

## Appendix 2. Quantitative elicitation materials

This appendix contains the list of invited and participating experts and an example of the spreadsheets completed by each expert. The spreadsheets were delivered and completed in Excel and have been reformatted for presentation here.

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### A. EXPERT DIRECTORY

State	Agency	Contact Name	Queries Sent	Response
VA	University of Virginia, Department of Environmental Studies	Kyle Haynes	1	No Response
VA	University of Virginia, Department of Environmental Studies	R. Michael Erwin	1	Interested, but Unable to Participate
VA	College of William and Mary, Center for Conservation Biology	Bryan Watts	1	Interested, but Unable to Participate
VA	College of William and Mary, Center for Conservation Biology	Mike Wilson	1	No Response
VA	Virginia Tech University, Cooperative Fish and Wildlife Research Unit	Paul Angermeier	2	Interested, but Self Described as Unqualified
VA	Virginia Tech University, Cooperative Fish and Wildlife Research Unit	Mark Ford (Will)	1	Interested, but Unable to Participate
VA	Virginia Tech University, Department of Fish & Wildlife Conservation	Jim Parkhurst	2	Interested, but Unable to Participate
VA	Virginia Tech University, Department of Fish & Wildlife Conservation	Carola Haas	3	No Response
VA	Virginia Tech University, Department of Fish & Wildlife Conservation	Marcella Kelly	1	No Response

State	Agency	Contact Name	Queries Sent	Response
VA	Virginia Tech University, Department of Fish & Wildlife Conservation	Kathleen Alexander	1	No Response
VA	Virginia Tech University, Department of Fish and Wildlife Conservation	Steve McMullin	1	No Response
VA	Virginia Tech University, Conservation Management Institute	Scott Klopfer	3	No Response
VA	Virginia Department of Game and Inland Fisheries	Mike Fies	2	Participated
VA	Virginia Department of Game and Inland Fisheries	Marc Puckett	2	Participated
VA	Virginia Department of Game and Inland Fisheries	Betsy Stinson	2	No Response
VA	Virginia Department of Game and Inland Fisheries	Mike Pinder	2	Interested, but Unable to Participate
VA	Virginia Department of Game and Inland Fisheries	Sergio Harding	2	Interested, but Unable to Participate
VA	Virginia Department of Game and Inland Fisheries	J. D. Kleopfer	2	Interested, but Unable to Participate
VA	Virginia Department of Game and Inland Fisheries	Rick Reynolds	2	Participated
VA	Virginia Department of Game and Inland Fisheries	Nelson Lafon	2	Participated
VA	Virginia Department of Game and Inland Fisheries	David Kocka		No Response
VA	Virginia Department of Conservation and Recreation, Division of Natural Heritage	Chris Ludwig	3	Participated

State	Agency	Contact Name	Queries Sent	Response
VA	Virginia Department of Conservation and Recreation, Division of Natural Heritage	Chris Hobson	3	Interested, but Unable to Participate
VA	Virginia Department of Conservation and Recreation, Division of Natural Heritage	Dean Walton	2	No Response
VA	Virginia Department of Conservation and Recreation, Division of Natural Heritage	Darren Loomis	3	No Response
NC	NC Museum of Natural Sciences	Jeff Beane	3	Participated
NC	NC Museum of Natural Sciences	Lisa Gatens	2	Participated
NC	NC Museum of Natural Sciences	Bryan Stuart	1	Interested, but Unable to Participate
NC	NC Museum of Natural Sciences	Doug Pratt	2	Uninterested
NC	NC Museum of Natural Sciences	David S. Lee	2	Participated
NC	NC Museum of Natural Sciences	John Gerwin	1	Interested, but Unable to Participate
NC	NC Museum of Natural Sciences	Ben Hess	1	No Response
NC	NC Museum of Natural Sciences	John Connors	2	Interested, but Unable to Participate
NC	Natural Heritage	Harry LeGrand	1	No Response
NC	NC Wildlife Resource Commission	Mark Jones	1	Interested, but Unable to Participate

State	Agency	Contact Name	Queries Sent	Response
NC	NC Wildlife Resource Commission	Jeff Hall	2	Participated
NC	Southeastern Bat Diversity Network	Mary Frazer	1	Participated
NC	Retired	David Lees	1	Participated
NC	Southeastern Bat Diversity Network	Mary Kay Clark	2	Participated
NC	NC USDA Natural Resource Conservation Service	Michelle Clendenin	2	Interested but Self Described as Unqualified
NC	NC USDA Natural Resource Conservation Service	Hank Henry	1	Interested, but Unable to Participate
NC	NC USDA Natural Resource Conservation Service	Don Riley	1	Interested but Self Described as Unqualified
NC	NCSU Fish. Wildlife & Conservation	Chris Moorman	2	Interested, but Unable to Participate
NC	NC Wildlife Resource Commission	John Wooding	2	No Response
NC	NC The Nature Conservancy	Cat Burns	2	Interested but Self Described as Unqualified
NC	Wildlife Resource Commission	Terry Sharpe	2	No Response
NC	Producer & Former Manager of Mattamuskeet NWR and USFWS biologist	Kelly Davis	2	Participated
NC	North Carolina State University	David Orr	2	Interested, but Unable to Participate
NC	NatureServe	Milo Pyne		

State	Agency	Contact Name	Queries Sent	Response
NC	NC State University	Charlie Plush	1	Participated
NC	Davidson College	Mike Dorcas	2	No Response
SC	Clemson University, Department Forestry and Natural Resources, Clemson University	William Bowerman	2	No Response
SC	Clemson University, USGS SC Cooperative Fish and Wildlife Research Unit	Patrick Jodice	2	Interested but Self Described as Unqualified
SC	Clemson University, Department Forestry and Natural Resources	J. Drew Lanham	2	Interested, but Unable to Participate
SC	Clemson University, Department Forestry and Natural Resources,	Ron J. Johnson	2	Interested, but Unable to Participate
SC	Clemson University, Department Forestry and Natural Resources	Greg Yarrow	2	No Response
SC	Dept of Natural Resources	Derrell Shipes	1	No Response
SC	Dept of Natural Resources	Steve Bennett	2	Participated
SC	Dept of Natural Resources	Mary Bunch	2	Interested, but Unable to Participate
SC	Dept of Natural Resources	Jay Butfiloski	2	Participated
SC	Dept of Natural Resources	Billy Dukes		Participated
SC	Natural Resources Conservation Service	Ann M. English	2	No Response
SC	Natural Resources Conservation Service	Dick Yetter	1	No Response
SC	Natural Resources Conservation Service	Kellee Melton	2	Not Interested
SC	Natural Resources Conservation Service	Shaun Worley	1	No Response

State	Agency	Contact Name	Queries Sent	Response
SC	The Nature Conservancy	Colette DeGarady	2	Interested, but Unable to Participate
SC	Savannah River Ecology Laboratory	Kurt A. Buhlmann	1	No Response
SC	Savannah River Ecology Laboratory	Tracey D. Tuberville	1	No Response
SC	Savannah River Ecology Laboratory	I. Lehr Brisbin	1	No Response

## B. OPERATIONAL DECISIONS

### Define response of (resource) to (operational decision)

Agricultural practices can influence the availability of some forage and shelter resources for wildlife. Experts will be randomly assigned a set of 2-4 resources and then assign positive, negative, or neutral responses for that resource to each agricultural practice. There are two types of questions about agricultural practices: categorical and continuous. These are interpreted slightly differently, but use the same answer rubric.

#### Questions about decisions among categories (e.g. no till or mulch till)

Compared to the baseline choice (No till), I would expect to this choice (mulch till) to produce a:

#### Questions about decisions along a continuous scale (e.g. frequency of fertilizer application)

As the decision value increases, I would expect a:

<i>Answer</i>	<i>Interpretation</i>
+2	Strong increase in the probability of occurrence of species using this resource
+1	Weak increase in the probability...
0	No change in probability...
-1	Weak decrease in the probability...
-2	Strong decrease in the probability...

### Define the uncertainty associated with your response

This project relies on knowledge elicited from experts. The knowledge elicited is broad – covering many species and many agricultural practices across a broad geographic region. In addition, experts differ in their professional background and expertise. Expertise is expected to vary among experts and among responses from a single expert. It is important that we distinguish better expert responses provided with high versus low

confidence. Therefore each time an expert answers a question, they must also indicate the “reliability” of their response. We use a seven point scale, but only scores of 4 to 7 are relevant in this context.

#### RELIABILITY

Score	Text Definition	Odds Ratio Definition	Probability
7	Fully confident this is true	All odds on	1.00
6	Very confident this is true	Better than 10-1 or 20-1 odds on	0.93
5	Somewhat confident this is true	Better than 2-1 or 3-1 odds on	0.71
4	I could be right or wrong	50-50 odds of being right	0.50
3	It's possible I'm right, but unlikely	No worse than 1-3 odds against	0.29
2	It's not impossible I'm right	No worse than 1-20 odds against	0.07
1	Not confident at all	All odds against	0.00

#### Questions with categorical responses:

#### RESOURCE:

Decision	Choice	Impact	Reliability	Comment
<b>CROP AREA MANAGEMENT</b>				
1	What crop did you plant?	<b>Fallow, No cover crop</b>		
	Corn			
	Wheat			
	Cotton			
	Soy			
2	What tillage methods did you use to prepare this field?	<b>None or Strip-till</b>		
	Reduced or Mulch-till			
	Conventional-till			
3	What soil conservation practices do you use?	<b>None</b>		
	Cover crop			
	Strip cropping			
	Vegetation filter strips			
4	What GMO products do you use?	<b>None</b>		
	Pest Resistant			
	Herbicide Resistant			
	Stacked			
5	What type of herbicide did you apply?	<b>None</b>		
	Selective			
	Non-Selective			

5a	How did you apply the herbicide?	<b>Post-emergent ground</b>		
		Pre-emergent		
		Post-emergent aerial		
6	What type of pesticide did you apply?	<b>None</b>		
		Selective		
		Non-Selective		
6a	How did you apply the pesticide?	<b>Post-emergent ground</b>		
		Seed		
		Pre-emergent		
		Post-emergent aerial		
7	Do you seasonally flood this field?	<b>No</b>		
		Yes		
8	Do you irrigate from surface water neighboring this field?	<b>No</b>		
		Yes		
8a	(If yes) Does this irrigation system have surface water available year-round neighboring this field?	<b>No</b>		
		Yes		
9	What accommodations do you make to allow wildlife to escape during harvest?	<b>None</b>		
		Flushing bar		
		Delayed harvest		
		Reduce speed		
		No night harvest		
		Alter harvest pattern		
10	What accommodations do you make to allow some forage/shelter value for wildlife?	<b>None</b>		
		Leave residue		
		Leave some rows		



Decision	Choice	Impact	Reliability	Comment
<b>CROP AREA MANAGEMENT (continued)</b>				
7 Do you seasonally flood this field?	No			
	Yes			
8 Do you irrigate from surface water neighboring this field?	No			
	Yes			
8a (If yes) Does this irrigation system have surface water available year-round neighboring this field?	No			
	Yes			
9 What accommodations do you make to allow wildlife to escape during harvest?	None			
	Flushing bar			
	Delayed harvest			
	Reduce speed			
	No night harvest			
	Alter harvest pattern			
10 What accommodations do you make to allow some forage/shelter value for wildlife?	None			
	Leave residue			
	Leave some rows			

Decision	Choice	Impact	Reliability	Comment
<b>EDGE/MARGIN (DRY) AREA MANAGEMENT</b>				
14 What is the dominant vegetation in the <b>edge/margin</b> area?	Naturally self established			
	Planted exotic grasses			
	Planted native grasses			
	Planted native grasses & forbs			
	Planted shrubs			
	Planted trees			
15 How do you manage the vegetation in the <b>edge/margin</b> areas?	No Management Action			
	Mow			
	Fire			
	Disc			
	Selective Herbicide			
	Non-Selective Herbicide			

15a When do you manage the vegetation in the **edge/margin** area?

Winter  
Spring  
Summer  
Fall


Questions with continuous value responses:

**RESOURCE:**

Decision	Unit	Impact	Reliability	Comment
<b>CROP AREA MANAGEMENT</b>				
1 Area planted	acres			
2 Frequency of sub-soil or deep-rip practice	years			
3 Total amount of fertilizer applied	wgt/acre			
4 Total amount of pesticide applied	wgt/acre			
5 Total amount of herbicide applied	wgt/acre			
6 Frequency of forage crop rotation	years			
7 Area of open water associated with irrigation	acres			
8 Amount of residue cover	percent			
<b>DRAINAGE (WET) AREA MANAGEMENT</b>				
9 Size of the non-crop drainage area	acres			
10 Frequency of vegetation management in drainage area	months			
<b>EDGE/MARGIN (DRY) AREA MANAGEMENT</b>				
11 Size of the non-crop drainage area	acres			
12 Width of the non-crop edge/margin area	meters			
13 Frequency of vegetation management in edge/margin area	months			

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## B. SPECIES' PREFERRED RESOURCES

### Assign (resource) to (species)

In each region of your state, each species must be assigned *one* Primary Forage, *one* Primary Day Shelter, and *one* Primary Night Shelter. Each expert will choose one taxa group (amphibians, birds, mammals, and reptiles) to assign forage and shelter characteristics.

#### Forage Resources

1. Omnivore
2. Aerial invertebrates
3. Tree/shrub invertebrates
4. Herbaceous invertebrates
5. Soil invertebrates
6. Aquatic small invertebrates
7. Tree/shrub foliage, seeds & fruits
8. Herbaceous foliage, seeds & fruits
9. Aquatic plant foliage, seeds & fruit
10. Pollen/Nectar
11. Terrestrial vertebrates
12. Aquatic vertebrates and large invertebrates
13. Marine prey
14. Detritus, fungi, & decaying material

#### Shelter Resources

1. Herbaceous vegetation
2. Shrub, vine, thicket vegetation
3. Living tree canopy, bark, or cavity
4. Aquatic vegetation
5. Freshwater
6. Marine (water and beach)
7. Standing dead tree (snag)
8. Fallen logs, leaf litter, & detritus
9. Bare ground surface or burrow
10. Ground burrow (under dense vegetation & roots)
11. Rocky outcrops
12. Caves, mines, & wells
13. Buildings, bridges, & tower

### Define the uncertainty associated with your response

This project relies on knowledge elicited from experts. The knowledge elicited is broad – covering many species and many agricultural practices across a broad geographic region. In addition, experts differ in their professional background and expertise. Expertise is expected to vary among experts and among responses from a single expert. It is important that we distinguish better expert responses provided with high versus low confidence. Therefore each time an expert answers a question, they must also indicate the “reliability” of their response. We use a seven point scale, but only scores of 4 to 7 are relevant in this context.

#### RELIABILITY

<u>Score</u>	<u>Text Definition</u>	<u>Odds Ratio Definition</u>	<u>Probability</u>
7	Fully confident this is true	All odds on	1.00
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## Spreadsheet #1: IDENTIFYING INFORMATION & INSTRUCTIONS

Reviewer Name; Reviewer Specialty; Reviewer Region(s); Date

### INSTRUCTIONS

Thank you for agreeing to participate in this research project aiming to inform farmers of how their operational decisions influence wildlife biodiversity in and around their fields. The review materials are presented in a series of tables which you can view by clicking on the tabs at the bottom of this screen. There are *five tabs*:

#### 1. Introduction

Please read the definition of terms contained in this introduction. This will help maintain consistent reasoning across all experts.

#### 2. Lookup tables

This summarizes all the lookup tables (set of possible responses) that will be used to enter answers to questions in tabs 2, 3, and 4.

#### 3. Primary Forage Resource

Here every species is assigned one primary forage resource from a drop-down list. This should be the primary food item consumed by the species when it is active in a terrestrial life stage in your region. If the same forage applies to the species throughout your state, you enter your choice in the first column (All NC). If forage preference changes among regions within the state, you may use columns 2-4 to indicate forage preference by region. Indicate the reliability of your knowledge.

#### 4. Primary Day Shelter

Here every species is assigned one primary day shelter resource from a drop-down list. This should be the primary microhabitat occupied during daylight hours by the species when it is active in a terrestrial life stage in your region. If the same day shelter applies to the species throughout your state, you enter your choice in the first column (All NC). If day shelter preference changes among regions within the state, you may use columns 2-4 to indicate shelter preference by region. Indicate the reliability of your knowledge.

#### 5. Primary Night Shelter

Here every species is assigned one primary night shelter resource from a drop-down list. If the species has the same day and night shelter - you may leave the cell blank (\*\*all blank cells will be interpreted as "same as day shelter"). This should be the primary habitat occupied through the night by the species when it is active in a terrestrial life stage in your region. If the same night shelter applies to the species throughout your state, you enter your choice in the first column (All NC). If night shelter preference changes among regions within the state, you may use columns 2-4 to indicate shelter preference by region. Again, indicate the reliability of your knowledge - even if you think the night shelter is the same as the day shelter.

## Spreadsheet #2: INTRODUCTION

### Metric for Educational Applications

The tool we are developing is intended to make very general predictions for educational applications. "Your farming practices are likely increasing, decreasing, or having no effect on species inhabiting the landscape around your farm." The idea is that farmers can then learn more about these species, including how different practices influence species occurrence, and be more likely to notice their presence/absence when working in their fields.

### Primary Resources

We define primary resources based on the temporal duration of the species activities - the primary resource is the one used most frequently when the animal is active in its terrestrial life stage.

### All State versus Regions

Some species' resource use patterns vary geographically. If a species uses the same resource wherever they occur within the state, one data value can be entered (All State). "All VA" does not mean the species occurs throughout Virginia, but rather that everywhere it does occur in Virginia, it uses the same primary resources. If, however, species primary resources vary among eco-regions within the state, this must be indicated by assigning distinct resource values to the relevant regions.

### Variance in Time: Lifecycles, Migrations, etc.

Farming practices and species follow seasonal cycles. These will be accounted for in the model, but are not noted in these tables. For species that have primarily aquatic lifecycles - with just a short period on land, always answer based on what the species does during its terrestrial stages. For species that migrate through a state or region, answer based on the species behavior while present in that state or region. For species that hibernate, answer shelter based on the period of longer duration (hibernating or active) but forage for the period when they are foraging.

## Spreadsheet #3: DEFINITIONS

### FORAGE CHOICES

*Select primary forage resource based on time spent foraging (not volume or nutritional value)*

- Omnivore: Equal parts plant and animal/insect materials
- Aerial invertebrates: Insects caught while in the air.
- Tree/shrub invertebrates: Insects gleaned from trees.
- Herbaceous invertebrates: Insects gleaned from herbaceous groundcover.
- Soil invertebrates: Insects found on bare soil surface or within the soil.
- Aquatic small invertebrates: Insects caught in the water.
- Tree/shrub foliage, seeds & fruits: Plant materials from trees
- Herbaceous foliage, seeds & fruits: Plant materials from herbaceous groundcover

- Aquatic plant foliage, seeds & fruit: Materials from aquatic plants (includes shoreline rushes & sedges)
- Pollen/Nectar: /nectar from flowering plants
- Terrestrial vertebrates : Small birds, mammals, reptiles, amphibians
- Aquatic vertebrates and large invertebrates: Fish, crayfish, reptiles, amphibians, etc
- Marine prey: Animals and plants in marine or brackish habitats
- Detritus, fungi, & decaying material: Detritus, fungi, & decaying material

### SHELTER CHOICES

*Select primary day and night shelter resource based on time spent in microhabitat*

- Herbaceous vegetation: Herbaceous ground covers, native or non-native
- Shrub, vine, thicket vegetation: Woody shrubs and vines, native or non-native
- Living tree canopy, bark, or cavity: Live trees, native or non-native
- Aquatic vegetation: Aquatic plants (including wetland sedges and rushes)
- Freshwater: Open water, flowing or still, permanent or ephemeral
- Marine (water & beach): Marine salt and brackish habitats, including beaches
- Standing dead tree (snag): Standing dead tree (snag)
- Fallen logs, leaf litter, & detritus: Fallen logs, leaf litter, & detritus
- Bare ground surface or burrow: Bare soils in open landscape (excluding beaches), surface or burrow
- Ground burrow (dense veg & roots): Burrow under dense vegetation (not bare soils)
- Rocky outcrops: Rocky outcrops, boulder piles, etc
- Caves, mines, & wells: Subterranean habitats, natural or man-made
- Buildings, bridges, & towers: Man-made structures

## Spreadsheets #4, 5, & 6: ASSIGN FORAGE, DAY SHELTER, & NIGHT SHELTER RESOURCES

Example of spreadsheet structure:

### Resource Category: FORAGE

#### Taxon: AMPHIBIANS

##### AMPHIUMIDAE

Amphiuma means	Two-toed amphiuma
Amphiuma pholeter	One-toed amphiuma
Amphiuma tridactylum	Three-toed amphiuma

##### PLETHODONTIDAE

Aneides aeneus	Green salamander
Plethodon aureolus	Tellico salamander
Plethodon cinereus	Redback salamander
<i>etc.</i>	

Entire State	*Piedmont	*Southeast Plains	*Atlantic Coastal Plain	Reliability Score	Comments
<i>*Only enter regional data if species' primary resource differs among regions</i>					