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| *class* **Parrot** extends **Bird** |
| - vocabSize: int  - favoriteSaying: String  - definingCharacteristic :"short, curved beak; noted for intelligence & mimicry" |

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| *class* **BirdOfPrey** extends **Bird** |
| - definingCharacteristic : “ sharp, hooked beaks with visible nostrils” |

**CS 5010 Lab1 UML:**

+ means public

- means private

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| --- |
| *enum* **Food** |
| berries, seeds, fruit, insects, other birds, eggs, small mammals, fish, buds, larvae, aquatic invertebrates, nuts, and vegetation |

extends

extends

extends

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| --- |
| *abstract* class **Bird** |
| - type: String  - definingCharacteristic: String  - extinct: boolean  - wings: int  - diet: Set<Food> |
| +Bird(type, characteristic, extinct, wings, diet)  +getType(): String  +isExtinct(): boolean  +getWings(): int  +getDiet(): Set<Food>  +getDefiningCharacteristic(): String  #validateConstraints(): void |

use

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| *class* **FlightlessBird** extends **Bird** |
| - definingCharacteristic : “ live on the ground ”  - wings = 0 |

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| *class* **Owl** extends **Bird** |
| - definingCharacteristic : “ facial disks that frame the eyes and bill” |

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| *class* **Pigeon** extends **Bird** |
| - definingCharacteristic : “ feed their young "bird milk"” |

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| *class* **Shorebird** extends **Bird** |
| - bodyOfWater: String  - definingCharacteristic : “ live near water sources including wetlands, freshwater and saltwater shorelands, even the ocean” |

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| *Interface* **NearWater** |
| +getBodyOfWater():String |

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| *class* **Waterfowl** extends **Bird** |
| - bodyOfWater: String  - definingCharacteristic : “ live near water sources (fresh or salt)” |

extends

extends

extends

extends

implement

implement

**Testing Plan:**

1. **What we need to check?**

* Every bird tracks: type, fixed definingCharacteristic, extinct, wings, diet(2–4).
* “Near water” birds (Shorebird, Waterfowl) also track bodyOfWater.
* Parrot tracks vocabSize and favoriteSaying.
* FlightlessBird always initializes with 0 wings.
* The fixed definingCharacteristic is hard-coded per subclass.

1. **Example Test cases**

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| --- | --- | --- | --- |
| **ID** | **Condition** | **Example Input** | **Expected** |
| T1 | Create **BirdOfPrey**(valid) | type="bald eagle", extinct=false, wings=2, diet={FISH, SMALL\_MAMMALS, OTHER\_BIRDS} | All getters return provided values;  defChar="sharp, hooked beaks with visible nostrils" |
| T2 | Create **Owl** (valid) | type="barn owl", wings=2, diet={SMALL\_MAMMALS, INSECTS} | defChar="facial disks framing the eyes and bill" |
| T3 | Create **Pigeon** (valid) | type="passenger pigeon", extinct=true, diet={SEEDS, BERRIES} | defChar="feed young 'bird milk' similar to mammals" |
| T4 | Create **Parrot** with extras(valid) | type="gray parrot", vocabSize=100, favorite="Hello!", diet={NUTS, FRUIT, SEEDS} | getVocabSize()==100, getFavoriteSaying()=="Hello!", parrot defChar fixed |
| T5 | **FlightlessBird** wings enforcement | type="emu", diet={VEGETATION, SEEDS, FRUIT} | getWings()==0 regardless of any suggestion (constructor doesn’t accept wings) |
| T6 | **Shorebird** requires bodyOfWater | type="horned puffin", diet={FISH, AQUATIC\_INVERTS}, body="North Pacific" | getBodyOfWater()=="North Pacific", defChar mentions near water |
| T7 | **Waterfowl** requires bodyOfWater | type="mallard duck", diet={VEGETATION, AQUATIC\_INVERTS, SEEDS}, body="Lake Washington" | OK; NearWater observable |
| T8 | **Diet size = 2** (min boundary) | any subclass with diet size 2 | OK |
| T9 | **Diet size = 4** (max boundary) | any subclass with diet size 4 | OK |
| T10 | **Diet size < 2** | diet size 1 | IllegalArgumentException("diet must contain 2–4 distinct items") |
| T11 | **Diet size > 4** | diet size 5 | same exception |
| T12 | **Null diet** | diet=null | IllegalArgumentException("diet required") |
| T13 | **Wings out of range** | wings = −1 or 3 (for classes that accept wings) | IllegalArgumentException("wings must be between 0 and 2") |
| T14 | **Null/blank type** | type=null or " " | IllegalArgumentException("type required") |
| T15 | **NearWater missing water** | new Shorebird(..., bodyOfWater=null) | IllegalArgumentException("bodyOfWater required...") |
| T16 | **Parrot negative vocab** | vocabSize=-1 | IllegalArgumentException("vocabSize cannot be negative") |
| T17 | **Parrot favorite sayings null** | favoriteSaying=null | IllegalArgumentException("favoriteSaying required (can be empty)") |
| T18 | **Fixed definingChar strings** | create each subclass | getDefiningCharacteristic() equals the exact expected phrase for that subclass |
| T19 | **Diet is unmodifiable** | call bird.getDiet().add(...) | UnsupportedOperationException |
| T20 | **Input-set defensive copy** | pass a mutable set, mutate it after construction | bird’s getDiet() unchanged |
| T21 | **Polymorphism check** | keep references as Bird, test instanceof NearWater | only Shorebird/Waterfowl match; can safely cast & call getBodyOfWater() |
| T22 |  |  |  |
| T23 |  |  |  |
| T24 |  |  |  |
| T25 |  |  |  |