saponaceus - Greater Scoafish

**Family: Basslet – Grammatidae**
- Gramma loreto - Fairy Basslet
- Gramma melacara - Blackcap Basslet

**Family: Parrotfish – Scaridae**
- Scarus coecileus - Blue Parrotfish
- Scarus coelestis - Midnight Parrotfish
- Scarus guacamaia - Rainbow Parrotfish
- Scarus vetula - Queen Parrotfish
- Scarus tanzanus - Princess Parrotfish
- Scarus iserti - Striped Parrotfish
- Sparisoma aurofrenatum - Redband Parrotfish
- Sparisoma chrysopterum - Redtailed Parrotfish
- Sparisoma rubripinnis - Yellowtail Parrotfish
- Sparisoma etomarium - Greenbunch Goby
- Sparisoma radiatum - Budtooth Parrotfish
- Sparisoma viride - Stoplight Parrotfish

**Family: Wrasse – Labridae**
- Ctenochaetus striatus - Creole Wrasse
- Halichoeres radiatus - Padding Goby
- Halichoeres garnoti - Yellowhead Wrasse
- Halichoeres hovittatus - Slippery Dick
- Halichoeres maculipinnis - Clown Wrasse
- Halichoeres poeyi - Blackear Wrasse
- Halichoeres pictus - Rainbow Wrasse
- Thalassoma bifasciatum - Bluehead

**Family: Hogfish, Razorfish/Wrasse – Labridae**
- Lachnolaimus maximus - Hogfish
- Bodianus rufus - Spanish Hogfish
- Xyrichtys martini - Rosy Razorfish
- Xyrichtys novacula - Peary Razorfish

**Family: Squirrelfish – Holocentridae**
- Holocentrus adscensionis - Squirrelfish
- Holocentrus rufus - Longfin Squirrelfish
- Sargocentron cornutum - Rock Squirrelfish
- Sargocentron zebratum - Dusky Squirrelfish
- Neomeron marianus - Longjaw Squirrelfish
- Sargocentron bullisi - Deepwater Squirrelfish
- Myripristis jacobs - Blackbar Soldierfish

**Family: Bigeye – Priacanthidae**
- Hereteropriacanthus cruentatus - Glasseye Snapper
- Priacanthus arenatus - Bigeye

**Family: Goby – Gobiidae**
- Gobiomorus occidentalis - Yellow Goby
- Gobiomorus chilensis - Broadstripe Goby
- Gnatholepis thermorum - Goldspot Goby
- Coryphothenius discus - Colon Goby
- Coryphothenius ecklonii - Pallaed Goby
- Coryphothenius glaucofrotnum - Bridled Goby
- Coryphothenius personatus - Masked/Glass
- Coryphothenius lipernes - Peppermin Goby

**Family: Blenny – Blenniidae**
- Malacanthus triangulatus - Saddled Blenny
- Acanthoblenius maria - Secretary Blenny
- Lutjanus biguttatus - Arrow Blenny
- Ophiodon elongatus - Redlip Blenny
GLOBAL VISION INTERNATIONAL - MAHAHAUL, MEXICO

Fish Species List – Part 3

**Family: Jawfish – Opistognathidae**
Opistognathus aurifrons – Yellowhead Jawfish

**Family: Lefteye Flounder – Bothidae**
Bothus lunatus – Peacock Flounder

**Family: Lizardfish – Synodontidae**
Synodus intermedius – Sand Diver

**Family: Hawkfish – Cirrhitidae**
Amblycirrhus pinos – Redspotted Hawkfish

**Family: Trumpetfish – Aulostomidae**
Aulostomus maculatus – Trumpetfish

**Family: Tilefish – Malacanthidae**
Malacanthus plumieri – Sand Tilefish

**Family: Smooth and Spiny Puffer – Tetraodontidae**
Sphoeroides splendida – Banded Puffer
Canthigaster rostrata – Sharpnose Puffer
Diodon holocanthus – Balloonfish
Diodon hystrix – Porcupinefish

**Family: Boxfish – Ostraciidae**
Lactophrys triqueter – Smooth Trunkfish
Acanthochirus polygnathus – Honeycomb Cowfish
Acanthochirus quadricornis – Scrawled Cowfish
Lactophrys bicuvatus – Spotted Trunkfish

**Family: Triggerfish and Filefish – Balistidae**
Balistes vetula – Queen Triggerfish
Atheres scriptus – Scrawled Filefish
Canthidermis sufflamen – Ocean Triggerfish
Balistes capriscus – Gray Triggerfish
Metapontias niger – Black Durgon
Cantherhines pulchra – Orangespotted Filefish
Cantherhines macrocerus – Whitebanded Filefish

**Family: Goatfish - Mullidae**
Pseudocentrus maculatus – Spotted Goatfish
Mullloidichthys martinicus – Yellow Goatfish

**Family: Drum – Sciaenidae**
Equetus punctatus – Spotted Drum
Pomacanthus acuminatus – Highfin
Equetus lanceolatus – Jackknife Fish

**Family: Sweeper – Pempheridae**
Pempheris schomburgki – Glassy Sweeper

**Family: Remora – Echeneidae**
Echeneis naucrates – Shark sucker

**Family: Moray – Muraenidae**
Gymnothorax funebris – Green Moray
Gymnothorax moringa – Spotted Moray
Gymnothorax miliaris – Blackhead Moray
Heteroconger longissimus – Brown Garden Eel

**Family: Stingray – Dasyatidae**
Dasyatis americana – Southern Stingray
Urolophus jamaicensis – Yellow Stingray
Astropterus narinari – Spotted Eagle Ray
Imago Earth Center

Introduction

In 1994 Jim and Eileen Schenk, local residents of the area, took the opportunity to obtain an 8 acre parcel of forest and field in the middle of Price Hill, which is located 5 minutes from downtown Cincinnati. In 2001 that area was doubled as another 8 acres was purchased creating an urban greenspace with a system of hiking trails that are free and open to the public. The Earth Center was purchased with the vision to provide an urban nature preserve to the people most in need of such a space, city dwellers. The primary function and bread and butter of Imago are the naturalist led programs for families and children from local schools and scout troops. Imago also oversees and works in collaboration with the Enright Eco-village, maintains and improves its greenspace through habitat restoration, and conducts what is considered the soul of the organization - Earth and Spirit.

Imago Earth Center Mission Statement:

“Foster in the residents of Greater Cincinnati, and in particular her urban youth, awareness and appreciation of the natural world. We do this by providing quality, hands-on experiences designed to create a lasting impact.”

Imago accomplishes this goal through providing environmental education, within its programs format, to 10,000 people each year. The programs are designed to expose and build connections between the participants and the natural world through hands-on experiences. The hands-on experiences and educational material is then reinforced and elaborated on with games, hikes, and other activities. The Earth Center believes strongly that learning occurs best when the participants are actively engaged and this is evident as that is the premise for every program taught at Imago.

Other components of Imago:

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10 Naturalist Employee Manual (1)
Earth and Spirit – Is the name given to the events and programs provided by the Earth Center that connect spirituality with ecological action. The message of Earth and Spirit, “These programs provide us with the motivation for living as though Earth were sacred, for all the children of the all the species for all times.”\textsuperscript{11} I find this analogous to the teachings of Aldo Leopold and his idea of a land ethic. Earth and Spirit uses conferences, celebrations, workshops, with a focus on elder leadership, and provides for a communication forum to promote the organizations beliefs.

Enright Ridge Eco-Village - “a community inspiring earth friendly living that nurtures an intimate and prosperous neighborhood within it’s uniquely forested urban setting.”\textsuperscript{12} The eco-village currently comprises 96 properties that are on, or approximate to, Enright Ave (where Imago is located). The community promotes itself as a sustainable urban neighborhood that is trying to build a strong sense of community and provide like-minded residents a venue for betterment ecologically and spiritually through collaboration.

Greenspace – Imago is also dedicated to habitat restoration of the 16 acres of its greenspace through elimination of invasive species (predominantly honeysuckle and winter creeper) and creation of native ecosystems with help from volunteers and nature.

\textbf{Area of interest for my internship:}

At Imago Earth Center I reported to Chris Clements, the Director. He oversaw all of my activities and provided me with a vast amount of techniques and ideas for teaching. I was trained at Imago by the outgoing Director of Education, Jill Whitmarsh, along with a wide group of volunteer and staff naturalists. The large majority and primary responsibility of my internship, was participating as a naturalist, leading elementary age school children in the programs offered through Imago. Imago offers fourteen on-site programs as well as two traveling programs in which naturalists visit schools to discuss Classification and provide a Nature Story Time. However, due to

\textsuperscript{11} \url{www.imagoearth.org}
\textsuperscript{12} \textit{ibid}
time of year, I taught programs located on-site that were mainly focused on Native Americans, nature hikes, insects, and plants. Each program worked on connecting students with nature and providing them with hands-on experiences. Another fantastic benefit of each program was that they targeted different state benchmarks which allowed teachers guidance on what program(s) most benefited their students.

The remaining portion of my time at Imago included daily responsibilities and preparation of a cost/benefit analysis for making the building more energy efficient in conjunction with a Power Point presentation highlighting the research. Along with those two major components of my internship I also wrote up Emergency Action Plans, participated in fundraising, and planned for future educational supplements that could easily be accessed by the public regarding building efficiency.

Naturalist

My internship was based primarily on providing environmental education to children from kindergarten through the eighth grade. Imago draws children from all over the tri-state area, however, mainly provides services to children in the Cincinnati Public school system and Northern Kentucky. Eighty percent of my time at Imago was based on learning or teaching environmental education. I spent a large portion of the first month shadowing volunteer and staff naturalists learning the material. Each person I followed had his/her own techniques, delivery tactics, and areas of expertise. It was a great way to train and allowed me to pull strengths from each naturalist. After training for the first month I proceeded to teach the children on my own. The programs I conducted or shadowed included the Native American Overview, Native American Combination, Nature Hike, Sensory, Plants, Insects, and Seasons (Fall). The programs focused on playing games to reinforce ideas and allowed for interactive learning. Each program taught was based on hands-on experiences, were extremely informative, and allowed the children to explore. Another great piece to the teaching style I learned at Imago was addressing topics with questions, or inquiry-based learning. Asking questions allowed the children to think about the topic at hand and turned what could
have been a boring lecture into a discussion. Inquiry-based teaching also allowed the students to become the teachers and for all parties involved to become better educated.

Each program at Imago began with all of the naturalists on staff setting up games and learning aids around the property according to the program being held. After the set up, rotations were established and work was divided amongst the naturalists. Once all of the logistics were sorted a naturalist would go out and meet the bus at the entrance to Imago. We would then conduct a head count and walk the children back to the open field next to the Earth Center building. The children were then introduced to the Earth Center and given information on what the day held. After the introduction, the large group was broken up into small groups, with one naturalist leading each group. After completing all of the rotations and depending on whether the program included lunch we would all meet back in the field and participate in a closing to say our goodbyes. After each program we went back through grounds and collected all the items from the program to return them to our office. Following clean up we would sit down and discuss likes, dislikes, strengths, and areas for improvement. A summary of each program I was involved with is provided in Appendix C.

![Figure 13: Introduction & Closing Circle](image)

The Native American Combination (NA) and the Native American Overview (NAO) were a huge portion of my repertoire. The NAO is a shortened version of the Combination program. As can be seen in Appendix B, which includes the Native American lesson from each naturalists’ handbook, there is a lot of information given to
each naturalist. Trying to convey to the children all of that information within the allotted amount of time proved difficult. NA programs communicated the differences and similarities between our current western society practices and those of the local Native American residents of Ohio the Shawnee, Miami, Ottawa, etc. The program emphasized the relationship between the local Native American tribes and their surrounding environment, as well as how well they utilized resources as a community. The program’s main focus highlighted how inefficiently modern western society uses our natural resources and surrounding areas. Another large area of attention in the program lay in the contrast between the Native American communal living where inclusion of extended members of family was the norm, versus our modern style of living. NA programs were geared towards the senses and included many activities and points of interest in the homestead area. The areas of interest in the homestead included the wigwam, musical instruments (shown in Figures 14 & 15), the three sisters garden, clothing and animal skins rack, and the tools used for hunting and fishing. We also presented the children with ideas about the differences in clans, played games with them that dated to the era of the Native Americans, took hikes with them discussing various uses of materials in the surrounding woodlands, talked about hunting, gathering, and food production.

Figure: 14 & 15 Children and Liz Bowater Discussing & Enjoying Native American Learning Aides

The nature hikes I conducted focused on stages of forest and field succession, useful species both plant and animal for humans, non-native species, the wide range of
animals found even in the most urban patches of forest, bird calls, games, and as in all programs inquiries from the children. The small 16 acre patch of urban forest was inundated with winter creeper and honeysuckle. For many of the children and quite a few adults this was their first introduction to non-native species. The property was once a neighborhood with many homes where now walls of previous foundations still exist. The landscaping that once enhanced the property value of the homes (honeysuckle and winter creeper) had become overrun throughout the property and was quite a pest species. One of the targets for the greenspace director was eradicating both species in the least harmful way to the other plants and animals in the surroundings.

Another fun and interesting program was Sensory aimed at preschoolers through first graders. The program concentrated not only on the five senses but gave children more insight and a better understanding of each. Through their senses the children were to become more aware of their surroundings. This was accomplished through games, activities, and demonstrations. Animal behaviors, techniques, and communication were also highlighted through activities that helped children understand how crucial the senses are not only to us but to other living things as well.

The Insect Program, Seasons Program (Fall), and the Plant Program were all programs through which I learned valuable teaching techniques while shadowing other employees. However, I was never able to teach any of those particular programs due to lack of demand at that time of year. Nevertheless, I was instrumental in helping with set up for each of those programs and providing assistance where needed. The Insect Program was aimed at Pre-K to Kindergarten students. The main components included the parts of an insect, the stages of metamorphosis, adaptations for survival, communication between insects, being able to distinguish insects from other invertebrates, and allowing students to understand insects’ role in the ecosystem and their relationship to humans. The Plants program focused on the parts of a plant and their functions, basic photosynthesis, the lifecycle, their importance, and established their role in the environment.

The Seasons’ program or series was great because it allowed the children to compare and contrast as well as see the progression of seasons over the course of a year. Each season they returned and learned about how the animals and the
surroundings adapted and changed from season to season. They brought a notebook for each program in the series and through observations via descriptions and pictures they gained snapshots of the seasons at different locations throughout the property. This obviously was the Fall Seasons program and focused on all of the animals, plants, colors, and happenings in the natural world that occurred in autumn. One of the main areas of concentration was the orbit of the Earth and how that affected us and other locations around the globe through the changing of the seasons. I was only able to observe and set up for the Seasons program but found the materials and concepts very interesting.

I taught my first program within the first month of my internship at Imago. I began with kindergarteners teaching the NAO program. The anticipation of teaching alone, without another naturalist by my side, was actually quite frightening, even though the group consisted of 20 five and six year olds. It was amazing how quickly the time passed and how difficult it was to convey all the NAO information in my head in a timely manner to the children. Due to Imago offering its programs to a broad range of ages (4 - 13), a key component to the success of teaching the children was figuring out at what level the information could be delivered. Through teaching across the ages I discovered that the girls at every age level were generally more engaged and less of a problem than boys. This was the first time I had taught on a formal level and it definitely provided insight into the different learning styles of boys and girls. I also found the older children a little more difficult to work with. Older children, especially boys, are not as inquisitive nor are they as easy to maintain in such a large group. Younger children are so much more excited about learning and they soak up all of the information presented with enthusiasm. Teaching each program took time with regard to learning the style, absorbing the information, and delineating the manner in which to teach each individual program. All of the programs also took time to prepare by pulling together a basket of helpful activities and due to set up of props throughout the landscape. At times we had to transport learning aides far from our main building. Another time consuming portion of setup was walking the trails picking up litter, which included a lot of interesting materials.
Building Efficiency Evaluation

After committing to work at Imago it became obvious that my time would not be completely filled by teaching environmental education. Chris, the director and I, met to discuss what my other options for work at Imago might include. It was decided I could work on a building efficiency evaluation. I began the evaluation by taking an inventory of the current overall efficiency of the building. That included everything from the appliances in the kitchen to the R rating of the garage door. After taking inventory I researched online all of the possibilities available to individuals and small companies/organizations for making their surroundings more energy efficient. With radiant heat in the floor and great overall insulation our building was very efficient. The exception to that were the windows and the garage door which was rated (R-0). The kitchen appliances, bathroom facilities, and lack of a thermostat along with the proposal of laminate for the office space, were other areas that were very inefficient. I then began researching possibilities for floor coverings for the upstairs office space. I looked online for the most environmentally friendly options keeping in mind that mud and dirt go along with working at a nature center. The possibilities I explored were cork, bamboo, and commercial carpet tiles/squares overruns. Carpet squares quickly became the option of choice. Carpet tiles had many benefits including a larger efficiency impact, much more environmentally friendly, and were the least expensive of the options. During our staff meeting the laminate, proposed by Scott Shafer the Properties Manager, was quoted at $1.97 per square foot. I eventually found carpet tiles that were $.45 cents per square foot. Purchasing carpet tile overruns was not only less expensive but also utilized tiles that would otherwise have been thrown into the landfill. They were also recyclable, easy to install, easy to replace, aesthetically pleasing, and helped to maintain a more constant temperature allowing for less heating and/or cooling of the building. After a staff meeting and discussion with Chris carpet tiles were deemed the flooring of choice for the office. I pulled together a letter for carpet tile donations as seen in Appendix E. I then went around to local carpet companies in the tri-state area and requested donations. After visiting a few different companies it became apparent local companies didn’t have holdings/extra carpet squares available. The South has an abundance of carpet tiles due to its location close to the carpet mills where overruns and glitches in
production occur. Therefore, they have a large supply of carpet squares that companies won’t accept and are unusable. These carpet mills then sell them to other middle men at bargain rates or store them and sell them via the internet cheaply. In this created market the carpet mill sells the tiles at or close to cost allowing them to break even, the buyer gets a great deal, and the landfill has less waste. I went back to Chris and we decided to purchase the tiles at the $.45 cents a square foot price. Generally at that price the carpet tiles are not the most attractive colors and there are only enough available to cover 45 square feet. Taking those factors into account you have to be creative when installing the tiles to create the most appealing mosaic possible. I purchased somewhere around 10-15 different colors of carpet tile each in its own unattractive shade.

The other areas of efficiency that I researched and evaluated were the bathrooms, (sinks, faucets, lighting, toilets, hand drying options), the overall lighting, windows, compost options, grey water collection, paint, temperature regulation, solar and wind alternatives, tankless water heaters, computers and their components, as well as their counterparts in the office: fax, phone, copier, etc. After researching and evaluating our options I was able to pull together the logical fits for our Center and realistic options for the budget. I was then given $1,200 to spend on the items I had researched and install them in the Earth Center building. I had to clear all purchasing ideas with the staff at our meetings. Upon approval from staff I was able to buy a list of items to help make the building more energy efficient. I came up with four different package ideas that I presented to the staff. We took a vote and pulled together a package of items that I was to purchase. The list included a dual flush toilet, a garage door, two thermostats, three faucet aerators, and the possibility of a hand dryer. The excess money was to be used on plaques highlighting all of the items so that visitors could incorporate these ideas in their own homes. A copy of the four packages is included in Appendix A. To date I have been able to purchase the garage door, the dual flush toilet and the faucet aerators. The thermostats were donated to Scott Shafer and therefore didn’t have to come out of my budget.

The other update to the office that I was instrumental in helping achieve was the painting of the 2nd story loft office space. Due to a miscommunication between me and the carpet tile company we moved everything in the office to begin installation of the
carpet tiles. Unfortunately, due to us prematurely moving our office around and without access to computers and no carpet to install we were in an uncomfortable predicament. I made some calls and was able to get some paint donated to Imago. The paint colors were yellow, white, and dark and light blue. They were leftovers from another office paint job. With only enough paint in each color to paint one wall and the ceiling we had quite an array of color on the top floor. The combination of fresh paint and installment of the carpet tiles was refreshing and a much needed update to our dusty, dirty office.

Other Responsibilities

My other responsibilities included working on two Emergency Action Plans (EAP) for major and minor injuries, participating in preparation of bulk mailings, and researching incident report forms, and scheduling programs. I had completed an Emergency Action Plan for the research base in Mahahual. Therefore, I was nominated to compile two EAP’s for our office. I pulled from and adjusted the document I had completed in Mahahual to be applicable for use at Imago. After completing the document I presented it at the staff meeting where we edited. I then printed the documents for inclusion in all of the staff and naturalist manuals. Copies of both EAPs are in Appendix D.

The bulk mailings were busy work compiling documents and stuffing and licking envelopes. They were time consuming and happened frequently over the course of my stay at Imago. The mailings included information on programs, were solicitations for money, and provided valuable information to members. They were also a time for great staff bonding.

The incident report form was a quick exercise that eventually ended up being placed in Chris’s area of responsibility. There were too many legal and liability issues including information I wasn’t privy to.

Scheduling programs simply required answering calls and physically documenting along with entering data into the computer specifics for a planned program. The specifics included contact information, school names and information, the number of children expected, age group, any medical/health information that was
relative, and the program of interest. It was another small and mindless part of the job but was essential due to the revenue that programs brought to Imago.

**Conclusion:**

Imago was a wonderful experience and a great fit for me with regard to pursuing and completing my internship obligations. I was able to dabble in many areas that would otherwise have been unavailable to me had I worked in a larger, and fully staffed facility. The small size of the Earth Center and the flexibility of a non-profit also allowed me to be autonomous in a lot of my decision making. This factor also let me draw upon my strengths when collaborating with Chris on possibilities for work outside of the main obligation of environmental education. All of these factors together allowed me to work on the building efficiency portion of my commitment. Building efficiency is of great interest to me and provided me with the knowledge to apply some of the measures in my own home. The dominance of females in the staff was a new and pleasant experience for me. Working in an office environment composed of 95% females simply allowed me to experience and grow in a new setting. Imago taught me a lot about teaching children and provided a structure and a nice pace that I haven’t experienced in the past when working with kids. Due to Imago’s function as a nature center and the location, the make-up of the children from their age to their socio-economic background, changed daily. With that constant diversity there were many chances for personal growth and learning while helping the children enjoy, learn, and experience the outdoors. This continual personal growth provided me with more confidence as a naturalist/teacher and could provide a strong background for possible positions in the future. Following up an internship in Mexico was a tough act to follow. In Mexico, from sunrise to sunset, my day was jam packed with activities and I grew intensely as a person (not to mention the amazing scenery that surrounded me). On the other hand, this internship highlighted the beauty that can be found in my own backyard. Due to the fact that I don’t live in Mexico currently, there is still so much to know and explore right here in Ohio. I have a much greater appreciation for things I would have overlooked had I not experienced Imago. For that reason alone I will be forever grateful for having taken on this internship. Finally, the nature center has established a new
contact for me, made me feel more a part of my community, and will allow me to continue to grow through work as a volunteer.

Goals Accomplished:

1. Power Point presentation detailing areas for building efficiency improvement.
2. Emergency Action Plans for major and minor injuries: approved and implemented.
3. Learning and Teaching Programs successfully with continual improvement over the course of the internship.
4. Public outreach and education in the form of signage and leaflets allowing interested persons to apply energy saving activities and applications into their own environment.
5. Established a good relationship with staff and will continue to volunteer as a naturalist and wrap up unfinished details regarding purchase and installation of items for building efficiency.
References

Naturalist Employee Manual

www.imagoearth.org
Appendix A: Wish List Packages For Imago

Package #1

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<tr>
<th>Items</th>
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<tr>
<td>Xclerator Dryer</td>
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<tr>
<td>Automatic Faucet</td>
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<td>Water Heater Blanket</td>
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<td>Faucet Aerators</td>
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Total: $1005.79

Package #2

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<td>Faucet Aerators</td>
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<td>Programmable Thermostat</td>
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Package #3

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Total: $1021.67

Package #4

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Total: $1050.07
Native American Background

This reference provides detailed information about some of the concepts and materials used in all of the Earth Center’s Native American lessons. Instructors can use this information in their presentations as appropriate for the age of the students and the time available. In addition to specific descriptions of clans, face painting, naming, homestead, hunting and fishing, there is an artifacts list, a games reference and a hike reference.

Scholars give the name “culture” to the way of life of a people, including its arts and crafts. In studying Indian cultures north of Mexico, they found seven great culture areas in the region. The Indians of each area shared similar natural surroundings and had much the same kind of culture. People who lived along the border between two culture areas often reflected the two ways of living.

In each area the people had special ways of acquiring clothing, food, houses and utensils. One thing they had in common was the use of stone tools. All made a variety of hammers, scrapers, knives, arrowheads, and spear points from stone.

The Indians who made their homes in the eastern part of North America had a region with plentiful rainfall. Forests spread over mountains and valleys, and there were many lakes and streams. The “Woodland” tribes largely depended upon all these gifts for survival. It is said that the trees were so thick, that a squirrel could cross from one end of Ohio to another without touching the ground. Or that one could walk for days, look up and never see the sky. Therefore, the Indians of the Eastern Forests did not have to wander far seeking wild food.

Clans

Clans are divisions within tribes, similar to a family grouping. Native people could not marry within their clans. Individual clans often gathered for ceremonies or competitive games. In some tribes, each clan had a particular purpose like providing leadership, taking care of discipline, keeping peace, etc. Each clan identified itself with a symbol – usually an animal or some other part of nature. At the Earth Center, we use four clan names - hawk, owl, wolf and bear, although there are many more among native tribes. The Lakota tribe divides clans into upper and lower, based on animal symbols (note: the terms upper and lower clans do not indicate status). The hawk and owl clans are upper clans because those animals live in the sky and the trees. The bear and wolf clans are lower clans because those animals live on the ground.

Face Painting

Native Americans painted their faces and bodies for a variety of reasons: to serve as spiritual protection before going to war, to look more attractive (like make-up today), to protect the skin from sun, wind and insects, to participate in ceremonies and to mourn someone who died. Paints were made from colored clays (red and white), as well as ground up charcoal, yellow pigment...
from bullberries or moss. They first smeared their bodies with buffalo or deer fat, then rubbed on the color.

The colors have special meanings: **black** – death, sadness; **red** – power, life, war, courage; **blue** – sky, truth, sadness; **yellow** – joy, victory, sun, happiness; **white** – peace, ceremonies; **green** – earth, new life, new experience. Colors are also associated with different points of the compass – yellow is east (where the sun rises), red is south (where it is hot), black is west (where the sun sets or dies), and white is north (snow.).

**Naming**

Among Native Americans, an adult of the tribe first named a baby usually based on a vision or dream. Often the naming was done at a special ceremony. Later the parents might give a name or nickname based on some event in the child’s life or related to an animal the child resembled. At the end of childhood, a young person spent three to four days alone in the woods. During that time he/she would have a vision or dream and either chose a name based on the vision or kept the name for another baby.

A male child born to a Shawnee was given a name within ten days. A female child was named within twelve days. The name was either bestowed by a parent or by some trusted friend of the family, called a “conferrer.” During this time he looks for an “Unsoma” (a significant event), which Moneto sends to indicate the name of the child. No surname was used among the Shawnee, and for convenience they often shortened a given name for common usage (just as we would shorten the name Jeffrey to Jeff; so a Shawnee would shorten the name Gay-nwaw-piah-si-ka to Gay-nwaw).

**Regional Overview of Native American Clothing and Regalia**

Many days of work were required to make garments the Indians wore. The women spent hours after tanning hides. This process included scraping flesh and hair from the hides, washing the hide, drying and stretching, treating it with a deer-brain mixture, and sometimes smoking it to waterproof. From the hides they made all sorts of things—robes, bedding, rawhide utensils, and carrying cases, called parfleches. Tailoring the garments meant cutting the skins with shell or flint knives and sewing them with animal sinew. Awls and needles were made of bone and horn. The horns were carved into spoons and ladles, the hooves cooked to make glue.

At work the women wore a wraparound skirt, the men a breechcloth. The men usually shaved their heads, leaving only a scalp lock. Their headdresses were dyed deer hair or a few feathers. (The forest would have been a poor place for the war bonnet of the Plains Indian. Tree branches would have torn off its feathers.) The winter fur robes that were common left one shoulder bare.

Native American regalia is the special dress, ornamentation, jewelry and other paraphernalia which is worn for particular occasions such as festivals and dances, ceremonies and rituals. The style of dress, symbols used in designs, colors in beadwork and other ornaments can help identify the wearer’s tribe or family. Specific aspects of regalia can also indicate the wearer’s political or marital status.

Certain outfits or elements of clothing were undoubtedly worn only for particular ceremonies. Some regalia is sacred or has been ritually purified or blessed (“smudged” or wiped with the
smoke of sacred herbs.) Always seek permission before handling someone else's special dress to avoid spiritual contamination of their regalia.

**Colors and Natural Dye Ingredients**

**Yellow**  Sunflower, Gold thread (Helleborus trifoilis), Cone flower petals with decayed oak bark or cattail root, Black willow roots, Fox moss (Eversnia vulpine), Yellow or curled dock root, Cottonwood, Lichen (Usnea barbata), Oregon Grape (Berberis repens), Osage orange wood.

**Red**  Choke cherry or wild plum, Tamarack bark, Spruce cones, Sumac berries, Alder, Hemlock inner bark, Poke berry, Bloodroot, Sassafras, Red Bedstraw, Buffalo berry (Lepargyrea), Squaw current, Red Osier Dogwood, Red cedar.

**Black**  Wild grape (Vitis, cinera and vulpine), Maples, Burr oak, Elderberries, Hazel nut bark combined with powdered brown stone.

**Brown**  Hickory or Walnuts gathered green and turned black, Rushes (Juncus hectaricus).

**Purple**  Blueberries, Blackberries, Elderberries, Northern dog whelk (Nucella lapillus), White maple.

**Blue**  Larkspur, Beech, Wire Birch, Indigo.

**Green**  Prince’s Pine, Moosewood, Evergreen (Arbutus menziesa), Copper mixed with ammonia (urine).

**Games and Sports**

The Indians did not give all their time to the work needed to stay alive. They had many games and sports. Tribal members came together for festivals that lasted a week or more. The gatherings usually had religious ceremonies as their main purpose, but there was time for games and visiting, storytelling, and social singing and dancing.

Children played much as children play today. Girls played with dolls dressed in the costumes of their tribes. Boys shot small arrows from bow bows and crept through the woods pretending to be hunters or warriors. There were whip tops to spin, stilts, slings, and other toys. They had dogs and small wild animals as pets. Around the fire in the evening, old and young played guessing games such as hunt-the-button. They made cat's cradles with plant fiber string. Children learned skills from games then as they do now. Archery, target practice, and foot-reciting taught skills needed by the hunters.

Young people competed in athletic sports. The “ball play” popular throughout the coast has become the modern sport lacrosse. Athletes were highly trained for intertribal contests in this game. The ceremonial dancing and feasting before the games may be compared to modern football pep rallies.
Indians of all tribes liked games of chance. The commonest was called the hand game. A player held in his hands two bone or wooden cylinders, one plain and the other marked. His opponents attempted to guess which hand held the unmarked piece. One camp might compete against another. Backers lined up beside the player, shouting and singing to distract them. A man might lose his horses, buffalo robes, or everything he owned in the excitement.

Numerous games used markers resembling dice. Common was the bowl game. Players tossed marked peach or plum seeds in a bowl.

### Dancing and Ceremonies

Most of the Indian dances and ceremonies were held for religious reasons. By honoring their spirits, or gods, the Indians hoped to gain help and favor. Medicine men or religious leaders, danced to seek aid for the sick. Hunters danced the deer dance or the buffalo dance to attract abundant game. Farming tribes staged ceremonies to bring rain or to make the corn grow or ripen. Certain dances dramatized stories from the history or mythology of the tribe. Other ceremonies were held when children arrived at manhood or womanhood or to initiate them into the religious secret societies of the tribe.

Although the purpose of a dance was serious, the Indians usually made it the occasion for fun and sociability. In many tribes, there were clowns or other fun makers among the musicians or dancers. Social dances were sometimes held in the evening or at the end of a festival.

### Songs and Musical Instruments

Singing accompanied every public ceremony as well as the important events in an individual’s life. Religious songs were passed down from generation to generation, as they were an important part of the ceremonies. Women sang songs not only to ease the burden of their own activities, but lullabies and songs to encourage the warrior were also typical. Certain songs were the exclusive property of clans and societies. Individuals in the clan, however, could sell their songs or even give them away.

A variety of instruments accompanied dance and song. These included drums, rattles, whistles, flutes, bull-roarers, and notched sticks rasped on bones. Any materials on hand were used to make instruments. For example, farming tribes made gourd rattles. The Iroquois used a turtle shell and a pot or water drum.

### Storytelling/Tales of the Old People

Every tribe had its legends—some more fanciful than true—of the history of the tribe. When the day’s work was done, the old people would tell these tales. There were also many stories of animals and mythical beings that could assume human form and yet retain some of their own particular traits. Children were thrilled by these stories. The Indian stories and myths were passed by word-of-mouth from one generation to another. This is known as the oral tradition.

### Native American Homesteads

**Wigwams and Long Houses:** All the Eastern Woodland Indians lived in much the same way. But from place to place even in this region, there were differences in climate and in available plants and animals. Therefore, the tribes differed in housing and clothing styles, in food habits,
and in means of transportation. Perhaps the most widely used home was the bark covered wigwam or wikon. Sometimes it was shaped like a cone, and sometimes it was more of a dome (much like the one at the Earth Center). Larger long houses that held four to eight families were often used for shelter in the winter. Nomads, like so many plains Indians who followed the western buffalo herds, used tipis. Tipis were made with three or four poles coming to a point at the top. Other tribes besides those living in this region built permanent villages, homesteads of various sizes.

All the houses were crowded by modern standards - 10 to 16 feet in diameter. This was not a problem since the majority of time was spent outdoors. The wigwams were made of young trees or saplings. The saplings would be cut in the spring or summer when the wood was flexible and easily bent into a frame. The ends of the saplings were cut into sharp points so they could be stuck into the ground, which kept the wigwams from moving around. Cords made from the inner bark of basswood, vines, or rawhide, were used to tie the bent-over saplings together into a dome-shaped frame. Next, other slender branches were wrapped around the circumference of the bent poles and tied to them. Slabs of bark were tied to this frame to form the roof and walls. Fires were built inside the wigwams for warmth, light and cooking. An opening was left in the center of the roof for smoke to escape; a removable mat would cover the smoke hole in wet weather. The doorway would be covered with mats, deerskin or bark and would be situated so that it was East facing to greet the rising sun. The floor of the wigwam was made of tamped down earth. Sleeping platforms were made from strong hardwood branches. These platforms served as beds, chairs, and shelves (underneath them were stored supplies for sewing, hunting, and fishing). Woven mat coverings made sleeping on these platforms more comfortable.

When native peoples moved from summer to winter hunting areas, they left the frames of their wigwams or long houses behind, often reusing them the next year. The wigwam covers could be easily packed onto a travois and carried to a new homestead when the tribe moved. They tended to move when the ground lost its richness through years of planting, the game in the neighborhood became scarce, or the firewood was used up.

The wigwam frame at the Earth Center is covered with cloth such as native peoples might have received in trade with Europeans during the late 1700s. The sails from the ships were quite durable and were considered a good investment. Other outer coverings used were slabs of tree bark - hickory, elm, chestnut, ash, mats woven of cattail leaves or reeds or animal skins. Sometimes decorated cattail mats were hung inside the wigwam for extra insulation against the cold.

Three Sisters Garden: The Woodland people knew how to grow crops therefore they could live in villages. They cultivated corn, beans, gourds, squash or pumpkins, and tobacco as interdependent plants in the Three Sisters Garden. In the spring, when the geese flew north, the Indians knew it was time to begin planting. This was typically in late May when the ground is warm. Women were the farmers because it was believed that they had a special friendship with the land. Women gave life when they had babies, and the Earth gave life when it produced crops.
After the fields had been prepared, the women made little mounds of soil about six inches high and two feet round. They then would plant the corn three to four feet apart, with fish as fertilizer. The raised ridges provided moisture and frost control. When the corn was six inches high, beans and squash or pumpkins were planted around the corn plants. As the corn stalks grew, they provided a means for the bean plants to climb up towards the sun. At the same time, the beans served as nitrogen fixers (which means they replenish the nitrogen depleted from the soil) for the corn. The squash and pumpkins liked to grow in the shade of the corn and beans; as their vines and leaves spread out, they kept the ground moist, prevented weeds from growing and protected the other plants from pests. Often sunflowers were planted around the boundary of the plot. Many times, these gardens grew on hills because the sloping sides would ‘catch’ the sun’s energy and warm the soil early in the planting season.

This method of growing several crops together, interdependently, is different from today’s crop rotation whereby one field is planted with a different crop each year to replenish the soil. These small fields of mounds were both efficient and productive, reducing soil erosion, weeds and harmful insects. In fact, these plants attract insects that prey upon garden pests. The plants flourished in the warm, rainy summers. Since this part of the country was so heavily forested with strong root systems, Indians removed the bark of trees, which killed the trees without the laborious chore of chopping the forest. This allowed enough sunlight for crop cultivation. After a few years, the Indians allowed the field to reforest and replenish itself.

The early settlers often sowed by tossing a handful of seeds (broadcasting) on prepared ground. Indians taught them to plant individually selected seeds. In this way, the varieties of a plant developed and flourished, as is evident by the myriad of colors and types of corn, potatoes, beans and squash. The Native Americans had a firm handle on “hybridization” because they knew to transfer the pollen of one kind of corn onto the silk of another to achieve a desired breed of corn.

In the middle of the summer, the harvesting of corn was a major holiday for the Indians. They believed that corn was a gift from the gods and called it Sacred Mother. They grew many types, sizes and colors of corn. Even if one kind became diseased, there were still plenty of others to harvest. To the Native American, corn had special meaning and was used in rituals. Sometimes, the different colors of kernels represented different Indian tribes. Corn was eaten fresh, popped, or ground into flour. The next main crop was beans. Like corn, there were many kinds and colors of beans. Usually, they were dried and stored for later use. The variety of squash were also dried and then boiled, baked or fried.

**Food Preparation and Storage**

The Iroquois and other Native American women harvested and prepared corn for storage by folding back the husks from the ears and braiding them into long ropes. The corn could be hung up by these ropes to dry and was later stored in baskets or earthen pits. The cornhusks were then used for many purposes - cordage, wrappers for cooking food, fire tinder, stuffing mattresses or cushions, and for many woven items including mats, masks, shoes and baskets. Many foods like corn were also dried on racks as a means of preservation.

The meat might be hung on green branches over the fire to cook or boiled by dropping hot rocks into the cooking pot. Before the availability of metal pots, a pit was dug, lined with a section of
hide and water was kept boiling with heated rocks. Another option used was to make a paunch from the stomach of a buffalo and suspend it on a tripod over the fire.

Most of the meat was cut into thin strips and jerked. This type of dehydration was the most popular means of long-term storage. Jerking meant hanging the strips on scaffolds or a rack to dry in the wind. Streamers were placed and allowed to blow in the wind in an effort to keep wolves away. This dried meat would keep for a long while. Sometimes it was pounded fine and mixed with melted fat and dried berries; then it was stored in containers of skin or membrane. Called pemmican, this process of preparation made chewing easier and this became an excellent concentrated food for warriors or hunters. Strips of meat or fish might also be smoked for many hours, which would dry the meat and give it a distinct flavor. They would then “cache” the meat, a technique that varied from tribe to tribe. Often the meat was simply placed between two hides in an out-of-the-way place. Some dug pits and place the wrapped meat inside. In winter a cave was dug into a snow bank. The caching of the meat was only a temporary means of storage.

Dried foods were stored in bags, hung in the trees away from the animals or kept in storage pits over the winter. Native people dug pits three feet in diameter and four to six feet deep and lined them with grasses and bark to keep moisture out. Additional grass and bark would be used to fill in the spaces between food items. Eventually, unused food in a storage pit would rot and the storage pit would become a garbage pit. Today, archaeologists learn much about the foods native peoples grew and ate from the remains of these garbage pits.

Dried foods as well as fresh meat and vegetables in season were often cooked into stews. In fact, these stew or soups were most popular because anything and everything was tossed into the boiling water. Broken bones were saved and used as a soup base because of the flavorful marrow. Bones were also laid beside the fire and turned occasionally, then split open for the cooked marrow.

Nuts, berries, cherries and dried corn were ground up and carried on hunting trips, like today’s trail mix, or mixed with water and baked into flat breads or cakes. Corn kernels were usually placed in a wooden mortar cut into a log and pounded to a powder with a stone pestle. The wooden mortars were carved and hollowed out from hardwood logs. Some of the pestles have the shapes of animals or other things carved into the end that would be held. Many women would tie the end of the pestle to the tip of a small sapling, and the spring in the bent over sapling made it easier to pound the kernels in the mortar. The dried and parched cornmeal would then be added to many kinds of food, and the men would carry little bags of the dried corn powder on their long trips and it would last a long time.

There were many kinds of nuts to eat including acorns from the oak, beech nuts, chestnuts, hickory nuts and walnuts. Flour from these would make delicious nut breads or butter. The nuts would be shelled first by setting them on a “nutting” stone (a cobble with a little depression in it), and then cracking it with another cobble. To grind the nuts into flour, a rolling pestle in a shallow stone mortar would be used.

Native Americans were tapping maple trees long before Anglos ever reached the North American continent. Legend has it a young Indian woman was too busy with her chores to go to
the creek to fetch water. In her camp was a maple tree that had been damaged and was giving out a tremendous amount of water from its wounds. The young woman decided to use the water to boil some meat. In her haste to complete the rest of her chores she forgot about the boiling water and let it boil away. That evening the woman worried as she served her husband the "well cooked" meat. To her surprise her husband ravenously ate the meat, broke open the pot in which it had been boiled and licked the inside clean. When he was done he proclaimed his wife to be the best in the village. This is how maple syrup was discovered.

A Native American fireplace, cooking fire, consisted of a ring of heavy stones. These stones helped hold the fire’s heat overnight. The fire would be restarted in the morning by dropping a few pieces of tinder on the remaining sparks and blowing gently. Firewood comes in three sizes, tinder, kindling and fuel. Tinder, the fine material that burns easily, includes shredded bark, dried pine needles or pine cones, dried catail heads, etc. Kindling is slightly heavier (usually dry twigs), while logs and dead wood are the main fuel. To start a fire, a small wad of tinder is placed in the center of the fireplace with a little tip of kindling over it. After the tinder is lit, the kindling begins to burn and then the main fuel is placed on the fire.

A variety of baskets and bowls would be used as food containers for storage. These might be made of woven grasses or twigs, birch bark, wood, hollowed out gourds or mollusk shells. Utensils were carved of wood or made of bone or antlers. Water, which was found easily in the streams, lakes and springs of this area, was collected in bowls, gourds, deerskins or clay pots. Pots were made by mixing clay with crushed shell, sand or the broken fragments of old pots to give it added strength. The clay was shaped into coils and wrapped into the desired shapes. Designs were pressed into the clay with shells, pointed sticks, combs and fingernails. After air-drying for several weeks, the pots were baked or “fired.”

**Hunting and Fishing**

It seems that no matter what tribe you study, you will find that all native peoples had a reverence for all animals, plants, birds, the earth (soil) and rocks. All of these were seen as part of creation, sacred among all and as family relations. For this reason nothing was wasted or hunted just for sport. The taking of any life was done with a prayer of thanks to the creature giving up its life.

Native peoples used wild game for food as well as for skins and furs. The animals of this bioregion’s forests included deer, squirrel, raccoon, possum, beaver, fox, skunk, bear, wild boar (not native to this area but brought in by Europeans before 1700), buffalo, wild turkey and other game birds. Fish, shellfish, frogs and turtles lived in the streams and lakes.

**Hunting:** Men did the hunting among the Eastern Woodlands tribes. At an early age, they learned to recognize tracks, scent and other signs of animals in the forests and to move quietly so as not to frighten away game. Occasionally, they might set fire to a field of thick grasses in order to flush out the game birds and small mammals living there (Voila! Blackened pheasant!)
A spear or bow and arrow or atlatl would be used to bring down the larger animals or birds; snares or traps enabled them to catch smaller animals like rabbits. Eventually guns were obtained in trade from the Europeans who came into the area.
**Weapon Making:** In addition to hunting, the chief skill of men lay in making weapons. They whittled bows from the wood of ash, hickory, locust trees, osage orange or other tough wood and shaped them in a double curve. Painted designs on the bows made them more personal and helped to camouflage them so animals could not see the clear outline of the bow.

Initially native peoples chipped stone like nodules of flint, obsidian and chert or blocks of quartz and quartzite to make a variety of tools and weapons. They took hammer-stones made of river cobbles to roughly chip out the shapes of knives, arrow points, spearheads and scraping tools. Then antlers were used to evenly flake around the edges. Finally, they used pointed bones to pressure flake the tool to make a perfect, sharp edge. When a tool became dull from use, a new, sharp edge could be chipped. Although after many sharpenings, tools got too small to re-work. After the arrival of Europeans, they would cut triangular shapes from the wom-out kettles to make arrow and spear points.

Arrow shafts were made of willow, dogwood, witch hazel or viburnum wood. Points and stone axe heads were affixed to the wooden shafts or handles with a glue made by mixing hardwood ashes and pine pitch. Feathers from wild turkeys and other birds were attached to the ends with deer sinew. Each hunter had his design in the feathers to show which animals he had killed in a big hunt.

**Fishing:** Native peoples used materials found in nature to make fishing gear because there were no Orvis catalogues in those days. Strong fishing line was made from the dogbane plant and fishhooks were made from deer bone. With special bone netting needles, they wove sturdy fishing nets onto carved wooden handles. A temporary, lightweight net for scooping up minnows as bait could be made from a forked stick with layers of spider webbing. A spear for fishing could be made by securing the honey locust thorns to a shaft.

Often native peoples would fish from a wooden dug-out canoe made by burning out the center of a log, chipping away the burned material and burning again until the canoe was the right thickness. By packing wet mud along the top rim and sides of the canoe, they made sure not to burn too far into the wood.
Sign Language

The native peoples of North America spoke more than 300 different languages. As they travel and traded with each other and later, with Europeans, they developed sign language as a way of communicating. Silent hand signals were also useful for hunters trying to sneak up on game.

### Sign Language Blessing
(Usually for PreK through grade 2)

<table>
<thead>
<tr>
<th>Gesture</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>May the Great Spirit</td>
<td>(gesture of smoke rising from forehead with first 2 fingers of right hand)</td>
</tr>
<tr>
<td>Of the Present</td>
<td>(extend right arm to center of circle)</td>
</tr>
<tr>
<td>And the Past</td>
<td>(extend right arm behind you, outside of circle)</td>
</tr>
<tr>
<td>Bring Happiness</td>
<td>(bend left arm at elbow, lay right arm on top of left, then lift upward in an arc then back down to make the sign of a rainbow)</td>
</tr>
<tr>
<td>To Your Hearts</td>
<td>(place both hands over heart)</td>
</tr>
<tr>
<td>Ah-ho</td>
<td>(hands together, fingers together and extended, arms bent, bow at waist)</td>
</tr>
</tbody>
</table>

### Sign Language Blessing
(Usually for grade 3 and up)

<table>
<thead>
<tr>
<th>Gesture</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>May the Great Spirit</td>
<td>(Gesture of smoke rising from forehead w/2 fingers)</td>
</tr>
<tr>
<td>Mother</td>
<td>(Fist to heart)</td>
</tr>
<tr>
<td>Earth</td>
<td>(Rubbing thumb and first 2 fingers together like dirt)</td>
</tr>
<tr>
<td>And the Four Big Winds</td>
<td>(Hold up four fingers)</td>
</tr>
<tr>
<td>Bless you</td>
<td>(Spread arms wide)</td>
</tr>
<tr>
<td>Winds</td>
<td>(Sweeping gesture like wind)</td>
</tr>
<tr>
<td>All</td>
<td>(Hands open with palms facing out, bring hands from shoulders down to waist, then push out)</td>
</tr>
<tr>
<td>Until</td>
<td>(Hand out flat, parallel to ground, and rotate counterclockwise)</td>
</tr>
<tr>
<td>We Meet</td>
<td>(Hand in fist with thumb sticking out, pointing below breastbone)</td>
</tr>
<tr>
<td>Again</td>
<td>(Bring forefingers of both hands together until they meet)</td>
</tr>
<tr>
<td></td>
<td>(This is a complicated movement to describe – watch someone else)</td>
</tr>
</tbody>
</table>

Since the Indians depended upon nature they studied its ways, knew the habits of the animals, and found out which plants were nourishing and which poisonous. They knew signs that foretold the turning of the seasons and the changes in the weather. They had no science to explain nature and so believed the sun, rain and other forces were controlled by spirits. In religion they worshiped animals, plants, the sun, rain, and wind. In ceremonies and prayers they tried to gain the favor of these gods.
CHEROKEE CREATION STORY

According to Cherokee legend.

In the beginning the animals and plants of the world were held up in the clouds, above the great waters in a big net, much like a fishing net.

There was so much life they became crowded, and the creator decided to create Earth, below the sun and rainclouds, and above the water.

But how was this going to be accomplished?

Who could go down and put the earth in place?

Well, the coyote, eager for glory volunteered. Before anybody else could say otherwise, he went swiftly down to the waters. He fell under the waves and drowned.

Then the eagle said it would like to try, and the creator gave consent. So the eagle, with its magnificent and powerful wings, flew down and hovered gracefully in the air current in this motion of dipping its wings in and out of the waves Earth sprang up, until there was plenty of land for all living creatures.

(As told by a Native American woman whose mother is Ojibwa and father is Cherokee-French).

THE EARTH IS OUR MOTHER SONG

The Earth is our Mother, we must take care of her
The Earth is our Mother, we must take care of her...
Hey younga ho-o younga hey young young
Hey younga ho-o younga hey young young

The Sky is our Father, we must take care of him
The Sky is our Father, we must take care of him...
Hey younga ho-o younga hey young young
Hey younga ho-o younga hey young young

The sacred ground we walk upon with every step we take
The sacred ground we walk upon with every step we take...
Hey younga ho-o younga hey young young
Hey younga ho-o younga hey young young
Native American Chiefs of Ohio

Pontiac – (1720-1769) He was an Ottawa born near Detroit. In 1760, he was part of a delegation that welcomed the British to what is now the Michigan/Ohio area after the defeat of the French in Canada. Pontiac acknowledged England’s King George III, but claimed to be of equal status as a sovereign. In 1763, he organized “Pontiac’s Rebellion,” an uprising of many tribes with the goal of destroying all the English settlements in the Northwest. Eventually the campaign failed and Pontiac accepted the English rule but was later murdered by Native Americans jealous of his influence.

Tischohan – He was a chief of the Delaware who migrated from the Philadelphia region to Ohio in the 1750’s. Remembered as gentle and honest, Tischohan was hired to scout for land around the Ohio River for the Moravian missionaries.

Little Turtle – (1752 – 1812) Born in Indiana, Little Turtle, a Miami, lived primarily in Ohio near what is now Piqua. Although he survived long battles in 1790 and 1791, he realized that the European Americans would win eventually and counseled peace. When a peace treaty was finally made at Fort Greene Ville, he said, “I am the last to sign it and I will be the last to break it.” Little Turtle was later presented to President Washington in Philadelphia.

Cornstalk – He was a chief of the Shawnee who first settled in the Scioto Valley. Narrowly defeated at Point Pleasant, he signed a peace treaty in 1774. He was so committed to the treaty that, in 1777, Cornstalk and his son returned to Point Pleasant to warn settlers of the possibility of another war. They were held as hostages and later murdered by soldiers in retaliation for the killing of a settler by roving Native Americans.

Tecumseh – (1765-1813) A great Shawnee statesman and warrior, Tecumseh bitterly opposed the invaders after his father was killed at Point Pleasant. He believed that no one tribe could trade away its territory since the Ohio valley was their common heritage. He worked to form a coalition of southern and western tribes. Tecumseh died fighting on the side of the British in the War of 1812.

The Prophet – (1775-1837) The younger brother of Tecumseh, his real name was Lalawethika. After a long trance, he claimed he had visited the spirit world and revealed visions to his fellow tribesmen in 1805. He urged them to turn away from the white man’s customs and to return to the primitive ways. His prediction of a solar eclipse in 1806 got everyone’s attention as did Tecumseh’s ideas of tribal co-operation. When later cures and predictions failed to materialize, he lost his influence, living his remaining days in Canada and later migrating to Missouri and Kansas with his tribe.

Logan – A Mingo, Logan gained fame as an orator migrating to Ohio from Pennsylvania in 1770 at the age of 45. Based near Chillicothe, he made incessant, barbarous war on nearby settlements in retaliation for an earlier massacre of native people that included his sister. In a famous speech, he outlined the injustices endured by his people for a parley with the British in 1774.

Colonel Lewis – Also called Quatawapea – “The Man on the water who sinks and rises again” - he was a Shawnee known more for his handsome appearance than his chiefly qualities. Colonel Lewis was a mighty hunter and did some farming. He became chief when, because of his impressive looks, the Secretary of War mistakenly supposed him to be the chief and presented him with a special medal bearing the likeness of President Jefferson. The rest of the tribe decided to go with the flow.
Native American Artifact Reference

Note: Most of Imago's artifacts were made by modern day Native Americans who use the natural materials and methods of early native people.

Decorative and Ceremonial Items

Mandela (accent on the first syllable) – This Mandela is a circular hanging piece used for decoration in a homestead or interior of a wigwam. The circle is an important geometric shape for native peoples. It symbolizes wholeness and the sun, source of life. This mandela is made of grapevines with a webbing of sinew (fibers of the tendon from the deer's lower leg joint to the heel) in the center. The sinew and the turkey tail feathers, bird bones, wooden beads and mollusk shell represent the different ecosystems in this area. (Mollusk shells like this one were common in the past, though they are not often found in this region today.)

Sinew – Animal sinew is the fibrous tendon along the spines of deer, moose, elk, or buffalo often used in embroidery. Sinew thread does not require the use of a needle. Before it is used, a length of sinew fiber is split away from soaked tendons and the tip is rolled between the fingers, creating a point. The single sinew fiber dries within minutes and a stiff point results. This is then easily passed through the hole made by an awl. The point is left dry, but the remaining length is kept supple and moist with saliva to make secure sewing possible. More rarely, thread was twisted from fibrous plants such as Dogbane (Indian Hemp).

Drum – The surface of the drum is usually deerskin scraped very clean and stretched over the frame. Sinew holds the drum together. The drumstick head is covered with deerskin and fastened with sinew. A drumbeat is a replica of the heartbeat; fast or slow, loud or soft, it represents the sound of life.

Small Turtle Rattle – The rattle is made of deer hide sewn with sinew. Pebbles are inside a rattle of this type. The turtle is a sacred symbol to Native Americans who still refer to North America as “Turtle Island.” Encourage students to explore any of the many fascinating legends about turtles and other animals.

Turtle Shell Rattle – This rattle is made of an actual turtle shell, fastened with hide and sinew and containing pebbles. The remains of the turtle are removed from the shell by placing it in an anthill and allowing the ants to go to work. According to one Native American legend, land is held up out of the water by grandmother turtle with other turtles supporting her.
**Talking Stick** – The talking stick is used to allow each person to take a turn telling stories or sharing ideas in a gathering. It could be decorated much more ornately with beads, shells, feathers, etc. According to tradition, the Cherokee used the talking stick at the celebration of the New Year (usually in November after the harvest) when the people would gather around the fire inside their wigwams, telling stories about the past year and planning for the coming year.

**Golden Pheasant Headdress** – On special occasions, Native Americans might wear feathers or even an entire bird skin as a colorful headdress. This headdress uses a golden pheasant, a species brought to North America from China in the 1800s; early native peoples would have used other wild birds for this purpose.

**Personal Ceremonial Pipe** – This pipe would have been smoked with family and close friends as a sign of kinship and prayer. The idea of smoking a symbolic “peace pipe” is more European than native. The bowl of this pipe is made of soapstone, which is fairly easy to carve; it may represent a bear, a beaver, or some other local animal. The shaft of the pipe was split so the softer pith in the center could be hollowed out. Then it was put back together and sealed with tar or tree resin. Native American tribes have different ways of passing a pipe around the circle, but it is always handled carefully and reverently, with hands supporting both its head and body. When the bowl or head is attached to the body of the pipe, the pipe is considered to be alive and sacred. A larger pipe would be used as a family pipe; still larger ones would serve as clan and tribe pipes for sharing with bigger groups.

**Tools and Weapons**

**Wood Handled Scraper** – A scraper is used for tanning an animal hide that would then be used for clothing, blankets, wigwam covers, etc. Native Americans would first stretch the hide, then use a tool like this to scrape away all of the fat, meat and muscle fibers, being careful not to poke a hole in the hide with the sharp tool. This scraper has a wooden handle, which fits the natural curve of the forarm. The flint knapped blade was inserted into a slit in the handle, then wrapped with sinew and secured by a natural sealant such as beeswax or tar from a local tar pit.

**Hand Held Scraper, Thumb Scraper** – These flint knapped pieces come in various sizes but are generally flat and circular with one sharp edge. Native Americans would hold these in their hands to scrape with greater precision than is possible with a larger, handled scraper.

**Knife in Beaded Sheath** – This knife has a stone blade inserted into an antelope horn handle. The blade may be of chert (a locally available stone) or flint (found in northern Ohio). An antelope horn like this one would have been obtained in trade with Plains tribes. The beaded sheath shows a floral design, typical of local Woodland tribes. (Europeans, especially Spaniards, would have been the source for colored beads like these.) The sheath is made to attach to a belt; it could be tied around the leg to keep it from flapping around when the owner moved.

**Chert Knife** - Made entirely of stone or chert, this knife is very sharp and could cut meat or hides easily.
**Arrowheads and Spearheads** – Imago’s collection of flint-knapped arrowheads and spearheads includes some items made recently using native methods (in the small basket) and other authentic items recovered from early Native American homesteads and hunting grounds (in the glass case). These items are all shaped like isosceles triangles. Arrowheads are shorter than spearheads - an inch to an inch and a half long with a sharp-edged part jutting from the base of the triangle. This design allowed the user to secure the arrowhead to the shaft by wrapping it with sinew. Spearheads have different designs depending on their purpose. Those used as tools or weapons have a flat part with more rounded edges coming out from the triangle base. This lower part is inserted into the end of a split stick and then secured with sinew to make the spear. Ceremonial spearheads are plain triangles, longer than those used for weapons or tools; the flat base is also inserted into a stick and bound with sinew but is not as secure as the weapon spearhead.

**Arrow** – The arrows we have are designed for use with a bow. They are light in weight so they can fly easily in order to hit prey at a distance. The bow and arrow has triple the target range of the atlatl and can be used more easily in the woodlands. Additional description of the construction of arrows is included in the Appendix under Hunting and Fishing.

**Bow** - This bow is made of Osage orange wood, which is very strong, flexible and rot resistant. The handgrip in the middle is coated with tar and beeswax; the sinew bowstring is thicker in the middle as support for the arrow.

**Lance** – Used as weapons, hunting tools and for ceremony. This lance was probably used for ceremony. We know this because it is decorated with turkey feathers, a weapon would not be decorated in this fashion. It has a flint knapped blade secured with sinew. Spears and lances were typically too heavy to be thrown with enough force and accuracy to kill prey at any distance, and therefore were used at close range or with an atlatl.

**Atlatl** – Atlatl comes from the Aztec word meaning “spear-thrower.” An ancient weapon that predates the bow and arrow, the atlatl, widely used in Europe as early as 8000 B.C., enables a hunter to throw a spear farther and with more force. It consists of a launching stick of wood or bone about two feet long with a barb or notch at one end, a loop or other handgrip at the other end and a weight in the middle for balance. The hunter seeds the feathered end of his spear on the barb or in the notch, lifts the launcher and spear to throwing position and then snaps the atlatl in a forward arc. At the top of the arc, the spear disengages and flies on to the target. Like a fishing rod, the atlatl acts as an extension of the hunter’s arm. More powerful than the spear, the atlatl was not as useful as a bow and arrow in an ambush or in a heavily wooded area. Spear points used with an atlatl could be made of antler so they traveled through the air more easily and were less brittle than stone spear points.

**Mortar and Pestle** - There are several examples of these tools used for grinding corn, cracking nuts or crushing berries for dyes. The user takes the pestle in hand and grinds against the flat stone mortar. Early Native Americans used larger mortar stones than the ones we have or else they ground corn inside a hollow tree stump, which would catch the commeal like a bowl.
Artifacts Made from Animal Materials

Deer Antlers and Picture – Native Americans used deer antlers saved from animals they killed for food and clothing. Because male deer shed their antlers each winter and grow a new set in the spring, antlers could also be found in the woods of this region. (Searching for antlers is called “shed hunting.”) Antlers made strong tools and weapons for uses such as hoeing the garden, lifting hot coals or cooking pots from the fire and hanging items in the wigwam or around the homestead. They made good knives and handles for tools or weapons and might have been used in children’s ring toss type games – let your imagination run wild. The photo of the deer shows its rack of antlers and its white tail – a warning flag that is raised when the animal is startled or alerted to danger. Note: It is not true that the number of points on a buck’s rack of antlers indicates his age. With the exception of Bambi, deer usually live only a few years; a large rack indicates a healthy, well-fed animal.

Moccasins – These moccasins are probably cow, elk or buffalo, made from a winter hide, which is thicker. Eastern Woodlands people wore soft-soled moccasins like these for walking quietly on ground covered with leaves and needles.

Fur Squares – Native Americans trapped various animals for their furs as well as their meat. The bushy, light brown pelt is beaver fur, which was valuable for its thickness and water resistance. The thinner, gray-brown pelt is squirrel, the larger white one is rabbit and the black one with a little white patch is skunk. A careful shot completely through the brain was necessary to kill a skunk without triggering its defensive (and offensive) odor.

Deer Bone Knife – This knife is carved from the long bone of a deer; the handle is decorated with engraved bands. Its sharp point would have been used more for stabbing than for cutting. A Native American man would wear a knife with a bone, stone or iron blade in a sheath around his neck or at his waist for defense. Women wore such knives hanging from their waists.

Porcupine Quill Ornament/Wrapped Rawhide Wheel – Porcupine Quillwork is perhaps the oldest form of Native American embroidery, and was a widespread form of decoration for peoples living within the natural range of the porcupine. The quills have a hard outer shell and a hollow center so they are pliable enough to be wrapped or sewn into craftwork. They are folded, twisted, wrapped, plaited and sewn using a wide range of techniques to embellish articles of clothing, bags, knife-sheaths, jewelry, baskets, and wooden handles and pipe stems.

This ornament would be used to decorate clothing. It is made of a rawhide wheel, wrapped with porcupine quills. Naturally white, these have been dyed in the colors representing the four points of the compass. (See face painting in Appendix for details.)

Artifacts Made Of Plant Materials

Blankets – Native Americans from the Southwest made the colorful blankets used around the homestead. The Woodland tribes used animal pelts and hides rather than blankets for bedding, covering of wigwams, etc. They also made grass mats and stuffed them with corn silk, cornhusks and feathers as mattresses and coverings.
**Basket of Dried Corn** – Baskets like this one are made of willow, honeysuckle or vining plants. It contains dried corn, one of the staples of the Woodland peoples’ diet. To prepare corn for storage, the husks were folded back and braided into long ropes; these ropes of corn would then be hung to dry.

**Twined Cornhusk Basket/Bottle** – A twined cornhusk bottle like this was made and used by many eastern Woodland Native Americans, including the Iroquois. Such a bottle, measuring 3.5 inches was watertight and often used to store salt or medicinal herbs. It would be made watertight with a corncob used for a stopper. The Iroquois word for this artifact is “gus-ha-da” which translates into English as “bottle.” Mats, ceremonial masks, shoes and baskets were also woven from cornhusks. Other uses of cornhusks include stuffing for mattresses, tinder for the fire, cordage and wrappers for cooking food.

**Basket Tray** – This tray is made of woven vines and twigs, collected in the spring when the sap would have made them pliable and easier to bend and shape.

**Locust Thorn** – Another multi-use item from nature as the head of a spear for fishing, a toothpick, a needle, etc.

**Round Colored Basket** – This basket is made of woven grasses and cattails. Dyes would have come from powdered charcoal, berries, root plants such as carrots or beets, and among tribes of the Southwest, powdered colored rock mixed with water.

**Gourd Water Jug** – A hollowed out gourd with a corncob cork makes a light, sturdy water carrier in its buckskin carrying straps. Bees’ wax is used on the outside as a sealant.

**Gourd Rattles** – These are self-explanatory; the discoloration is mold, a natural change occurring as the gourd ages. It could be removed by scraping with sandstone and kept clear with a coat of bees’ wax.

**Birch Bark Basket** – Birch trees are more common in northern Ohio and so birch bark as a natural material may be unfamiliar to many children. This basket is tied together with vines. Birch bark was also used to make canoes, arrow quivers and drinking cups.

**Wood Bowl** – This bowl started as a block of wood, shaped and hollowed by repeated burning with hot coals and scraping away of ash and loose wood fiber.

**Square Twig Basket** – This is a simply constructed item, using the Lincoln Log principle and tied together with vines. The rope inside was made from local jute following this process: fiber is stripped from the inner bark of the plant; the strips are pounded with rocks to break down the fibers; pounded fibers are twisted to a desired thickness; finally, the strands are braided into a sturdy rope.
Native American Games

Learning about Native American games is an especially good way for today’s students to relate their lives to those of Native American children. Interspersing games with the more sedentary parts of the program also helps maintain the students’ interest and provides a chance for physical activity. The following games are suggested for use in the Native American programs. While there may not be evidence that all of these games were played by children of the Eastern Woodlands tribes, the games they did play probably had some common elements, as do the games played by today’s children. The choice of games for an individual program depends on the age and abilities of the students as well as the focus of the program and the time available. Often, students will want to play a game longer than the time allotted, especially if everyone has not had a turn. Suggesting that they try the game when they return to school can help ease the situation.

Introduction: Point out that Native American children played games just like children of today. Ask what games students like to play. (Limit this to 3 or 4 answers – try to elicit a variety of responses including physical and mental games.) Choose one or two of their answers and ask what they learn from the game? What skills the game develops? (e.g. soccer teaches speed, teamwork, ball control, aiming at a goal.) Native American children learned how to hunt, how to move quietly in the woods and other skills from their games – as games are introduced, teacher can point out skills developed.

Starting Games: Native Americans tended to use more hand signals than spoken language, especially when they attended gatherings of different tribes with different languages. To start games, introduce this non-verbal signal: starter stands with left arm straight out in front and right arm straight up above head making fists with both hands; game players watch as starter lowers right arm; when right fist rests on top of left, game begins. Use this with games like “Steal the Skin,” “Baton Relay,” “Snakemaster,” and “Rabbit Sticks.” If a game is difficult for a child with special needs, she/he can often participate as the starter.
Variations: Preschoolers may not be comfortable being blindfolded so it is best to invite a teacher or other adult to take that part and allow the children to take turns fox walking. With older students, you can allow the person in the middle to remain there as long as s/he catches the fox walker before that person can steal a stick. When someone successfully gets the stick, s/he takes the place in the middle. If, on the other hand, you want everyone to get a turn in the middle, then you allow the fox walker to take the place in the middle whether or not s/he successfully got a stick. With a large group, you can put two people in the middle, back to back, have 6 or 8 sticks and choose two fox walkers. This gives more people a chance to participate more quickly but can be noisier and more confusing.

**Buckeye Toss**
(grades 1 through 8)

This is a game about concentrating, reacting quickly and not flinching.

**Materials:** Two cloth bags containing acorns or buckeyes

**Directions:** Students form a large circle. Teacher, as chief, stands in center and gently tosses the cloth bag to one student. Student gently tosses it back. (Before tossing, stress that this game is about gently returning the bag; it is not a speed pitching contest. Also demonstrate a “ready” position – arms at sides, eyes on the chief.) Chief continues around the circle, tossing bag and having it returned. Occasionally, chief pretends to throw but does not do so. Students are to stand still until bag is actually in the air; if they reach for the bag when it is not thrown, that is a “flinch.” After one practice round for students to get the feel of catching, throwing and not flinching, the game actually begins. If a student fails to catch the bag or flinches, s/he steps out of the circle. Play continues until one student is left. If s/he successfully takes three throws without flinching, s/he joins the chief in the circle and they both toss pouches to the other players. (Note: In keeping with Native American tradition of respect for, the chief may be joined by someone else but is never replaced.)

**Variations:** The rules can be interpreted strictly with older students; enlisting the aid of chaperones or those who are “out” in determining flinches can be helpful. With younger students and/or those with special needs, chief can be more lenient about failure to catch bag. Joking about a flinch rather than making a child step out of the circle also works. Students enjoy watching adults play the game as well. With a larger group, starting with two chiefs and two bags keeps the game moving and allows more participation.

**Snakemaster**
(Grades 1 through 8)

This game teaches hand and finger coordination and concentration.

**Materials:** Two-foot long “snakes” made of strips of cloth.

**Directions:** Each student gets a “snake” which s/he unrolls and holds by one end. Student holds arm out straight and tries to gather the whole “snake” up into his or her fist using just the thumb and first two fingers. Wrist should not move and each student should concentrate just on
his or her "snake." After a practice round, have all students start gathering "snakes" up at the signal. As each one finishes, s/he raises his or her arm and yells, "Snakemaster!"

**Variations:** With younger students, this is pretty informal. With older students, you can get more technical, deducting points for moving wrists, looking away from your own "snake," not having every bit of material tucked into your fist. However, that can open a real can of worms as students claim some people started early, had theirs partially rolled up, etc.

### Rabbit Sticks

**(Grade 3 and up)**

This is a more advanced game of aiming and throwing.

**Materials:** Plastic tub for a target, rabbit sticks about 1 ½ foot long and 1 ½ to 2 inches in diameter, a carpet square for each pile of rabbit sticks.

**Directions:** Basically, students try to hit the target with the rabbit sticks, which sounds simple enough. The challenge in this game is for everyone to take a turn without anyone getting concussed in the head. Organization, clear ground rules and vigilance are critical. Tub is placed open side down at one end of field. Students line up behind carpet squares with a pile of rabbit sticks on them, four in each pile. Demonstrate proper throwing technique as follows. First, extend non-throwing arm straight in front of you toward the target with palm facing inward – this is the aiming arm and serves as a guide for aiming accurately. Demonstrate options of throwing both overhand and sideward.

Before students start throwing, have those who are not throwing take 4 or 5 big steps back from those who are throwing. Tell students not to start throwing until you give the hand signal. When they finish throwing, they are to wait until they hear from you that everyone is done throwing. Then they retrieve the sticks. As an additional skill test, have them watch where their sticks land, reminding them how hard it would be for a Native American to replace a flint knapped arrowhead or spear which was lost. (Providing each player with a different colored set of rabbit sticks would support this variation.) If there are enough chaperones, have one adult keep an eye on each line, making sure that those waiting their turns don’t get too close to the throwers.

**Variations:** Older students may enjoy keeping track of their hits and misses, calculating percentages and weighing chances of survival.

### Caught Ya!

**(Grades 3 and up)**

This game develops intuition and concentration.

**Materials:** 1 to 3 wooden beads depending on size of group

**Directions:** All students stand in a circle with one student in the middle. Students are given beads. At a given signal, students begin passing or pretending to pass beads behind their backs while the person in the center watches. When the game stops, everyone puts his or her hands in front while the person in the center guesses/senses who has the beads.
Bones
(Grades 3 and up)
This game teaches group decision-making, concentration and intuition. Native people, including the Miami tribe of this area, used this game rather than waging war to settle conflicts between tribe. The most intuitive members of each tribe would be selected as representatives in the competition.

Materials: 2 sets of 10 counters (acorns, stones, etc. may be used), one bundle of sticks or "bones," with one marked stick
Directions: Divide group into two tribes, each with a chief. One tribe takes the bones and passes them behind their backs while chanting. When the chanting stops, the other tribe votes on who has the marked stick. Regardless of the vote, that tribe's chief gets the final choice as to who has the marked stick. If s/he chooses correctly, his or her tribe gets a counter from the other tribe and gets to take the bones. If s/he chooses wrong, his or her tribe gives up a counter and the other tribe keeps the bones for the next round. Play continues for a set amount of time or a specified number of rounds.

Baton Relay
(All ages)
This game teaches teamwork and running speed, a highly valued skill.

Materials: 3 or 4 batons (talking sticks may be used) depending upon size of group and number of teams.
Directions: Divide into 3 or 4 equal teams. Lay out a relay course such that, as one member of the team completes his or her leg of the course, s/he passes the baton to the next team member. The team that completes the course first and still has the baton wins the race. The length and complexity of the course should be determined by the age of the students unless you want a preschoolers' race to turn into the Tour de France.

Steal the Skin
(Grades 3 and up)
This game teaches speed and strategy.

Materials: 4 rectangular pieces of cloth, about the size of a dish cloth
Directions: The entire group forms a circle to set boundaries for the game. Two children start off in the center, facing each other. Have them raise their dominant hand, the one they write with, and clasp other hands. Each child has a fabric "skin" in his or her back pocket or waist of pants (make sure "skin" is on the opposite side of opponent's free hand). At the start signal, each child tries to get the other one's "skin" while still holding hands. The one who finally steals the skin is the winner and plays the next person in the circle. (Note: Just the end of the "skin" should be tucked in the pants with most of it trailing behind. Students may need to remove long coats, tuck up long shirts, etc. so the skin is clearly visible.)
Variations: With a larger group two pairs of players can compete at once within the circle. As above, they play the next players on around the circle until everyone has had a chance. The final two winners have a play off to determine a grand champion for their clan.

Moccasin Game
(PreK through grade 2)
This game teaches intuition.

Materials: 2 or 3 moccasins, 1 bean.
Directions: One player puts bean in one of the moccasins; second player has to guess where bean is hidden.
Variations: To make this more of a teamwork game and include more players, like Caught Ya or Bones, group could divide into 2 teams. Team could vote on which moccasin to pick. If they guess correctly, they get to hide the bean.

Lima Bean Toss
(PreK through grade 2)
This is mostly a game of luck comparable to today's casino games. Native Americans often played for valuable items like skins or furs and tools or weapons.

Materials: Enough cloth pouches for each child, 5 lima beans in each pouch, a colored marking on one side of each bean, a pile of sticks as counters.
Directions: Each child shakes the beans in the pouch and dumps them on the ground. If all 5 beans come out plain side up or colored side up, child takes 2 counter sticks. If 4 of the 5 beans match, child takes 1 stick. After several rounds, compare who has the most counters.
**Extra/New Games**

**Dark Walk**
(all ages)
This is a game to practice developing an "instinctive sense of direction." Native Americans would often need to be able to find their way at night without the use of lights or torches. This game shows children how hard it is to walk in a straight line without being able to see where they are going.

**Materials:** Blindfolds.
**Directions:** Begin by lining children up single file. The naturalist should stand 30-40 feet away from the front of the line. The first child in line is allowed to directly face the naturalist before putting on a blindfold. The naturalist then says walk and the blindfolded child attempts to walk in a straight line toward the naturalist. The child stops and removes the blindfold when he/she either reaches the naturalist or gets as close as he/she thinks is possible. It is important to remind the children to walk slowly and carefully. This game should be played in an area that is free of roots and stones that could be a tripping hazard. With larger groups, more than one blindfolded child can walk at a time to speed up the process.

**Rattler!**
(grades 1 and up)
This is a variation on the game Bat and Moth that fits in with the Native American theme. This game stresses the importance of being aware of one's surroundings and potential dangers. Rattlesnakes were something that many Native American tribes had to learn to avoid. This game involves outwitting and capturing a rattlesnake.

**Materials:** Blindfold, noisemakers (preferably something that simulates a snake's rattle).
**Directions:** Organize the children in a circle about 20-30 feet in diameter. Two players stand inside the circle, one blindfolded and the other holding a noisemaker. The blindfolded child is the hunter and the child with the noisemaker is the rattlesnake. The rattlesnake's job is to silently count to 10 repeatedly, shaking the "rattle" every 10 seconds. The hunter's job is to listen carefully for the sounds and try to catch (tag) the snake. The snake can move in between rattles but must do so silently so as not to give away its/her position. It is important that the snake not be allowed to move too quickly or the hunter's job will become very difficult. Once the snake is captured, two new players are chosen. Adjusting the size of the circle can make this game easier or harder.

**Pine Cone Hoop Toss**
(all ages)
Almost every Native American tribe developed some type of game using various sorts of pinecones. This game is a test of both accuracy and arm strength.

**Materials:** Wooden hoop (1-2 feet in diameter), pinecones.
**Directions:** Line up the children and place the hoop on the ground about 10 feet away. Give each child several pinecones. Each child stands 10 feet away from the hoop and tries to toss their pinecones into the hoop using an underhand form. One point is given for a cone that lands inside the hoop and then bounces out. Three points are given for a cone that lands and stops inside the hoop. Increasing the distance from the hoop makes this game harder for older groups.
There and Back
(grades 3 and up)
This is a fun race that is meant to emphasize teamwork and cooperation.

Materials: 8 strips of cloth (3-4 feet in length).
Directions: Mark two lines about 20-30 feet apart. Organize children into pairs. One player gets on their hands and knees with their fingertips resting on the first line. The second partner also gets down on hands and knees behind the first player but facing the opposite direction. Have the parents tie one ankle of each partner together using a strip of cloth. When the naturalist yells “Go!” each pair races towards the second line (one partner will be facing this line while the other partner moves backwards). Each pair must coordinate their movements in order to advance as fast as possible. After reaching the finish line, the naturalist will lead a quick discussion on teamwork and strategy. The pairs will then race back to the original line with each partner facing the opposite direction from their first attempt. Tying both ankles together significantly increases the difficulty of this race.

Native American Relay Race
(all ages)
This is a goofy activity meant to kill an extra few minutes or occupy especially active children. It reinforces the need for young Native Americans to learn about the natural world that surrounds them.

Materials: None.
Directions: This is just a simple relay race that can involve as few or as many different rounds as the need may call for. Possibilities for different rounds include hop like a frog, shuffle like a bear, prance like a deer, fly like a bird, and run like a Shawnee. The frog hop requires players to grip their legs just above the ankles and hop forward. The bear shuffle requires players to walk on their hands and feet while moving the left hand and right foot together and the right hand and left foot together. Players can also swing their heads from side to side to further imitate a bear. Prancing like a deer requires players to skip/jump just as a deer would run through the trees. Flying like a bird simply requires players to flap their arms like wings as they run. Finally, running like a Shawnee is no different than running like any other child. The naturalist may want to choose the winner based on accuracy of the imitations rather than pure speed. This would reward Native American children for their knowledge of nature and animals.
Native American Hike Reference

This reference indicates some natural features to be pointed out during Native American program hikes. Instructors should be able to correctly identify the plants mentioned. (Note: The woods in this area were much thicker 200 to 300 years ago because the forests were older and had not been clear cut for lumber and farmland. It is said that the forests were so dense that a person could sometimes walk for days without seeing the sky and that a squirrel could go from one end of Ohio to the other without ever touching the ground.)

Path past grandfather oak and loop below amphitheater
Grandfather oak (200-300 year old chinkapin oak – NA tribes ate ground acorns); rocks along path for tools and to contain fire ring; brush pile in loop below amphitheater housing rabbits and other small mammals; wild roses in lower loop (thorny vegetation as garden fencing); pokeweed along concrete path between amphitheater and lower loop (berries and stems for dyeing, edible leaves)

Amphitheater
Deer runs and tracks, tall grasses for weaving and as fire starters, large old tree at edge housing mammals, insects and birds, prairie grasses and wildflowers as habitat (food and shelter) for mammals and game birds; Queen Anne’s lace (edible root aka wild carrot, a natural nesting place for insects)

Pond and wetland nearby
Pond could house fish, turtles, frogs, beaver, game birds; clay, sand and shells used for making pots; tracks around pond and in wetland mud; cattails for weaving, dried heads as fire starters and as edibles (shoots can be salad, roots can be boiled like potatoes, pollen makes protein-rich flour, young head can be boiled and eaten like corn on the cob)

Path past locust tree and across bridge
Honey locust tree (thorns as fishing spearheads, tooth picks, needles for sewing) and edible sweet pulp inside pods in fall; willow tree (bark as a pain reliever when chewed or boiled into a tea; flexible branches for arrow shafts, woven baskets; twig ends for paintbrushes); brush pile on left on hill down to ravine (Note: NA people would follow a hill like that down to a water source)
Things to watch for everywhere

1. **Food**: Plant edibles like wild strawberries, mushrooms, wild onions, garlic mustard, dandelions (greens and flowers), lemon sorrel for soup (like clover with yellow flower – aka sourweed or wild sorrel), plantain chewed into poultices to stop bleeding, itch and as a natural band aid (large, rounded, dark green leaf which is also a wild edible like salad greens). Animal habitat like hollows in trees (squirrels, raccoons); squirrels’ nests called dreys (pile of leaves up in tree – best seen in fall or early spring); honeysuckle, poison ivy and other berry producers which feed animals. Maple trees produce sap; catalpa tree roots can be pounded into a poultice for wounds or burns

2. **Shelter**: Saplings (in spring or summer, straight, not pitly like honeysuckle); vines, grasses, bark.

3. **Fire**: Sticks of various sizes (tinder, kindling, fuel), pine cones or needles as fire starters, rocks to make fire ring.

4. **Tools/Weapons**: Rocks, sticks, grasses for weaving mats and ropes, spider webs for use with forked sticks as small fish nets, honeysuckle with hollow center as whistle.

**Note**: Some of the Earth Center plants like honeysuckle, garlic mustard, poison ivy and Queen Anne’s lace were not in this country when native peoples lived here. They serve as examples of wild edibles and useful plants.
Insects
Pre K-K version

Learning Objectives:
1. Learn the parts of an insect.
2. Learn the stages of insect metamorphosis.
3. Learn adaptations that insects have for survival.
4. Learn about insect communication.
5. Be able to distinguish insects from other invertebrates.
6. Develop an increased awareness of and respect for insects, their role in the ecosystem and their relationship to human beings.

Logistics:
This lesson is designed for Preschoolers and Kindergarteners. As a 1.5-hour program, this lesson will have the following time schedule:
1. Welcome: (~5 minutes) includes dealing with lunches, brief welcome to the EC, introduction of teachers and division into small groups.
2. Opening: (~5 minutes) in small groups, includes review of EC rules and introduction to the lesson
3. Rotations: (~20 minutes each) – each group starts at a different rotation point, moving in order (ex. if you start at #3, your sequence is 3,4,1,2.) Rotations for this lesson are as follows:
   1. Anatomy (picnic tables)
   2. Communications/ Insect Search (Native American area/pond)
   3. Adaptations (amphitheater)
   4. Metamorphosis (half moon)
Note: It is best to do the Anatomy part before the Insect Search so the students understand what is and what is not an insect. Do not have a group begin with the Insect Search unless there are 4 groups. Stopping to look for insects and/or insect signs can fill time during any rotation as needed.
4. Closing: (~5 minutes): These five minutes will most likely be incorporated into the last rotation since most groups arrive just on time or a bit late.

Opening:
This can be done in a section of the picnic area/field or on the way to the first rotation spot. Instructor reintroduces him/herself to the group and covers the basic EC rules:
- Respect for living things in the environment (ex. no picking, gently replacing lifted rocks, etc.), leaving the EC as they found it (no taking anything home)
- Stay on trails unless invited off; instructor goes first and another adult goes last on hikes
- Walk to avoid slips or trips
- Use of restrooms

Introduction:
Introduce the lesson by focusing the group’s attention on insects using questions such as:
-What do you know about insects?
-Are they small or large?
- Are there lots of insects at the Earth Center or just a few?
-Can you name some? If they name something that is not an insect, explain that you will talk later about how to tell an insect from other creatures.
- Are insects helpful? If they bring up negatives like biting and stinging, ask “Why do the insects do that?” (protection, fear, food). Try to elicit positive answers such as honey making, pollinating, feeding other animals, etc.
-How do you feel about them? If someone mentions that they are afraid of insects, discuss fear. Explain that fear is not a bad thing, and we tend to fear things that we do not understand. Once we begin to understand the things that frighten us, our fear lessens or even disappears. As a teacher, do not bring up being afraid of insects unless a student approaches the subject. If you begin by talking about fearing insects, students who may not even have considered that may wonder if they need to be more cautious. Being positive yet realistic is always the best policy.

**Rotation One: Insect Anatomy** (picnic tables/meadow)

*Materials: Insect poster, Missing parts cards, Pictures for Grasshopper Hop, box of insects and compound eyes, tarp*

**Introduction:**
Start by explaining that to be an insect you have to have certain parts. For this age group it may be helpful to compare insect parts to how people have certain parts that make them a person (head, hands, eyes, ears, etc.) or how a cat has parts that make it a cat (tail, whiskers, claws, etc.). Then use the Insect Poster to go over the parts of an insect and their functions. Involve the students by having them name and count the parts.
Remember, for young students repetition is key! The more you review the parts with them, the more likely they will be able to remember it later.

**Activity: Insect Poster**
Use the insect poster to go over insect anatomy and the functions of each part.

1. Three body parts: Head, thorax, and abdomen
   - Thorax and abdomen will most likely be new words for this age group, so have the children repeat the words a few times with you. They may not quite understand the concept, but they often enjoy learning fun, new words.

2. Six legs
   - This is an important point for this age group because this will be key in helping them to identify what is and what is not an insect during the insect searches.

3. Two antennae
   - Insects have two antennae attached to their head. These are used to feel, smell, and in some insects, to hear.

4. Compound eyes
   - Compound eyes help the insect see color and pattern but not details. Allow the students to look through the compound eyes. Ask them what they see and how
Adaptations Program
Onsite
(1-4)

Learning Objectives
Students will:
1. Learn how animals and plants adapt to different environmental conditions in order to survive.
2. Compare how different animals have various mouthparts for getting food.
3. Learn how some animals avoid predation.
4. Investigate various plant adaptations.
5. Compare and contrast the adaptations of nocturnal and diurnal animals.

Logistics
This program runs 1.5 hours and has the following schedule:
1. Welcome: (5 minutes) includes dealing with lunches, brief welcome to the EC, introduction of teachers and division into small groups. See the description in the general lesson format at the beginning of the manual.
2. Opening: (5 minutes) in small groups, includes review of EC rules and introduction to the lesson.
3. Rotations: (20 minutes each) - each group starts at a different rotation and moves in order through each area
   a. Eating - done in the building and picnic tables
   b. Avoiding Predation - done in the homestead
   c. Hike - starts at the half moon, ends in amphitheater
   d. Nocturnal vs. Diurnal - in the amphitheater
4. Closing: (5 minutes) these five minutes will most likely be incorporated into the last rotation since most groups arrive just on time or a bit late.

Opening
This can be done in a section of the picnic area/field or on the way to the first rotation spot. Instructor reintroduces him/herself to the group and covers the basic EC rules:
- Respect for living things in the environment (ex. no picking, gently replacing lifted rocks, etc.), leaving the EC as they found it (no taking anything home).
- Stay on trails unless invited off; instructor goes first and another adult goes last on hikes.
- Walk to avoid slips or trips.
- Use of restrooms.

Rotation One
Eating
Ideal Location: Building/Picnic Tables
Alternative Locations:
Materials: Skulls, teeth, material for Fill the Bill

Introduction: All animals have to get food in order to survive, but all animals do not eat the same thing. Some animals eat only plants (herbivores: rabbits, deer). Some eat only
Plants
Onsite
(1st-2nd)

Learning Objectives
Students will:
1. Learn the parts of a plant and their functions.
2. Learn about basic photosynthesis.
3. Learn about the lifecycle of plants.
4. Learn why plants are important.
5. Develop an increased awareness of and respect for plants as living organisms, their role in the ecosystem, and their relationship to human beings.

Logistics
This program lasts about 1.5 hours and has the following schedule:
1. **Welcome:** (5 minutes) includes dealing with lunches, brief welcome to the EC, introduction of teachers and division into small groups. See the description in the general lesson format at the beginning of the manual.
2. **Opening:** (5 minutes) in small groups, includes review of EC rules and introduction to the lesson.
3. **Rotations:** (20 minutes each) each group starts at a different rotation point, moving in order (ex. if you start at c, your sequence is c,d,a,b) Rotations for this lesson are as follows -
   a. Anatomy (Native American area)
   b. Lifecycle (picnic tables/meadow)
   c. Photosynthesis (amphitheater)
   d. Hike
4. **Closing:** (5 minutes) these five minutes will most likely be incorporated into the last rotation since most groups arrive just on time or a bit late.

Opening
This can be done in a section of the picnic area/field or on the way to the first rotation spot. Instructor reintroduces him/herself to the group and covers the basic EC rules:
- Respect for living things in the environment (ex. no picking, gently replacing lifted rocks, etc.), leaving the EC as they found it (no taking anything home).
- Stay on trails unless invited off; instructor goes first and another adult goes last on hikes.
- Walk to avoid slips or trips.
- Use of restrooms.

Introduce the lesson by focusing the group’s attention on plants using questions such as:

Rotation One
Anatomy
Ideal Location:
Alternative Locations:
Materials:
Seasons Series: Fall

Onsite
(1st-2nd)

Learning Objectives
Students will:
1. Experience the four seasons.
2. Learn what causes the four seasons.
3. Observe the characteristics of each season.
4. Record seasonal differences in journals.
5. Understand how fall affects plants.
6. Understand how fall affects animals.

Logistics
This program lasts 1.5 hours and will have the following schedule:
1. Welcome: (5 minutes) includes dealing with lunches, brief welcome to the EC, introduction of teachers and division into small groups. See the description in the general lesson format at the beginning of the manual.
2. Opening: (5 minutes) in small groups, includes review of EC rules and introduction to the lesson.
3. Rotations: (20 minutes each) each group starts at a different rotation point, moving in order (ex. if you start at c, your sequence is c,d,a,b) Rotations for this lesson are as follows -
   a. How Seasons Happen (picnic tables/meadow)
   b. Animals in the Fall (amphitheater)
   c. Plants in the Fall (inside building)
   d. Hike with journals (stop at pond and upper ridge trail)
4. Closing (5 minutes) these five minutes will most likely be incorporated into the last rotation since most groups arrive just on time or a bit late.

Opening
This can be done in a section of the picnic area/field or on the way to the first rotation spot. Instructor reintroduces him/herself to the group and covers the basic EC rules:
- Respect for living things in the environment (ex. no picking, gently replacing lifted rocks, etc.), leaving the EC as they found it (no taking anything home).
- Stay on trails unless invited off, instructor goes first and another adult goes last on hikes.
- Walk to avoid slips or trips.
- Use of restrooms.

Introduce the lesson by focusing the group's attention on autumn using questions such as

Rotation One
How Seasons Happen
Ideal Location: Picnic tables/Meadow
Alternative Locations:
Materials: Sun label, globe, rope path
Sensory Awareness
Onsite
(PreK-1)

Learning Objectives
Students will:
1. Understand the wonders of the sensory organs.
2. Develop keener awareness of the senses: sight, hearing, touch, smell, and taste.
3. Become more aware of natural surroundings through the use of these senses.
4. Use the above awareness to improve ability to listen to and follow directions, visualize and respond to non-verbal communication, and use critical thinking.

Logistics
This program lasts about 1.5 hours and has the following schedule:
1. Opening (5 minutes)
2. Sight (15 minutes) – to include some but not all of the following.
   a. Sharp Eyes Warm Up
   b. Identifying Shapes
   c. Identifying Shapes in Nature
   d. Identifying Colors in Nature
   e. Visual Memory Game
   f. Micro-Hike
3. Hearing (15 minutes) – to include some but not all of the following
   a. Bird Calls
   b. Bird Symphony
   c. Poem
   d. Sound Mapping
   e. Fox Walk
4. Smell (15 minutes) – choose from the following activities.
   a. Dog Nose
   b. Sharp Smeller
   c. Earth Stew
5. Touch (15 minutes) – choose from the following activities.
   a. Touchy Feely Box
   b. Touch Sock
   c. Meet an Acorn
   d. Adopt a Tree
6. Taste (15 minutes) – to include any of the following.
   a. Taste Test
   b. Maple Syrup Taste
   c. Magic Bag
   d. Bee Dance
7. Closing (5 minutes)
Appendix D: Emergency Action Plan Minor Injuries

Emergency Action Plan
Minor Injuries (Scrapes, Cuts, Bloody Nose)

Stop, Think, Act

1. ALWAYS Carry First Aid Kit
   - When pulling together materials in the morning a first aide kit should be include in every basket used for activities.
   - A radio should also be included.

2. Identify Teacher/Assistant with Emergency Medical Forms
   - Medical Forms are to stay with the identified teacher.

3. Clean Area
   - Maintain your safety first. Wear protective layer (non-laytex) gloves) before contact with affected area.
     1. Clean the area with alcohol prep pad.
     2. Apply Neosporin if so desired.
     3. Cover the affected area with band-aid.
   - For bloody nose walk child back to building. Pinch soft parts of the nose together and towards the face for 5 minutes. Keep head higher than level of the heart and apply ice. Apply tissue/toilet paper to area if bleeding continues.
   - If child falls and it is believed area will become swollen apply ice pack (bag) to affected area as soon as possible.
Appendix D: Emergency Action Plan Major Injuries

**Emergency Action Plan**
Major Injuries (bee stings with allergic reactions, sprained/broken ankles)

**Stop, Think, Act**

1. **ALWAYS Carry First Aid Kit**
   - When pulling together materials in the morning a first aide kit should be included in every basket used for activities.
   - A radio should also be included.

2. **Identify Teacher/Assistant with Emergency Medical Forms**
   - Medical Forms are to stay with teacher that has been identified.

3. **Contact One Other Member of Imago Naturalist Staff** *(if extreme injury skip to step 4)*
   - It is preferable to make contact with naturalist leading group that includes teacher previously identified.
   - Maintain your safety first. Wear protective layer (non-lytex gloves) before contact with affected area.
   - Treat child according to information in medical form.
   - Determine if child should seek further medical care from a professional.

3. **Contact Emergency Medical Services**

   **Hospital:**
   Mercy Hospital Western Hills
   3131 Queen City Avenue
   Cincinnati, OH 45238
   513-389-5000

   **Dentist:**
   Dr. Lawrence W. Hagen II
   4998 Glenway Ave.
   Cincinnati, OH 45238
   513-251-5500

   **Our Information:**
   Imago
   700 Enright Ave.
   Cincinnati, OH 45205
   513-921-5124
4. Maintain Calm Among Other Children

- Use adults in group to keep other children calm and under control.

5. Incident Report Forms

- Incident Report Forms are located in the Confirmation Packet Forms/Evaluations Folder next to the fax machine in the office.
- A report should be filled out for EVERY major injury at Imago and given to teacher/assistant previously identified.
Appendix E: Carpet Tile Donation Letter

Rhiannon Hoeweler
Imago Earth Center
700 Enright Ave.
Cincinnati, OH 45205
513-205-5048
email: rhoeweler@imagoearth.org
www.imagoearth.org

To Whom It May Concern:

I am writing on behalf of Imago Earth Center, a 16-acre non-profit nature center located in upper Price Hill. We provide, among many other services, environmental education to children throughout the tri-state from kindergarten through eighth grade. Our programs provide environmental education to 10,000 people each year.

Currently, we are in the beginning phases of making our office building more energy efficient. We are then hoping to educate the public about our efforts and highlight not only the energy and cost savings, but also, the health benefits. Ultimately our goal is to encourage people to incorporate similar products and changes into their own homes/surroundings.

Through research we have concluded carpet tiles are the best option for floor covering in our office space. They will provide our building with some much needed energy conservation and sound absorption. They will save our office money on costly replacements as they are interchangeable, provide for fast installation, and allow for unlimited under floor access. The keystone portion of installing carpet tiles would be saving 924 sq. ft. of tiles that might otherwise end up in a landfill.

I am asking your company to donate any carpet tile overruns, second closeouts, leftovers, or discontinued colors to help our nature center begin the process of becoming an example to the community. We are looking for carpet tiles to cover a 924 sq. ft. area keeping in mind that we are a nature center with lots of little muddy feet circulating through our doors.

Imago is a registered 501c(3) organization and as such your organization may be entitled to certain tax benefits for your donation. Thank you for your time and consideration of this letter.

Sincerely,

Rhiannon Hoeweler