

**Environmental systems and societies**  
**Standard level**  
**Paper 2**

Thursday 19 November 2015 (morning)

2 hours

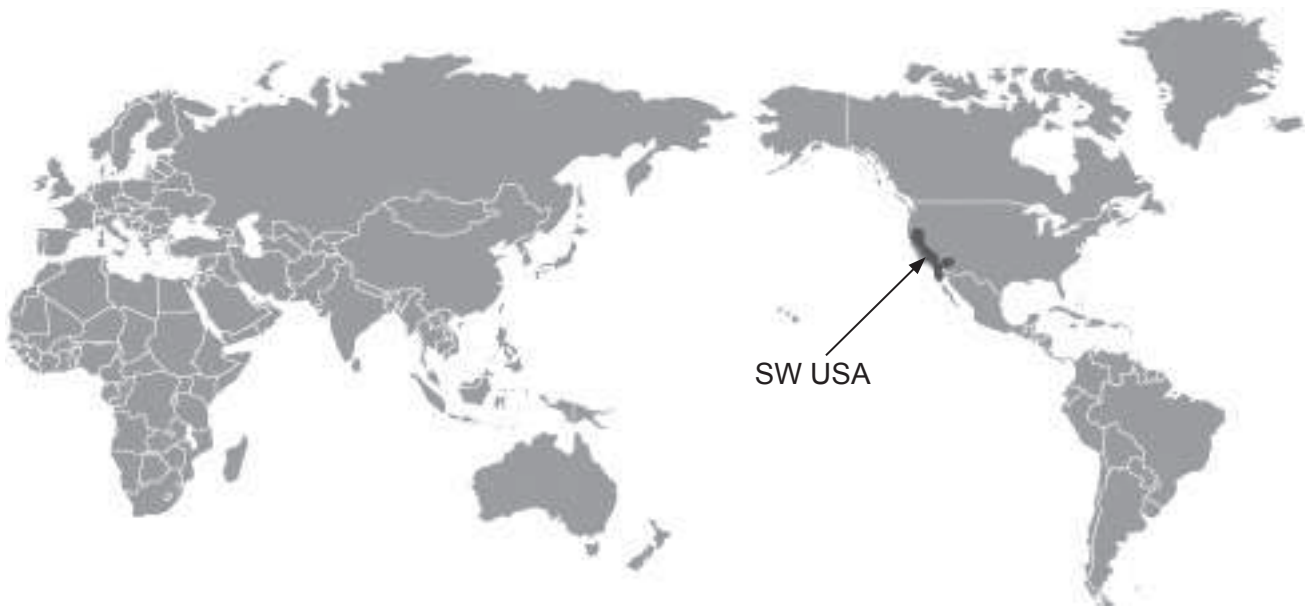
# Resource booklet

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**Instructions to candidates**

- Do not open this booklet until instructed to do so.
- This booklet contains **all** of the resources required to answer question 1.

**Figure 1: World Map showing the location of SW USA**



[Source: <http://projects.oregonlive.com>]

**Figure 2(a): Photographs of California condors (*Gymnogyps californianus*) eating carrion (dead animal carcass) and a tagged California condor in flight**



[Sources: California condors eating carrion: "California-Condor" by Clendenen, David - U.S. Fish & Wildlife Service digital library, WO-5529-30. Licensed under Public Domain via Commons - <https://commons.wikimedia.org/wiki/File:California-Condor.jpg#/media/File:California-Condor.jpg>

Condor in flight: Photograph courtesy Scott Frier/U.S. Fish and Wildlife Service]

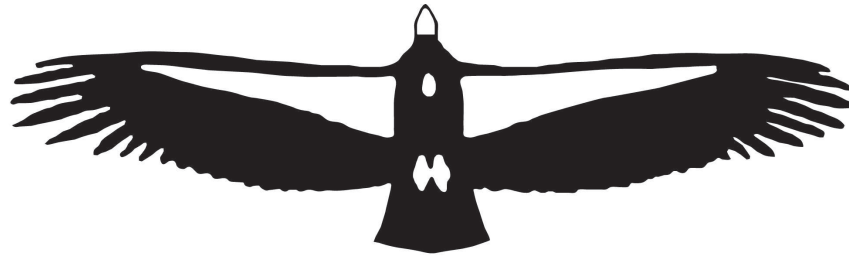
### **Figure 2(b): Fact file on the California condor**

- The California condor is the largest North American land bird.
- Condor numbers dramatically declined in the 20th century due to poaching, lead poisoning, and habitat destruction.
- The California condor became extinct in the wild in 1987 when all 22 remaining wild individuals were captured.
- These surviving birds were bred in zoos through captive breeding programs.
- In 1991, condors were reintroduced into the wild.
- The California condor is one of the world's rarest bird species: population counts in 2012 estimated a total population of 405, including 226 living in the wild and 179 in captivity.
- It is now listed as critically endangered by the IUCN.
- The condor is a scavenger and eats large amounts of carrion.
- It is one of the world's longest-living birds, with a lifespan of up to 60 years.
- Individual birds have a huge range and have been known to travel up to 250 km in search of carrion.
- The condor is a significant bird to many Californian Native American groups and plays an important role in several of their traditional myths.
- California condors mature and reproduce slowly. They do not breed until they are between six and eight years old, and the female lays only one egg every two years.

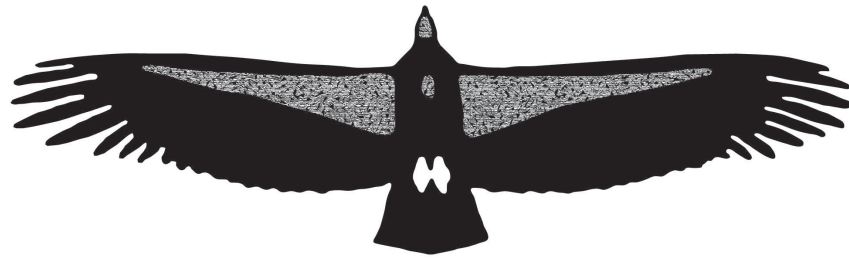
[Sources: © International Baccalaureate Organization 2016]

**Figure 3: Identification guide for California condors and other, similar birds**

Adult  
condor



Immature  
condor



Adult  
Golden  
eagle



Immature  
Golden  
eagle



Turkey  
vulture

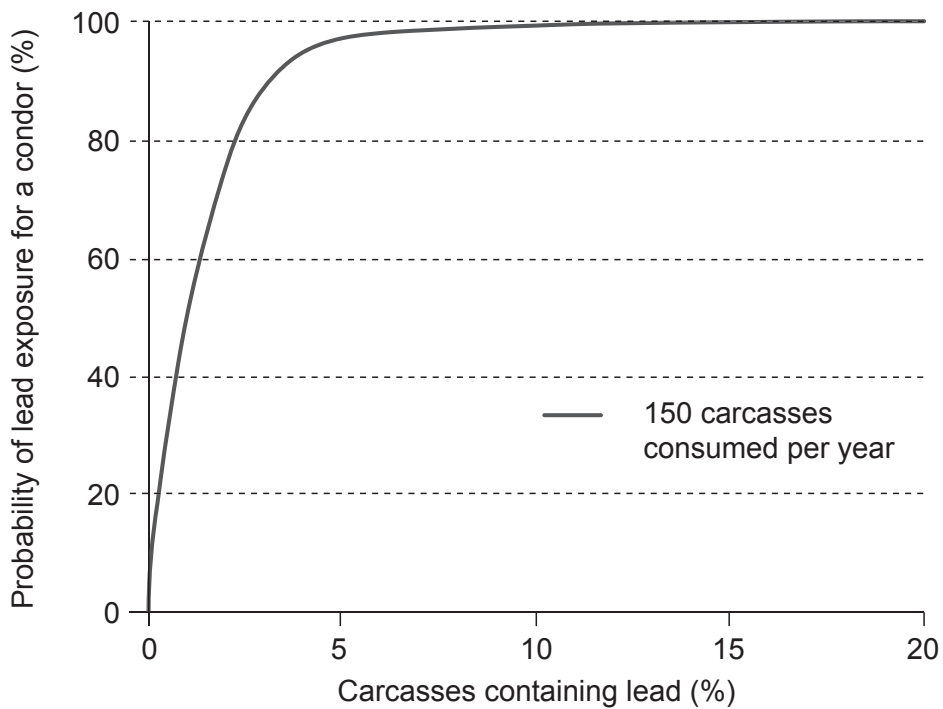


[Source: Courtesy of the Ventana Wildlife Society]

**Figure 4(a): Threats to the California condor**

- Poaching for museum specimens
- Lead poisoning (from eating animal carcasses containing lead shot)
- DDT poisoning
- Birds flying into electric power lines and wind turbines
- Egg collecting
- Habitat destruction
- Hunting by farmers who mistakenly believed the birds had killed farm animals.

**Figure 4(b): Graph to show how probability of lead exposure for condors is affected by their diet**



[Source: "California Condors face lead menace" by Meera Subramanian. Reprinted by permission from Macmillan Publishers Ltd: *Nature*, **486**, 451 (26 June 2012), doi:10.1038/486451a. © 2012. www.nature.com]

**Figure 5(a): The captive breeding programme for California condors**

- If the egg is removed from a condor nest the mother will lay another. Scientists removed eggs so that mothers would lay more. They did this to increase the overall number of eggs. This meant, however, that they needed to hand rear some chicks.
- Chicks are fed with glove puppets which resemble adult condors to prevent chicks from becoming attached to humans.
- Captive-bred California condors have been trained to avoid power lines and people. Now the number of condor deaths due to power lines has greatly decreased.
- The cost of the captive breeding programme is US\$5 million per year, or roughly US\$13,000 per bird.
- The aim is to have three distinct populations — one wild in California, another wild in Arizona, with a third raised in captivity. Each would have 150 birds and at least 15 breeding pairs.

**Figure 5(b): Photograph of a condor chick being hand-reared using a condor puppet**



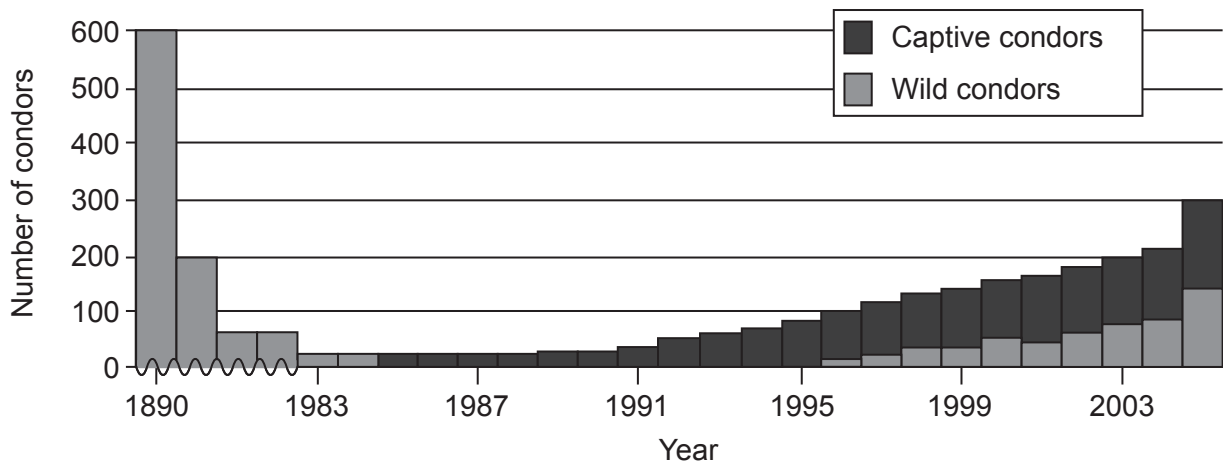
[Source: "*Gymnogyps californianus1*". Licensed under Public Domain via Wikimedia Commons – "*Gymnogyps californianus1*". Licensed under Public Domain via Wikimedia Commons - [https://commons.wikimedia.org/wiki/File:Gymnogyps\\_californianus1.jpg#/media/File:Gymnogyps\\_californianus1.jpg](https://commons.wikimedia.org/wiki/File:Gymnogyps_californianus1.jpg#/media/File:Gymnogyps_californianus1.jpg)]

Figure 5(c): A map showing the location of the California condor breeding centre and release sites



[Source: Map locations courtesy of David Badders at *The Oregonian*]

**Figure 6: Graph to show the change in California condor population over time**



[Source: EndExtinction.org. Courtesy of San Diego Zoo Global Wildlife Conservancy]

**Figure 7(a): Photographs of a rare condor cape, (dating from 1800s) worn for ceremonial dance and a 21st century Chumash man doing a traditional dance**



[Sources: Chumash man: Photo ©2013 Victoria Linssen, <http://victorialinssen.com>  
Condor cape: Wailaki, Condor Cape, late 1800s  
Denver Art Museum Collection: Native Arts acquisition fund, 1950.150  
Photo © Denver Art Museum]

**Figure 7(b): Chumash culture and the condor**

The Chumash people historically inhabited the central and southern coastal regions of California. Their descendants still live there now. Old cave paintings show human figures wearing condor feathers for ceremonies and dances. Condors were once sacrificed during rituals. There is a legend that if the condor becomes extinct, so too will the Chumash.



**Figure 8(a): Screenshot of the Facebook page for NW Condor Watch**



[Source: www.facebook.com]

**Figure 8(b): A photograph of tourists watching condors on the Californian coast**



[Source: Courtesy of the Ventana Wildlife Society]

**Figure 9(a): Ridley-Tree Condor Preservation Act**

- In 2008 it became illegal to use bullets containing lead for hunting game such as deer, bear and elk, in areas designated as California condor range.
- This act only applies in California. In neighbouring states it is not illegal to use lead bullets for game hunting.
- Organisations such as the National Rifle Association oppose the ban on lead bullets.

**Figure 9(b): A photograph showing the difference between a lead (left) and a non-lead bullet (right) after impact**



[Source: US National Park Service]

**Figure 10: Compromising to protect condor habitat**

Tejon Ranch, located on the map **Figure 5(c)**, is a very large (1000 km<sup>2</sup>) expanse of hills, valleys and canyons that is a home for the California condor and an important biodiversity hotspot. It is owned by the Tejon Ranch Company.

After months of debate and negotiations, in 2008 an historic agreement was reached between the company and a group of environmental NGOs. The company agreed to preserve 90 % of the property, including feeding grounds for condors. In return the environmental groups agreed not to oppose the building of up to 26 000 homes on the remaining 10 % of the company's land.

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Thursday 19 November 2015 (morning)

Candidate session number

2 hours

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**Instructions to candidates**

- Write your session number in the boxes above.
- Do not open this examination paper until instructed to do so.
- Section A: answer all questions. Refer to the resource booklet which accompanies this question paper.
- Section B: answer two questions.
- Write your answers in the boxes provided.
- A calculator is required for this paper.
- The maximum mark for this examination paper is **[65 marks]**.



### Section A

Answer **all** questions. Write your answers in the boxes provided.

The resource booklet provides information on the California condor. Use the resource booklet and your own studies to answer the following.

1. (a) Define the term *species*. [1]

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- (b) With reference to **Figure 2(b)** identify **two** ways in which scavengers such as condors play a role in an ecosystem. [2]

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- (c) With reference to **Figure 3** identify **two** features of the birds that could be used to construct a simple key to distinguish between condors and other large species of bird. [2]

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- (d) With reference to **Figures 2(b)** and **4(a)** explain **one** feature of condors that make them prone to extinction. [2]

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(This question continues on the following page)



**(Question 1 continued)**

- (e) Identify **one** data collection method which may have been used by scientists to estimate the abundance of condors. [1]

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- (f) Justify whether condors should be classified as K or R strategists. [2]

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- (g) With reference to **Figures 4(b)** and **9(b)**:

- (i) Suggest a reason why a condor is likely to be poisoned even if a small proportion of the carcasses it consumes contain lead. [1]

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- (ii) State the term for a species that is used to measure pollution levels. [1]

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**(This question continues on the following page)**



**(Question 1 continued)**

- (h) With reference to the resource booklet, complete the table by identifying strategies that reduce the effect of lead on the environment. [2]

<b>Process of pollution</b>	<b>Strategy for reducing impacts from this case study.</b>
Human activity producing pollutant	Replacing lead bullets with non-lead bullets
Release of lead into the environment	.....
Long term impact of lead on the environment	.....

- (i) With reference to **Figures 4(a), 7(a) and 7(b)** identify **one** similarity and **one** difference between the attitudes towards condors of Chumash Indians in the past and cattle farmers who shoot them now. [2]

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- (j) Identify **two** arguments for the conservation of California condors. [2]

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**(This question continues on the following page)**



**(Question 1 continued)**

- (k) With reference to the resource booklet, complete the table by identifying **one** way in which each of the following are playing a role in the conservation of California condors. [3]

<b>Individuals or organizations</b>	<b>How they are playing a role in the conservation of California condors.</b>
Individual citizens	.....
The Government of the state of California	.....
NGO	.....

- (l) Using evidence from the resource booklet evaluate the success of the conservation programme for California condors. [4]

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### Section B

Answer **two** questions. Write your answers in the boxes provided.

Each essay is marked out of **[20]** of which **[2]** are for clarity of expression, structure and development of ideas:

- [0]** Quality of expression, structure and development is poor.
- [1]** Quality of expression, structure and development is limited.
- [2]** Quality of expression is clear, structure is good and ideas are well developed.

2. (a) Distinguish between renewable and replenishable natural capital using examples. [4]
- (b) Explain how the global climate functions as a system. [6]
- (c) Discuss how different environmental philosophies can affect the choice of pollution management strategies in response to global warming. [8]

Expression of ideas [2]

3. (a) Distinguish between a human carrying capacity and an ecological footprint of a population. [4]
- (b) Explain the factors which influence the choice of energy sources in **two** different societies. [6]
- (c) Evaluate the role of national and international development policies in reducing human population growth. [8]

Expression of ideas [2]

4. (a) Distinguish between transfers and transformations using examples from the water cycle. [4]
- (b) Explain the role of climate in the distribution and relative productivity of a named biome. [6]
- (c) Evaluate the sustainability of freshwater use in a named case study and the environmental philosophy(ies) involved in this decision making process for the management of this resource. [8]

Expression of ideas [2]





5. (a) Distinguish, using examples, between the processes of succession and zonation. [4]
- (b) Explain the relationship between ecosystem stability, diversity and succession. [6]
- (c) Discuss the relationship between social systems and food production systems with the help of named examples. [8]

Expression of ideas [2]

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16EP09

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16EP11

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16EP13

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16EP14



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16EP15

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