Classroom Study Guide

Return Flight

RESTORING THE BALD EAGLE TO THE CHANNEL ISLANDS

Grades 6-12 with Community College Extensions

Return Flight Reviews

"Selected as Editor's Choice! Highly Recommended. This is a wonderful story of the very best in wildlife biology technique with an excellent script and exquisite video footage. A most interesting success story about how to rebalance an environment that was the victim of a severe environmental insult."

–Science Books and Films (American Association for the Advancement of Science)

"**Highly Recommended.** An inspiring documentary film about the heroic efforts of wildlife biologists to reintroduce America's national symbol of the wilderness to its historic nesting grounds. Return Flight is a welcome, instructive, and genuinely positive contribution to the often discouraging news about America's wilderness and wildlife."

-Educational Media Reviews Online

"The story of the efforts and ultimate success of the eagle reproduction project is quite informative and heart-warming."

-Brent Plater, San Francisco State University Environmental Studies Program

"A testament to the very real possibilities of righting past human errors. Kevin White's film chronicles how years of determination and passion by a small group of dedicated individuals have created positive environmental change."

-Valerie Landes, Executive Producer, Natural Heroes/Public Broadcasting Service

"Director White is able to take a story 20 years in the making and turn it into a narrative sure to inspire the next generation of biologists to take on epic projects of their own. And above all, he shows eagles in flight, making for a film that soars."

-Malibu Times

"One of the more popular films on our 2012 tour. Audiences really respond to the compelling positive story."

-Wild & Scenic Film Festival

Email **msrp@noaa.gov** to receive a free DVD copy of *Return Flight: Restoring the Bald Eagle to the Channel Islands* which accompanies this Classroom Study Guide.

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Introduction and Overview

About the Classroom Guide

This **Return Flight Classroom Guide** was developed for Middle School, High School, and Community College teachers to facilitate discussions and further investigation in their classrooms relating to the topics introduced by the PBS documentary, *Return Flight: Restoring the Bald Eagle to the Channel Islands*. The lesson plans contained in this guide emphasize topics that are relevant throughout the film and that are applicable to the pressing environmental issues of today's society. All of the lesson plans begin with a discussion about a specific topic and then follow with a hands-on activity or a call to action for students.

About the Film

The Bald Eagle was once an important avian predator in the Channel Islands, a group of islands just off the coast of Southern California. In the early 1960's, the Bald Eagle disappeared from the islands due to egg collecting, hunting, and extensive DDT contamination in the marine environment. *Return Flight* chronicles how wildlife biologist, Dave Garcelon, and his dedicated team of biologists worked tirelessly for decades to bring the Bald Eagle back to the Channel Islands in the face of pervasive DDT contamination.

The film also provides some history on DDT, a pesticide developed in WWII that was extensively used by consumers and agriculture – but not without serious consequences. Prior to the 1972 Congressional DDT ban, there were only 407 breeding pairs of Bald Eagles left in the continental United States - and none in southern California. Ultimately, the recovery of the Bald Eagle on the Channel Islands mirrors its larger recovery in the continental United States. What emerges is a positive story of how innovation and dedication can triumph in the face of one of the most pervasive environmental challenges of our time.

Filmed over the span of several years, the documentary was made by award-winning filmmaker Kevin White, and narrated by Peter Coyote.

About the Filmmaker

Kevin White has worked in media since 1980. He started Full Frame Productions in 1984, and co-founded the non-profit Filmmakers Collaborative SF in 1988. Kevin has produced dozens of award-winning films and several series. His work includes *Not All Parents Are Straight*, which screened at the Berlin Film Festival, won the Golden Gate Award at the San Francisco Film Festival, and aired nationally on PBS. He was co-director/cameraman for *We Bring a Quilt*, narrated by Robert Wagner, which aired on PBS and Bravo and was nominated for A Champion in Education national award. He was Co-Producer for *The Women Next Door*, which was in the Berlin Film Festival and aired nationally on the PBS documentary series POV, receiving many awards.

Since 2001, Kevin has focused on producing environmentally themed films, including *Restoring Balance*, *Returning Home* and the Emmy nominated, *A Simple Question*, produced with his colleague David Donnenfield for their *How On Earth* series. Many of these films have been broadcast on the PBS series *Natural Heroes*, and have received multiple festival invitations and awards.

In 2010, Kevin and David received the Harold Gilliam Award for Environmental Reporting from The Bay Institute for their work on the *How On Earth* project.

Lesson Plan #1

Historical Impacts of DDT

Common Core State Standards

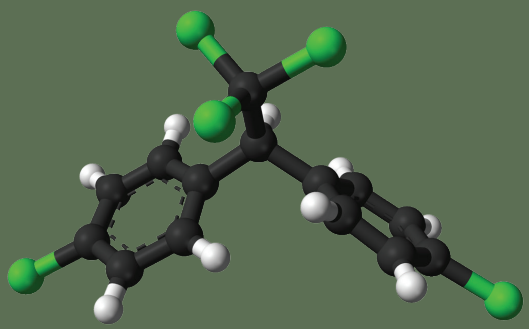
Grades 6-12

RL.7
W.1, W.2, W.7, W.8
SL.1, SL.2, SL.4
RH.2, RH.3, RH.7, RH.10
WHST.2, WHST.4, WHST.6, WHST.7, WHST.8

Next Generation Science Standards

HS-LS2-7*
HS-LS4-6*
HS-LS-ETS1-1

*These standards only apply to optional activities.



3-D Model of DDT

Lesson Plan #1-Historical Impacts of DDT

What Students Will Learn

Students will understand the historical impacts of DDT on birds and other wildlife and learn about how scientists first discovered these impacts.

Lesson Background

DDT, once considered a miracle chemical, was used extensively to kill insects in people's homes, on agricultural crops, and in residential neighborhoods. The harmful impacts of DDT to humans and wildlife were not known during its early use and it was considered a safe chemical. Rachel Carson, a marine biologist and conservationist, documented her observations of the impacts of synthetic pesticides, especially DDT, on humans and wildlife in her 1962 book, *Silent Spring*. In this activity, we learn about how actions that we take in society can either harm us or protect us. It is important for us as a society to weigh the positive and negative impacts of our actions and learn from mistakes that were made in the past.

DDT Impacts to Bald Eagles

The Bald Eagle population in 1782, when America adopted the eagle as its national symbol, was estimated at around 100,000 nesting eagles. Prior to the 1940's, Bald Eagles were declining rapidly due to a history of hunting and persecution by collectors and farmers. Congress passed the Bald Eagle Protection Act in 1940 to protect eagles from anyone killing, selling, or possessing the species. The act initially served to protect Bald Eagles, but by 1963 because of DDT use as a pesticide throughout the United States, less than 500 nesting pairs of Bald Eagles remained in the lower 48 states from the original population size. The Bald Eagle was in danger of extinction. The eventual ban of DDT in 1972 was the first step in the road to recovery for the Bald Eagle.

DDT contamination causes eggshell thinning in Bald Eagles (and other birds), and when adult birds incubate their eggs, they could easily break in the nest. Bald Eagles are then not able to successfully reproduce leading to dwindling populations. The chemical DDT quickly breaks down into DDE which is very persistent in the environment. DDE is still found in the environment today, decades after DDT was banned. Scientists are trying to understand the long-term effects of DDE on wildlife and humans.

Following the ban of DDT, the U.S. Fish & Wildlife Service in 1978 listed Bald Eagles as threatened or endangered depending on the location of the population. This helped to accelerate the pace of recovery for Bald Eagles through captive breeding programs, reintroduction efforts, law enforcement, and nest site protection during the breeding season. In 2007, Bald Eagles were removed from the endangered species list but population numbers still remained low on the Channel Islands.

Lesson Plan Tips for Teachers

- **Watch *Return Flight* and take notes on uses, impacts, and facts about DDT that are discussed in the film.**
- **Decide if you would like to have your students read the book *Silent Spring*** by Rachel Carson **or research her to write a short essay about her work.**
- **Have a list of chemicals ready that are currently used or used in the past which are also being phased out or have been banned.**
- **Have a few examples prepared of safer alternatives to toxic chemicals that we use in our everyday lives.**

Contaminants of Emerging Concern
There are a number of chemicals that are being discovered in water that are being classified by the Environmental Protection Agency (EPA) as Contaminants of Emerging Concern (CECs). These chemicals are grouped as polybrominated diphenyl ethers used as flame retardants in the manufacture of a number of products, by-products of pharmaceuticals, waste from personal care products, or perflourinated compounds used in a variety of consumer and industrial products. They are referred to as CECs because the risks to human health and the environment associated with these contaminants are largely unknown.

The presence of these contaminants, how often they are found in the environment, and the main source of these chemicals entering the waterway is currently being studied by the EPA. A recent report (http://water.epa.gov/scitech/cec/upload/Literature-Review-of-Contaminants-in-Livestock-and-Poultry-Manure-and-Implications-for-Water-Quality.pdf) released by the EPA explains efforts that are being made to better understand the impacts of these contaminants and how they could affect human health and the environment. The EPA also identifies information gaps that can help outline research needs in the future.

Materials

- *Return Flight: Restoring the Bald Eagle to the Channel Islands* DVD (23:33 min.)
- Paper and pen or pencil
- Internet
- Copies of *Silent Spring* (optional)

Activities

1. Watch *Return Flight* and have students note any uses, impacts, and facts about DDT which are discussed in the film and specifically relating to the Bald Eagle.

2. Hold a discussion about what the students learned about DDT and impacts to the Bald Eagle.

3. **Optional:** Have students read the book *Silent Spring* by Rachel Carson either in class together or as homework.

4. Have students research Rachel Carson and write a short essay about her contribution to our understanding of the impacts of DDT to humans and wildlife and other synthetic pesticides today.

5. Have students research two or three other chemicals that were used widely until we realized their damaging effects and then banned their use or are in the process of phasing out their use (i.e., PCBs, Chlorofluorocarbons). Make a list of these chemicals as a class and note when they were first introduced and when they were banned (or in the process of being phased out).

6. Have students research a group of CECs and have them create a one page fact sheet about the group of contaminants they chose. The fact sheet will include an introduction to the chemical including when it was first used, current uses of the chemical, what we know about potential impacts to humans and wildlife, and what is currently being done about the contaminant. The students can include graphics and images that illustrate the contaminants on their fact sheets.

7. **Optional:** Have students research safer alternatives for some of the toxic chemicals that are commonly used today. Discuss as a class why the safe alternatives are not commonly used in place of the more toxic ones.

Community College Extensions

1. Have students read the book *Silent Spring* by Rachel Carson and write a reflection paper about the convincing evidence that led to the ban of DDT.

2. Have students research CECs and choose a group of chemicals that are currently being studied. Have them develop a short presentation of the group of chemicals they chose, including history of the chemical, known impacts to humans and wildlife, a summary of the research that has been done so far, and safer alternatives if they exist.

Additonal Resources

U.S. Fish & Wildlife Service-Fact Sheet: Bald Eagle Natural History, Ecology, and History of Recovery
www.fws.gov/midwest/eagle/recovery/biologue.html

About Rachel Carson
www.rachelcarson.org

Rachel Carson Homestead
www.rachel_carson_homestead.myupsite.com

United States Environmental Protection Agency-DDT-A Brief History and Status
www.epa.gov/pesticides/factsheets/chemicals/ddt-brief-history-status.htm

Extension Toxicology Network
http://pmep.cce.cornell.edu/profiles/extoxnet/carbaryl-dicrotophos/ddt-ext.html

Lesson Plan # 2

Surviving on the Soup of the Sea: Food Webs and Bioaccumulation*

Common Core State Standards

Grades 6-12
RI.7
SL.2
RH.7

Next Generation Science Standards

MS-LS1-6
MS-LS2-2, MS-LS2-4
HS-LS2-4, HS-LS2-6
HS-LS4-5

*Courtesy of University of Southern California, Sea Grant Program

David Witting

Kevin White

Lesson Plan #2-Food Webs and Bioaccumulation

What Students Will Learn

Students will be able to understand how contaminants move through a food chain and what factors affect contamination levels in different species. Students will also explore how organisms in a food web are interconnected and what happens to other organisms in the foodweb when changes in the environment alter individual populations.

Lesson Background

There are many different food chains that interact to form complex food webs in the near shore coastal environments. These food webs reflect that predators have a variety of food sources and show how energy is passed from one organism or group of organisms to another. The complexity in food webs helps to ensure survival in nature even if one source becomes scarce. The web may break down when too many sources decrease or disappear. We can also see how contaminants move up the food chain and bioaccumulate to impact top predators.

Energy Transfer in Food Webs

Many food webs begin with photosynthetic producers that get their energy from sunlight. Primary consumers (worms, snails, copepods, fish fry) feed upon producers and/or detritus. They are eaten by secondary consumers that are predators (small fish, crabs, etc.) and the food web continues with predators feeding upon prey until top consumers or top predators are reached. A simple marine food chain might include diatoms that conduct photosynthesis to produce energy. That energy is consumed when the diatom is eaten by a copepod, which is then eaten by fish fry, which in turn is eaten by a small fish, which is then consumed by medium fish, which is finally eaten by a bird. When one organism is consumed, the energy is transferred to the next level. However, with each transfer energy is lost in the process of digestion. Many more organisms are required to support a top predator. When organisms die, microbes play a critical role in decomposition, providing nutrients for plant and algal growth.

Materials

- *Return Flight: Restoring the Bald Eagle to the Channel Islands* DVD (23:33 min.)
- Sample food web (see resource section)
- One card for each organism in the food web (see resource section)
- Ball of yarn

Activities

1. Watch *Return Flight*. Hold a discussion about bioaccumulation and how DDT moved up through the food chain as discussed in the film. Engage students in the discussion by asking them how DDT made it from the bottom of the ocean into Bald Eagles.

Lesson Plan Tips for Teachers

- **Prepare a discussion about bioaccumulation relating to DDT and how it moved through the food chain as described in *Return Flight*.**
- **Read the fact sheet about fish contamination and make notes about how certain fish become contaminated based on the species, feeding behavior, location, diet, and age.**
- **Find organism cards in the back of this guide and copy and print them onto cardstock. Purchase a ball of yarn.**
- **Find the food web in the back of this guide and make a copy of it. Have explanations prepared for different scenarios.**

a. Point out that not all fish and organisms get contaminated because of where they live and feed from such as organisms that live in rocky reef areas (these fish do not feed on organisms living in the sediment where the DDT is now found).
b. Read this fact sheet (http://www.oehha.ca.gov/fish/so_cal/pdf_zip/SoCalFactsheet61809.pdf) with students to understand which fish become more contaminated than others based on species, location, diet, and age.
c. Review the Fish Consumption Advisory Tables on the fact sheet (link above) and have students discuss why certain species are more contaminated than others based on their feeding behaviors, location, and life history.

2. Play Food Web Connectivity Game:
   a. Pass out organism cards to each student. Have students get in a circle and pass a ball of yarn, unwinding the yarn webbing as it moves from prey to predator. If it reaches top predators without reaching all of the students return to decomposers/nutrients and continue until all participants have been connected.
   b. Ask the following questions to students:
      i. What if there is a fisherman that catches all of the small fish, topsmelt, or sardines? (They are no longer a food source for the larger fish so the larger fish will have to leave the area to feed.)
      ii. What happens when the small fish are no longer eating all the plankton? (In addition, the topsmelt and sardines are no longer eating plankton, which can result in an increase in plankton. Excessive plankton can result in a loss of oxygen if they use up the nutrients and then die, dropping to the bottom to decompose.)
      iii. What happens to the number of predators who need food? (They decline.)
   c. Have predators let go of their connection to the yarn to demonstrate the impact.

3. Show sample food web from resources section and ask students to predict what will happen to different organisms in the foodweb during the following scenarios:
   a. A new increase in fishing is allowed and fishermen catch all of the larger fish. (Primary consumers will increase because they are not being preyed upon - their predators are all being fished out.)
   b. The pelicans are injured by an oil spill. (Sardines and anchovies increase in number; detritivores increase as microbes break down birds that have died.)
   c. Rainwater runoff dumps large amounts of "fertilizer" into the ocean causing a plankton bloom. (Tremendous growth increasing the total phytoplankton population; consumers increase as they have more food.)
   d. Toxins that were dumped in the bottom of the harbor seep into the sand. (Detritivores consume them and become contaminated and the consumers that eat the detritivores suffer from bioaccumilation, secondary consumers suffer from biomagnification.)
   e. The area receives a designation as a marine protected area and commercial fishing is no longer allowed. (The size of top consumers increases.)
   f. The harbor is dredged causing tiny sand to cloud the water. (Producers decrease producing food with less sunlight available, so less food available to the entire foodweb.)

Community College Extension

Have students research the comeback of the California Brown Pelican after DDT was banned in the United States. Have students write a report about the history of DDT and how California Brown Pelicans were impacted, their recovery, and how they are impacted today.

Lesson Plan #3

Learning From Experts

Common Core State Standards

Grades 6-12

RL.7
W.8
SL.1, SL.4
WHST.7*, WHST.8*, WHST.9*

*These standards only apply to optional activities.

Lesson Plan #3-Learning From Experts

What Students Will Learn

Students generate questions for experts that appear in *Return Flight* to explore science career opportunities. Students also learn how to apply the scientific process to the central theme of the film.

Lesson Background

The film chronicles efforts to restore Bald Eagles to the Channel Islands off the coast of southern California. Throughout the film, we are introduced to many experts who are involved with either documenting the impacts to Bald Eagles on the Channel Islands or are restoring the eagles. If these experts could be interviewed by the students, what questions would the students ask them? What else would the students want to know about the motivations and challenges involved with this type of work?

Materials

- *Return Flight: Restoring the Bald Eagle to the Channel Islands* DVD (23:33 min.)
- Paper or journal and pen or pencil
- Internet (optional)

Activities

1. Watch *Return Flight* and have students write down names and titles of experts as they are introduced.

2. Return Flight Experts Activity:
    a. Compile a class list of all experts and their titles introduced in the film after watching the video.
    b. Discuss the role of each expert in the film and how they contribute to restoring the Bald Eagles to the Channel Islands.
    c. Break students up into groups of 2-3 and assign them an expert from the compiled list. Have each group of students develop 3-4 questions they would like to ask the experts if they had the opportunity. (Alternative: Have students pick an expert they would like to interview and have them develop questions individually as opposed to working in groups).
    d. Have students/groups share their questions with the class and pick two questions from each group that are key questions.
    e. Consider contacting experts from the film to have them answer the questions or find other experts in your local community who students could interview using similar questions to the ones they developed. You could then review the answers as a class at a later date.
    f. **Optional:** Watch interviews in extras section on the DVD to look for answers to students questions or to generate some additional questions.
    g. **Optional:** Have students research answers to their questions online. Hold a discussion about what students found during their research and if this leads to any further questions.

Lesson Plan Tips for Teachers

- **Watch *Return Flight* and make a list of experts and titles as they are presented in the film.**
- **Make notes on the experts and what roles they play in the film.**
- **Decide if you are going to have students work in groups or individually.**
- **Decide if you want to contact experts from the film to answer student questions or if you want students to research their questions online.**

3. Introducing the Scientific Process Activity:
    a. For research scientists introduced in the film discuss how the scientific process could be applied to their role in restoring the Bald Eagle to the Channel Islands. Have students determine the following:
        i. State a Hypothesis (or several)
        ii. State methodology used by researchers in the film
        iii. Determine data collection necessary to prove or disprove hypothesis(es)
        iv. Determine data analysis(es) used to interpret results
        v. Discuss results presented in film and if these lead to new questions

Community College Extensions

1. Watch interview extras and write a journalism piece about one of the experts from the film such as a mock interview, magazine article, blog story, or web story.

2. Have students select an expert that they would like to pretend to be from the film. Have them research the educational and practical experience that they would need to be successful in their field. Hold a mock career day in class and have students make a 10 minute presentation about their role in the restoration of Bald Eagles and their career path of the expert they selected. Students could dress up as the expert and bring props.

Additonal Resources

Institute for Wildlife Studies
www.iws.org

The Nature Conservancy
www.nature.org

Montrose Settlements Restoration Program
www.montroserestoration.noaa.gov

Channel Islands National Park
www.nps.gov/chis/

National Oceanic & Atmospheric Administration
www.noaa.gov

NOAA's Damage Assessment, Remediation, and Restoration Program
www.darrp.noaa.gov/about/index.html

United States Department of Justice-Environmental & Natural Resources Division
www.justice.gov/enrd/

Santa Barbara Museum of Natural History
www.sbnature.org

Santa Cruz Island Foundation
www.scifoundation.org

The Life and Legacy of Rachel Carson
www.rachelcarson.org

Rachel Carson Homestead
www.rachel_carson_homestead.myupsite.com

Lesson Plan #4

Debating Values and Viewpoints*

Common Core State Standards

Grades 6-12

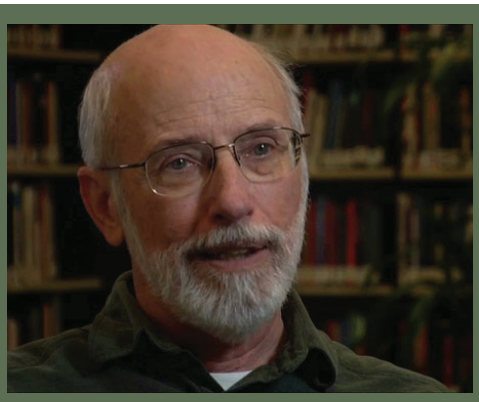
RI.7
W.1, W.2, W.4 W.7, W.8
SL.1
H.7, H.8
WHST.1, WHST.2, WHST.4, WHST.6, WHST.7, WHST.8, WHST.9

Next Generation Science Standards

MS-LS2-1, MS-LS2-2, MS-LS2-4
HS-LS2-7
HS-LS4-6
HS-LS-ETS1-1, HS-ETS1-3

*Adapted from *Journey North* Curriculum

Kevin White



Lesson Plan #4-Debating Values and Viewpoints

What Students Will Learn

Students practice taking different perspectives when debating environmental issues. They then take these perspectives into account when proposing solutions.

Lesson Background

Environmental issues are typically viewed from a variety of perspectives. Our views are often dependent on how things affect us personally. For example, some people believe that cutting trees in the rainforest is having a negative impact on the migration of songbirds and that it should be stopped. Others believe that this is having minimal negative impact and is necessary for the economic development of the country. Students need to develop the tools to examine different perspectives to come up with creative and practical solutions to our environmental problems.

The DDT Debate

As portrayed in *Return Flight*, the pesticide DDT, DDT was used extensively in households and agriculture as a miracle chemical killing unwanted insects before being banned in the U.S. after the discovery of major impacts to humans and wildlife. In other countries like Africa, DDT is still being used today as the first and only line of defense against malaria. It is estimated that nearly half the world's population are at risk of infection by malaria and this disease contributes to one million deaths annually.

DDT has saved millions of lives from malaria since it was introduced more than 60 years ago and continues to protect the most vulnerable populations such as children and pregnant women. However, DDT's effectiveness in killing malaria-carrying insects is a fraction of what it used to be because mosquitoes can quickly build up a resistance to the chemical. The build up of resistence to a chemical is inherent when using pesticides. Also, the resistence that mosquitoes have built up against DDT has increased over time since this chemical doesn't break down very quickly in the environment. Using more DDT in these situations could be even worse because the resistant population could expand. The short-lived effectiveness of DDT in this situation makes it even more important for communities to find alternative methods to control insects.

There are other types of insect control that can be used which are safer for the environment and people. However, many scientists and organizations believe that DDT should still be the main control for malaria. What do you think?

Materials

- *Return Flight: Restoring the Bald Eagle to the Channel Islands* DVD (23:33 min.)
- *Achieving Balance (*http://www.nps.gov/chis/photosmultimedia/achieving-balance.htm)(15:06 min.)
- Paper or journal and pen or pencil
- Internet

Lesson Plan Tips for Teachers

- **Watch *Return Flight* and note any environmental issues that could be debated in addition to the ones listed.**
- **Prepare some example statements that each side could make on the issues listed.**
- **Watch the film *Achieving Balance* (http://www.nps.gov/chis/photosmultimedia/achieving-balance.htm) and decide if you would like to show it to the class.**
- **Research and read more about the DDT debate.**

Activities

1. Watch *Return Flight* and have students write down environmental issues presented in the film that could be approached from different viewpoints. Here are a few examples to get the students thinking about certain issues presented in the film:
    a. ***Ban of DDT***-Should we continue to use harmful pesticides in our society? (See the DDT debate above.)
    b. ***Natural vs. Artificial Incubation***-Should biologists continue to let the Bald Eagle eggs hatch naturally? When should they intervene? (**Optional:** Watch interview with David Garcelon and Peter Sharpe in extras section where they talk about artificial incubation.)
    c. ***Golden Eagles vs. Bald Eagles***-Did the biologists do the right thing by removing the Golden Eagles from the Channel Islands? What indicators are they using to determine if this was the right approach? (**Optional:** Watch interview with Kate Faulkner in extras section where she talks about restoration on Santa Cruz Island.)
    d. ***Watching Bald Eagles on webcams***-Are we doing any harm by watching eagles on webcams? How does it benefit the eagles? How does it benefit the environment? (**Optional:** Watch interview with Tom Dunlap in extras section where he talks about webcams and bringing nature closer to people.)

2. Compile a list of environmental issues that students have identified while watching the film and pick several topics for debate.

3. Once you have the main topics you are going to debate then list at least five statements that someone on each side of the issue might make. Have students mark which ones are "factual" and which ones are "opinion." (Point out which types of statements might be more persuasive facts vs. opinions. Explain that opinions need to be backed up by evidence to make them more persuasive.).

4. Break up students into different positions/roles for the debate and give them a chance to research/discuss and write down the history, opinions, and facts related to the issue and how they will defend their position.

5. Match groups with opposing positions and give them 10 minutes to present their cases. You could also hold a full class debate if there are multiple positions/roles.

6. After each group has presented, allow 5 to 10 minutes for other groups to ask clarifying or challenging questions and for the groups in the "hot seat" to respond.

7. Once each group has presented and defended its case, decide as a class what the best solution is for each issue.

8. **Optional:** Watch the film *Achieving Balance* (http://www.nps.gov/chis/photosmultimedia/achieving-balance.htm) and debate the issue of removing non-native species from island ecosystems.

Community College Extension

1. Have students research both sides of the DDT debate and then have them write an opinion paper about whether they would choose to ban it worldwide or continue to use it in countries afflicted with malaria. They should use facts to back up their reasoning.

2. Have students write a research paper about a topic relating to DDT. They should incorporate recent data and findings.

Additonal Resources

DDT History and Current Use:
United States Environmental Protection Agency-DDT-A Brief History and Status
www.epa.gov/pesticides/factsheets/chemicals/ddt-brief-history-status.htm

Extension Toxicology Network
http://pmep.cce.cornell.edu/profiles/extoxnet/carbaryl-dicrotophos/ddt-ext.html

Pesticide Action Network
www.panna.org

Africa Fighting Malaria
www.fightingmalaria.org

Bald Eagle Resources:
Institute for Wildlife Studies
www.iws.org

American Bald Eagle Information
www.baldeagleinfo.com

Non-Native Species Removal:
Conceptualizing and Evaluating Non-Native Species
www.nature.com/scitable/knowledge/library/conceptualizing-and-evaluating-non-native-species-80060037

Island Conservation
www.islandconservation.org

Lesson Plan #5

What is Ecological Restoration?

Common Core State Standards

Grades 6-12
RI.7
W.8
SL.1, SL.2
RH.7

What Students Will Learn

Students will learn about different types of natural resource and habitat restoration and why they are important for humans and the natural world.

Lesson Background

Ecological restoration activities can include bringing species or habitat back to an area that were once negatively impacted by human activities. Examples of habitat restoration include creating wetlands or removing dams to open up rivers and creeks for spawning salmon. Species restoration involves attracting or placing wildlife back to areas where their population is low or completely gone. Ecological restoration can be successful with a good plan and a dedicated team.

Bald Eagles as Apex Predators

Bald Eagles are referred to as apex predators. This means that Bald Eagles don't have any predators of their own and are at the top of the food chain. The presence of apex predators helps to maintain the health of ecosystems. These predators keep certain prey numbers in check and balanced within the ecosystem. When apex predators are removed from a system, impacts can be seen at many trophic levels.

On the Channel Islands, Bald Eagles were a part of the ecosystem for thousands of years before they disappeared. During their absence an opportunistic predator, the Golden Eagle, moved into the Bald Eagle's old territory. On Santa Cruz Island, Golden Eagles preyed on the Santa Cruz Island fox which is a unique species only found on that island. The foxes were not used to having an aerial predator like the Golden Eagle, so their population began to decline dramatically. Once scientists removed the Golden Eagles and began bringing Bald Eagles back to their old territories on the islands, the fox numbers started increasing. The presence of the Bald Eagle nesting on the islands again appears to be keeping the Golden Eagles from returning, since both birds compete for similar resources. This is an example of how important apex predators are in the functioning of ecosystems.

Restoration on the Channel Islands National Park

The Channel Islands National Park comprises five of the eight Channel Islands off the coast of southern California. The islands were at one time widely impacted by human activities and through the introduction of non-native species. Some of the islands experienced years of sheep and cattle ranching while hunting of marine mammals and Bald Eagles took place on some islands. Marine resources such as abalone and fish were heavily harvested from all islands. Some introduced species on the islands included feral cats, black rats, feral pigs, and non-native plants.

Lesson Plan Tips for Teachers

- **Watch *Return Flight* and note several restoration projects mentioned in the film. Watch *Achieving Balance* (http://www.nps.gov/chis/photosmultimedia/achieving-balance.htm) and note restoration techniques and successes of restoration shown in the film.**
- **Visit the Montrose Settlements Restoration Program (MSRP) and the Damage Assessment Restoration and Remediation websites. Make some notes about all of the restoration projects that MSRP does and make a list of other large settlement cases.**
- **Research restoration projects in your local community and make note of benefits. Also research potential projects that your students could be involved with.**

Lesson Plan #5-What is Ecological Restoration?

Today the Channel Islands are slowly being restored to their natural state. Many of the non-native species have been removed from the islands including a percentage of the plants. Species that have benefitted from the restoration efforts on the Channel Islands include several species of seabirds, Bald Eagles, Peregrine Falcons, island foxes, mice, lizards, and many other native species. The Channel Islands National Park Service manages and protects park cultural and natural resources on the islands for the recreational enjoyment of the public. The Channel Islands National Park averages more than half a million visitors each year.

Materials

- *Return Flight: Restoring the Bald Eagle to the Channel Islands* (23:33 min.)
- *Achieving Balance: Anacapa Island Ten Years After the Removal of the Black Rat* (15:07 min.)
- Paper and pen or pencil

Activities

1. Watch *Return Flight* and make note of several restoration projects that are presented during the film (ie., Bald Eagle and Santa Cruz Island Fox). Have students note the techniques that biologists use to restore these species.

2. Watch *Achieving Balance* and make note of restoration techniques and how restoration has impacted species and the ecosystem of Anacapa Island.

3. Discuss as a class why restoration was necessary for the species in these films and what would have happened if it didn't take place (see "Bald Eagles as Apex Predators" above).

4. Discuss the role of the Montrose Settlements Restoration Program (MSRP, www.montroserestoration.noaa.gov) in helping the Bald Eagle to recover on the Channel Islands. What other restoration projects does MSRP support? Provide some other examples of restoration settlement cases and what they are doing to bring back species and habitat (darrp.noaa.gov/about/index.html).

5. Ask students how scientists know if their restoration efforts are successful. Introduce the idea of monitoring. **Optional:** During January to June observe eagle chicks and adults in their nests (http://www.iws.org/interactive_nestchat_allUstream.html) and submit observations to the Institute for Wildlife Studies (www.iws.org).
   -Discuss natural impacts to species that might interfere with restoration efforts (ie. predation, weather, natural disasters, etc.)

6. Have some examples prepared of restoration projects that recently happened or are in early stages in your local community and present them to the students. Discuss why these projects are important and who benefits from them.

7. **Optional:** Watch the interviews with Kate Faulkner, David Garcelon, and Peter Sharpe in the extras section of the *Return Flight* DVD. Discuss any additional information about restoration techniques and impacts learned from these short interviews.

8. **Optional:** Find a local restoration project that students can take part in either by participating in the classroom or in the field. Have students keep a journal about their experience.

Community College Extension

1. Have students research other major chemical and oil spill cases on the National Oceanic & Atmospheric Administration's Damage Assessment Remediation & Restoration Program website (www.darrp.noaa.gov). Have students create a powerpoint presentation about one of the high profile cases presenting information about case background, injury assessment, restoration activities, and media coverage (if applicable).

2. Watch the "Interview Extra" on the *Return Flight* DVD with Ann Hurley, Biologist & Attorney, U.S. Department of Justice (7:20 min.). Have students research environmental careers in federal agencies and determine what type of training they would need to pursue these careers.

Additonal Resources

Channel Islands National Park Service
www.nps.gov/chis/planyourvisit/index.htm

Montrose Settlements Restoration Program
www.montroserestoration.noaa.gov

Institute for Wildlife Studies
www.iws.org

Island Conservation
www.islandconservation.org

Global Restoration Network
www.globalrestorationnetwork.org

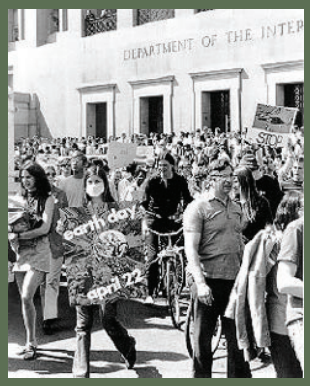
Lesson Plan #6

Public Interest in Environmental Conservation

Common Core State Standards

Grades 6-12

RI.7
W.10
SL.1, SL.2, SL.4
RH.7
WHST.7, WHST.8



Lesson Plan #6-Public Interest In Environment

What Students Will Learn

Students will learn about how the Environmental Protection Agency was first formed, the laws that were first created to protect the environment and human health, and how "ordinary citizens" were the catalyst for the action by the U.S. government.

Lesson Background

The United States Environmental Protection Agency (EPA) was created in 1970 following increasing public concern about human activity impacts to the environment. A majority of the public concern about the environment and human health came from Rachel Carson's book *Silent Spring* about the impacts of DDT on wildlife and humans. Shortly after congress created the EPA, they developed laws such as the Clean Air Act and Clean Water Act to protect the environment from past and future polluters. One of the largest shows of public support for environmental protection are during Earth Day demonstrations which began in 1970 and are still active today.

Materials

- *Return Flight* DVD Interview Extras
- Science Journal
- Internet

Activities

1. Watch *Return Flight* Interview Extras:
    a. Tom Dunlap, Environmental Historian, Texas A&M University (9:22 min.)
    b. Ann Hurley, Biologist & Attorney, U.S. Department of Justice (7:20 min.)

2. Have students construct a timeline of events/people starting in the 19th century of key environmental conservation actions or decisions that led up to the formation of the United States Environmental Protection Agency on December 2, 1970. Have small groups of students research different periods of time on the timeline and then compile the list as a class. Have each student create the timeline graphically on their own and submit as a final project.

3. Introduce the first laws that were created to protect the environment and human health. Discuss the key components to each law (http://www2.epa.gov/laws-regulations/laws-and-executive-orders#majorlaws).
    a. National Environmental Policy Act (1970)
    b. Clean Air Act (1970)
    c. Clean Water Act (1972)
    d. Resource Conservation and Recovery Act (1976)
    e. Comprehensive Environmental Response, Compensation, and Liability Act (aka. Superfund, 1980)

Lesson Plan Tips for Teachers

- **Research a timeline of key environmental conservation actions or decisions that led up to the formation of the United States Environmental Protection Agency. Divide the timeline into sections of dates that you can have students research in small groups.**
- **Prepare key components of the first laws listed above for a class discussion. Prepare a discussion about the history of Earth Day and how key it was for getting citizens involved in protecting the environment.**
- **Visit the Citizen Science Project websites listed under "Additional Resources" and note some potential projects for students. Research a few other bird webcams as projects.**

4. Hold a discussion about how "ordinary citizens" helped to create the environmental movement which spurred action by the U.S. government to protect the environment and human health. Discuss the history of Earth Day demonstrations (first one held in 1970) which showed the widespread support of environmental concerns by the public.

5. Engage students in citizen science. Have students choose a citizen science project to be involved with from one of the websites in the Additional Resources section below or have students research a bird or animal webcam to observe. Students could work on their citizen science project or observe a webcam over several weeks or a month recording their observations or progress in a science journal. At the end of a specified time period students could then write a summary report of their project or webcam observations.

Webcam Activity:

a. Have students research a bird or animal webcam (www.earthcam.com) to observe for half an hour each week. Have students act like field biologists and journal behavioral observations of these birds/animals. After a month of regular observations have students write a report of their findings.

b. Alternatively, students could follow the Channel Island Bald Eagles on live webcams during January to July recording behavioral observations of eagle chicks and adults in their nests (http://www.iws.org/interactive_nestchat_allUstream.html) and submit observations to the Institute for Wildlife Studies (www.iws.org).

Additonal Resources

Federal Government Environmental Agencies:

U.S. Fish & Wildlife Service
www.fws.gov

Environmental Protection Agency
www.epa.gov

National Oceanic & Atmospheric Administration
www.noaa.gov

U.S. National Park Service
www.nps.gov

Army Corps of Engineers
www.usace.army.mil

U.S. Geological Survey
www.usgs.gov

Bureau of Land Management
www.blm.gov

National Resource Conservation Service
www.nrcs.usda.gov

U.S. Forest Service
www.fs.fed.us

Council on Environmental Quality
www.whitehouse.gov

Citizen Science Projects:

Zooniverse-Web-based citizen science projects
www.zooniverse.org

Cornell Lab of Ornithology-Bird-related citizen science projects
www.birds.cornell.edu/citsci/

Sci-Starter-Citizen science projects
scistarter.com/index.html

Lesson Plan #7

Climate Change and Environmental Resilience

Common Core State Standards

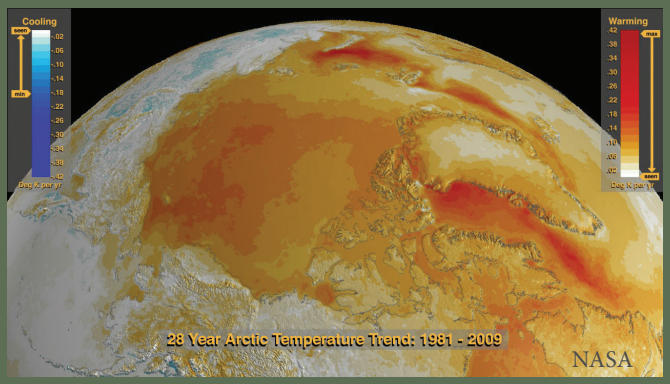
Grades 6-12

RI.7
W.8
SL.2
RH.7
WHST.7, WHST.8

Next Generation Science Standards

HS-LS2-7
HS-LS4-6
HS-LS-ETS1-1, HS-LS-ETS1

Ansgar Walk



Cameron Strandberg

What Students Will Learn

Students will learn about effects of climate change on vulnerable ecosystems and how resource managers are preparing for the impacts to natural resources.

Lesson Background

The effects of climate change are already impacting many important ecosystems. Resource managers are starting to plan for impacts by building in resilience and adaptability to ecological restoration projects. Impacts such as sea level rise, warming temperatures, changing ocean current patterns, and increasing flooding/drought are just a few of the possible effects of climate change on coastal islands and communities. Plant and animal species will be affected by these changes and will need to adapt for their survival. Creating and protecting thriving and healthy ecosystems is one way to buffer the effects of climate change on coastal ecosystems.

Coastal Habitat Restoration and Climate Change

Coastal habitats are now experiencing many stresses from climate change and restoration of these areas is critical to their successful management. Ecological restoration can help coasts adapt to climate change if resource managers plan effectively for long-term impacts. Some coastal habitats could also help slow the impacts of climate change due to their ability to remove greenhouse gases from the atmosphere. Tidal marshes remove the most greenhouse gases from the atmosphere (aka-"carbon sequestration") and therefore restoration of these habitats could offset impacts locally. Resource managers need to prioritize coastal habitats for their role in reducing impacts of climate change. They also need to look at restoration from the ecosystem level instead of small-scale projects that won't provide much long-term benefit to communities. In some cases, small-scale projects that are linked physically can provide the same benefits as large-scale projects.

President's Plan for Climate Change

In June 2013, President Obama presented a plan to curb carbon pollution and to prepare the United States for the impacts of climate change that are too late to avoid. President Obama urged states, cities, and communities to protect themselves from any future impacts. He also stated the importance of the Federal Government in building stronger infrastructure, protecting the economy and natural resources, supporting science, and preparing Federal operations and institutions to protect citizens from climate change impacts.

Here are some of the actions that are proposed in the plan to reduce carbon pollution:

- Development of carbon pollution standards for both new and existing power plants
- Investment in advanced fossil energy and efficiency projects to support innovative technologies

Lesson Plan Tips for Teachers

- **Watch *Return Flight* Interview Extra with Kate Faulkner. Make note of the challenges that the Channel Islands National Park is facing in terms of Climate Change and what resource managers are doing to address these challenges.**
- **View the Interactive Global Warming Effects Map and prepare answers to the questions listed. View President Obama's Climate Action Plan online and prepare answers for the questions listed.**
- **Visit the Carbon Fund website and note ways that students can reduce their daily carbon footprint.**

- Designating permits for wind, solar, and hydropower projects by 2020 that will power more than 6 million homes
- Expanding the President's Better Building Challenge, focusing on helping commercial, industrial, and multi-family buildings become at least 20 percent more energy efficient by 2020
- Cutting more than half of the U.S. carbon pollution by 2030
- Partnering with industry to develop better fuel economy standards for heavy-duty fuels
- Finding new ways to reduce pollution of highly-potent gases (ie. methane) and protect forests and critical landscapes

Materials

- *Return Flight* DVD Interview Extras
- Internet

Activities

1. Watch Interview with Kate Faulkner, Chief of Natural Resources, Channel Islands National Park (6:54 min.).

2. Discuss the ecological restoration projects that they are implementing in the Channel Islands and the challenges of climate change that the resource managers are facing. What are the main impacts of climate change to the Channel Islands? How are resource managers addressing the impacts of climate change on the Channel Islands?

3. View the Interactive Global Warming Effects Map http://environment.nationalgeographic.com/environment/global-warming/gw-impacts-interactive/
    a. How many impacts are being seen globally?
    b. What impacts are we experiencing in the U.S.?
    c. How does the U.S. contribute to global-scale impacts of climate change?

4. Visit the following website: http://www.whitehouse.gov/share/climate-action-plan. Walk through information about climate change and how President Obama's Climate Action Plan is proposing to reduce carbon pollution and preparing the U.S. for future impacts.Further Discussion Questions:
    a. What other steps could the U.S. government take to reduce carbon pollution?
    b. What is the definition of resilience and how would you build this into restoration projects if you were a resource manager?
    c. What are the climate change impacts to your state? (visit http://www.whitehouse.gov/blog/2013/06/26/state-state-reports-president-obamas-plan-cut-carbon-pollution-and-prepare-consequen)

5. Discuss how students can help reduce their daily carbon footprint (www.carbonfund.org).

Community College Extensions

1. Have students choose a topic relating to the impacts of Climate Change either locally or globally and write a research paper about the topic using evidence from the latest scientific literature.

2. Have students choose a topic relating to how President Obama's Climate Action Plan will either offset carbon emissions or prepare the U.S. for impacts (http://www.whitehouse.gov/share/climate-action-plan). Have students create a powerpoint presentation about their topic and present it to the class.

Additonal Resources

NOAA's Climate.gov-Teaching Climate
www.climate.gov/teaching

The White House-Energy, Climate Change, and our Environment
http://www.whitehouse.gov/energy/climate-change

Carbonfund.org
www.carbonfund.org

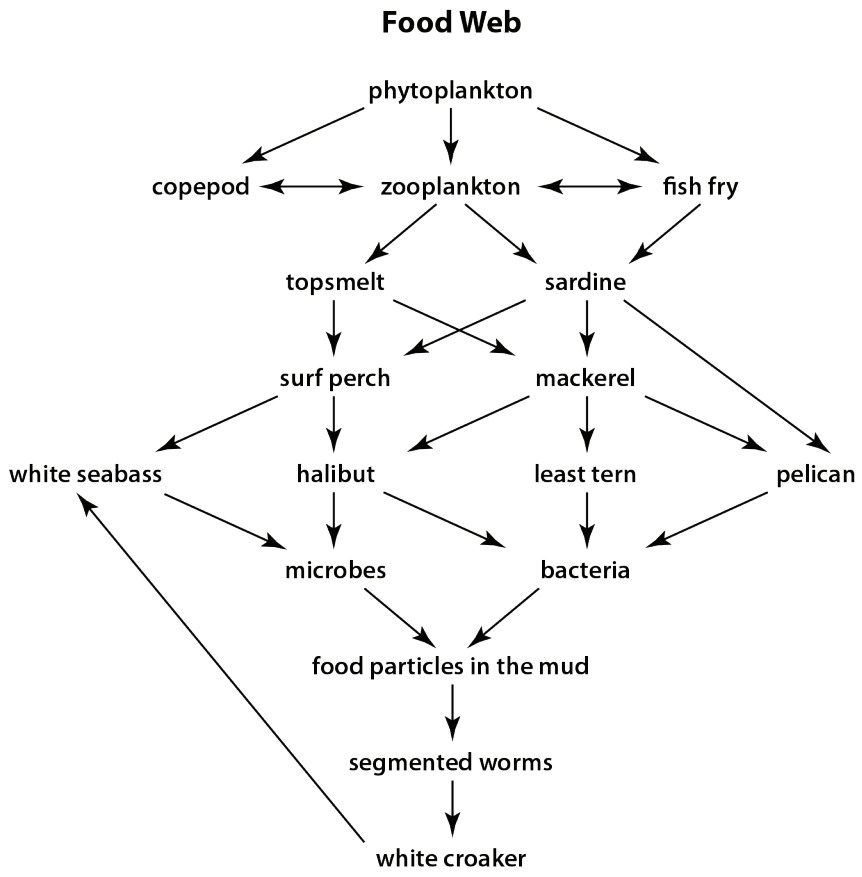
Intergovernmental Panel on Climate Change
http://www.ipcc.ch

Additional Materials-Lesson #2-Food Web Organism Cards*

phytoplankton	**pelican**
topsmelt	**halibut**
bacteria	**sardine**
bald eagle	**mackerel**
shrimp	**surf perch**
copepod	**fish fry**
zooplankton	**white seabass**
white croaker	**particles in the mud nutrients**
microbes (decomposition)	**segmented worm (polychete)**

* Courtesy of University of Southern California, Sea Grant Program

Additional Materials-Lesson #2-Sample Food Web*



* Courtesy of University of Southern California, Sea Grant Program

The *Return Flight Classroom Study Guide* was developed in partnership with the **Montrose Settlements Restoration Program** and **Filmmakers Collaborative SF**.

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To purchase *Return Flight: Restoring the Bald Eagle to the Channel Islands* DVDs or school licenses:

http://www.filmmakerscollaborative.org/return-flight/