

## RESULTS FOR SPECIES\*

### Modification to Standard Method

#### Viability Analysis and Ranking in CBY

In CBY, unlike in neighboring ecoregions, each target occurrence judged to be viable was also assigned a Priority ranking of “Low”, “Medium” or “High”. This priority ranking was meant to further identify those occurrences in greatest need of conservation, or which were under greatest threat, or which occurred at a high-quality site that captured other conservation targets or biodiversity features of conservation interest (e.g., non-target state-rare species, high-quality natural community occurrences, etc.). Not surprisingly, Priority ranks often paralleled EO Ranks, since EO Ranks generally reflect the quality of the habitat in which target occurrences are found. In some cases, though, A-ranked target occurrences were given a Priority of “Low” (e.g., where they already occurred on protected land with appropriate ecological management) and C-ranked occurrences were assigned a Priority of “High” (e.g., where it was the only occurrence in the state, or where numerous other state-rare species or a unique natural community occurred at the same site).

#### Conservation Goals for Species in CBY

**Table sp5. Conservation goals for species based on rarity and distribution.**

Distribution	GRank		
	G1	G2	G3
<b>Restricted (R)</b>	20	20	30
<b>Limited (L)</b>	10-20	10-20	10-20
<b>Widespread (W)</b>	5-10	5-10	5-10
<b>Peripheral (P)</b>	–	5	5-10

G3 species that are Restricted to the CBY ecoregion, although more common and therefore more likely to survive into the future, will not be included in any other ecoregion’s portfolio. Thus, 30 occurrences was set as the conservation goal for this category of target, rather than the more typical 20.

Where the range of a globally rare target species extends across more than one ecoregion, we made the assumption that occurrences of that target would be included in the portfolios of each of those other ecoregions. It is important to note that this approach to setting conservation goals works only if other ecoregional planning efforts make similar assumptions when setting conservation goals for those portfolios. We plan to evaluate the contributions made by neighboring ecoregions once all of these portfolios are complete.

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\* Anderson, M.G. and S.L. Bernstein (editors). 2003. Results for species. Based on Samson, D.A. 2002. Chesapeake Bay Lowlands Ecoregional Plan; First Iteration. The Nature Conservancy, Conservation Science Support, Northeast & Caribbean Division, Boston, MA.

## Targets Selected

### Primary

Fifty eight species of plants and animals were selected as Primary conservation targets in the Chesapeake Bay Lowlands ecoregion, including 10 vertebrates, 16 invertebrates and 32 plants (Table sp1). Of these, seven (5 animals, 2 plants) are ranked G1 or G1G2 (or equivalent ranks, such as G3T1, etc.), 18 (5 animals, 13 plants) are ranked G2 or G2G3, and 33 (16 animals, 17 plants) are ranked G3 or G3G4. Seven (5 animals, 2 plants) of the CBY Primary species conservation targets are federally listed as Endangered, while eight (4 animals, 4 plants) are federally listed as Threatened (Table sp1).

Among Primary species targets, seven animal species (the Delmarva Fox Squirrel and six invertebrates) and one plant species have distributions Restricted to the ecoregion (Table sp1). With seven additional Primary animal targets classified as having Limited distributions, just over half (14/26) of animal conservation targets are found only in CBY and/or one other adjacent ecoregion. Among Primary plant targets, however, only five species (16%) are Restricted or Limited in their distributions, while almost three-quarters of the species are either Peripheral to the ecoregion or Widespread in their distribution.

**Table sp1. Primary species conservation targets, with global ranks and rangewide distributions.**

Scientific Name	Common Name	Global Rank <sup>1</sup>	Rangewide Distribution
<i>Animals-Vertebrates</i>			
<i>Acipenser brevirostrum</i>	Shortnose Sturgeon	G3 (E)	W
<i>Acipenser oxyrinchus</i>	Atlantic Sturgeon	G3	W
<i>Aimophila aestivalis</i>	Bachman's Sparrow	G3	P
<i>Caretta caretta</i>	Loggerhead	G3 (T)	P
<i>Charadrius melodus</i>	Piping Plover	G3 (E)	W
<i>Clemmys muhlenbergii</i>	Bog Turtle	G3 (T)	P
<i>Corynorhinus rafinesqui</i>	Rafinesque's Big-Eared Bat	G3G4	P
<i>Melospiza georgiana nigrescens</i>	Coastal Plain Swamp Sparrow	G5T3	L
<i>Picoides borealis</i>	Red-Cockaded Woodpecker	G3 (E)	P
<i>Sciurus niger cinereus</i>	Delmarva Fox Squirrel	G5T3 (E)	R
<i>Animals-Invertebrates</i>			
<i>Aeshna mutata</i>	Spatterdock Darner	G3G4	W
<i>Alasmidonta heterodon</i>	Dwarf Wedgemussel	G1G2 (E)	W
<i>Callophrys hesseli</i>	Hessel's Hairstreak	G3G4	L
<i>Callophrys irus</i>	Frosted Elfin	G3	L
<i>Cicindela dorsalis dorsalis</i>	Northeastern Beach Tiger Beetle	G4T2 (T)	L
<i>Cicindela puritana</i>	Puritan Tiger Beetle	G1G2 (T)	L
<i>Epitheca spinosa</i>	Robust Baskettail	G3G4	P

<i>Hydrochus sp 1</i>	Seth Forest Water Scavenger Beetle	G1	R
<i>Photuris bethaniensis</i>	A Lampyrid Firefly	G1?	R
<i>Poanes massasoit chermocki</i>	Chermock's Mulberry Wing	G4T1	R
<i>Problema bulenta</i>	Rare Skipper	G2G3	L
<i>Satyrium kingi</i>	King's Hairstreak	G3G4	P
<i>Somatochlora provocans</i>	Treetop Emerald	G3G4	L
<i>Stygobromus araeus</i>	Tidewater Interstitial Amphipod	G2G3	R
<i>Stygobromus indentatus</i>	Tidewater Amphipod	G2G3	R
<i>Stygobromus phreaticus</i>	Northern Virginia Well Amphipod	G2G3	R
<b>Plants</b>			
<i>Aeschynomene virginica</i>	Sensitive Joint-Vetch	G2 (T)	L
<i>Agalinis acuta</i>	Sandplain Gerardia	G1 (E)	P
<i>Agalinis auriculata</i>	Earleaf Foxglove	G3	P
<i>Agalinis skinneriana</i>	Pale False Foxglove	G3	P
<i>Amaranthus pumilus</i>	Seabeach Amaranth	G2 (T)	P
<i>Carex decomposita</i>	Cypress-Knee Sedge	G3	P
<i>Carex lupuliformis</i>	False Hop Sedge	G3G4	W
<i>Chamaecrista fasciculata</i> var. <i>macroserma</i>	Large-seeded marsh senna	G5T2	R
<i>Chelone cuthbertii</i>	Cuthbert Turtlehead	G3?	P
<i>Coreopsis rosea</i>	Rose Coreopsis	G3	P
<i>Cypripedium kentuckiense</i>	Southern Lady's-Slipper	G3	P
<i>Desmodium ochroleucum</i>	Creamflower Tick-Trefoil	G2G3	P
<i>Euphorbia purpurea</i>	Glade Spurge	G3	P
<i>Fimbristylis perpusilla</i>	Harper's Fimbristylis	G2	L
<i>Gaylussacia brachycera</i>	Box Huckleberry	G2G3	P
<i>Helonias bullata</i>	Swamp-Pink	G3 (T)	P/L
<i>Hypericum adpressum</i>	Creeping St. John's-Wort	G2G3	W
<i>Isotria medeoloides</i>	Small Whorled Pogonia	G2G3 (T)	W
<i>Juncus caesariensis</i>	New Jersey Rush	G2	P
<i>Litsea aestivalis</i>	Pondspice	G3	P
<i>Monotropis odorata</i>	Sweet Pinesap	G3	P
<i>Muhlenbergia torreyana</i>	Torrey's Dropseed	G3	P
<i>Nuphar lutea</i> ssp <i>sagittifolia</i>	Cape Fear Spatterdock	G5T2	P
<i>Oxypolis canbyi</i>	Canby's Dropwort	G2 (E)	P
<i>Panicum hirstii</i>	Hirsts' Panic Grass	G1	L
<i>Polygonum glaucum</i>	Sea-Beach Knotweed	G3?	P

<i>Pycnanthemum torrei</i>	Torrey's Mountain Mint	G2	W
<i>Rhexia aristosa</i>	Awned Meadowbeauty	G3	P
<i>Rhynchospora inundata</i>	Drowned Hornedrush	G3G4	P
<i>Schizaea pusilla</i>	Curly-Grass Fern	G3	P
<i>Scirpus etuberculatus</i>	Canby Bulrush	G3G4	P
<i>Trillium pusillum</i> var. <i>virginianum</i>	Virginia Least Trillium	G3T2	L

<sup>1</sup>Federal rank in parentheses; E = Endangered, T = Threatened

Four animal species and ten plant species on the initial Primary Target list (i.e., ranked G1-G3 and with documented occurrences in CBY) were downgraded to the Secondary target list, or were dropped entirely from the portfolio, again based on expert opinion of the Working Groups. All of the species added to or removed from the Primary Target list, and the reason for their inclusion or exclusion, are presented in Table sp2.

**Table sp2. Plant and animal species added to, or dropped from, the Primary Target list.**

Scientific Name	Common Name	GRank	Reason
<b>Species Added</b>			
<b>Animals</b>			
<i>Picoides borealis</i>	Red-cockaded woodpecker	G3	signif. native species
<i>Melospiza georgiana nigrescens</i>	Coastal plain swamp sparrow	G3	signif. native species; in decline
<i>Corynorhinus rafinesquei</i>	Refinesque's big-eared bat	G3G4	signif. native species
<b>Plants</b>			
<i>Carex decomposita</i>	Cypress-knee sedge	G3	signif. native species
<b>Species Dropped</b>			
<b>Animals</b>			
<i>Elliptio lanceolata</i>	Yellow lance	G2G3	should be ranked G4 or G5
<i>Meropleon titan</i>	A noctuid moth	G2G4	should be ranked G4 or G5
<i>asmigona subviridis</i>	Green floater	G3	should be ranked G4 or G5
<i>Lampsilis cariosa</i>	Yellow lampmussel	G3G4	should be ranked G4 or G5
<b>Plants</b>			
<i>Schwalbea americana</i>	Chaffseed	G2	extirpated from ecoregion
<i>Alnus maritima</i>	Seaside alder	G3	Secondary list; abundant in CBY
<i>Sabatia kennedyana</i>	?	G3	single EO is introduction
<i>Pycnanthemum setosum</i>	Awned mountain mint	G3?	should be ranked G4 or G5
<i>Carx barratii</i>	Barrett's sedge	G3G4	should be ranked G4
<i>Carex mitchelliana</i>	Mitchell's sedge	G3G4	may be common; need more info
<i>Juglans cinerea</i>	Butternut	G3G4	may be common; need more info

<i>Scleria reticularis</i>	Reticulated nutrush	G3G4	should be ranked G4 or G5
<i>Cardamine longii</i>	Long's bittercress	G3Q	may be common; need more info
<i>Bidens bidentoides</i> var. <i>mariana</i>	Maryland bur-marigold	G3T3	Secondary list; abundant in CBY

As would be expected in this coastal plain ecoregion, the vast majority of the Primary targets are species that occur in, or are associated with, aquatic, wetland or shoreline habitats. Five of the ten vertebrate targets, 14 of the 16 invertebrate targets, and 21 of the 32 plant targets (69% overall) would be categorized as aquatic, wetland or shoreline habitat species. Some of the invertebrate species, while not aquatic species per se, utilize host plant species that grow in aquatic or wetland habitats (e.g., Hessel's hairstreak). The proportion of Secondary species targets that are found in aquatic, wetland or shoreline habitats is even higher than that for Primary species targets (see below).

### Secondary

Forty six species of plants (8) and animals (38; 17 vertebrates and 21 invertebrates) native to the ecoregion were identified as secondary conservation targets (Table sp3). Secondary targets are generally state- but not globally rare species for which there is some concern about their long-term viability within the ecoregion, due to declining populations, increasing threats, and so on. The majority of these species in CBY are ranked G4 or G5, although three of the secondary plant species are ranked G3 (or G3T3). The latter are all Restricted or Limited species that grow in tidal waters at a moderately large number of sites in the ecoregion; in spite of their rarity rank, their viability status in CBY is secure because their habitats are under low levels of threat.

**Table sp3. Secondary species conservation targets, with global ranks and rangewide distributions.**

Scientific Name	Common Name	Global Rank	Rangewide Distribution
<i>Animals-Vertebrates</i>			
<i>Ambystoma mabeei</i>	Mabee's Salamander	G4	L
<i>Ambystoma tigrinum</i>	Tiger Salamander	G5	W
<i>Anas rubripes</i>	American Black Duck	G5	W
<i>Botaurus lentiginosus</i>	American Bittern	G4	W
<i>Certhia americana</i>	Brown Creeper	G5	P
<i>Circus cyaneus</i>	Northern Harrier	G5	W
<i>Haematopus palliatus</i>	American Oystercatcher	G5	W
<i>Helmitheros vermivorus</i>	Worm-Eating Warbler	G5	W
<i>Hyla gratiosa</i>	Barking Treefrog	G5	P
<i>Laterallus jamaicensis</i>	Black Rail	G4	W
<i>Limnothlypis swainsonii</i>	Swainson's Warbler	G4	P
<i>Oporornis formosus</i>	Kentucky Warbler	G5	W
<i>Protonotaria citrea</i>	Prothonotary Warbler	G5	W
<i>Rana virgatipes</i>	Carpenter Frog	G5	P

<i>Rynchops niger</i>	Black Skimmer	G5	W
<i>Sitta pusilla</i>	Brown-Headed Nuthatch	G5	P
<i>Wilsonia citrina</i>	Hooded Warbler	G5	W
<b>Animals-Invertebrates</b>			
<i>Alasmidonta undulata</i>	Triangle Floater	G4	W
<i>Anax longipes</i>	Comet Darner	G5	L
<i>Argia bipunctulata</i>	Seepage Dancer	G4	W
<i>Atlides halesus</i>	Great Purple Hairstreak	G5	P
<i>Cicindela abdominalis</i>	A Tiger Beetle	G5	P
<i>Cicindela dorsalis media</i>	White Tiger Beetle	G4	L
<i>Cicindela gratiosa</i>	A Tiger Beetle	G5	P
<i>Cicindela lepida</i>	Little White Tiger Beetle	G4	P
<i>Cordulegaster erronea</i>	Tiger Spiketail	G4	L
<i>Enallagma dubium</i>	Burgundy Bluet	G5	W
<i>Enallagma pallidum</i>	Pale Bluet	G4	W
<i>Enallagma weewa</i>	Blackwater Bluet	G5	W
<i>Gomphus rogersi</i>	Sable Clubtail	G4	W
<i>Isoparce cupressi</i>	Cypress Sphinx	G4	P
<i>Leptodea ochracea</i>	Tidewater Mucket	G4	W
<i>Libellula flavida</i>	Yellow-Sided Skimmer	G5	W
<i>Ligumia nasuta</i>	Eastern Pondmussel	G4G5	W
<i>Nannothemis bella</i>	Elfin Skimmer	G5	W
<i>Nehalennia irene</i>	Sedge Sprite	G5	W
<i>Stylurus laurae</i>	Laura's Clubtail	G4	L
<i>Tachopteryx thoreyi</i>	Gray Petaltail	G4	L
<b>Plants</b>			
<i>Alnus maritima</i>	Seaside Alder	G3	L
<i>Bidens bidentoides</i> var. <i>mariana</i>	Maryland Bur-marigold	G3T3	R
<i>Carex vesicaria</i>	Inflated Sedge	G5	P
<i>Eriocaulon parkeri</i>	Parker's Pipewort	G3	L
<i>Lysimachia thyrsoiflora</i>	Water Loosestrife	G5	P
<i>Minuartia caroliniana</i>	Pine-Barren Sandwort	G5	W
<i>Rhynchospora harperi</i>	Harper Beakrush	G4	W
<i>Rhynchospora oligantha</i>	Few-Flowered Beaked-Rush	G4	P

One group of Secondary species, the birds, deserves special attention. The Conservancy's Partners in Flight (PIF) program has developed a list of native bird species for each ecoregion

that they recommend be considered as conservation targets in the respective ecoregional portfolios. In CBY, the Animal Working Group reviewed the Partners in Flight list (Table sp4), but made their own determination of which birds should be Secondary targets and which should not. Six of the species recommended by Partners in Flight were designated as Secondary targets in CBY (Piping plover was a Primary target), while six others were not included as targets (Table sp4). However, seven additional bird species not on the PIF list for CBY were included as Secondary targets in the ecoregional portfolio (Table sp3).

**Table sp4. Bird species recommended as conservation targets in CBY by Partners in Flight and those species included as Primary or Secondary targets.**

<b>PIF Conservation Target Species</b>	<b>Target Status in CBY Portfolio</b>
American Black Duck	Secondary
Black rail	Secondary
Piping plover	Primary
Willet	none
Chuck-will's widow	none
Brown-headed nuthatch (local pops.)	Secondary
Wood thrush	none
Prairie warbler	none
Prothonotary warbler	Secondary
Worm-eating warbler	Secondary
Kentucky warbler	Secondary
Saltmarsh sharp-tailed sparrow	none
Seaside sparrow	none

**Portfolio Results**

**Primary Targets**

For the 58 Primary species targets in CBY, 303 of 437 (69%) known occurrences were judged to be viable, and were included in the portfolio (Table sp6, Map 6). Three Primary animal targets (Rafinesque's Big-Eared Bat, Coastal Plain Swamp Sparrow, Red-Cockaded Woodpecker) and one Primary plant target (Cypress-Knee Sedge) had no occurrences recorded in BCD in the ecoregion. Two additional Primary animal targets (Shortnose Sturgeon, Atlantic Sturgeon), and one Primary plant target (Sandplain gerardia) did not have any viable occurrences in the ecoregion, so no portfolio sites exist for these seven species targets. Notably, too, 16 other species targets (6 animals, 10 plants) are represented by only a single viable population in the ecoregion. Thus, only 60% (35) of all Primary species targets in the ecoregion are represented by more than one occurrence in the portfolio (Table sp6).

**Table sp6. Total number of occurrences, portfolio occurrences, and priority occurrences of Primary species conservation targets in the ecoregion.**

<b>Scientific Name</b>	<b>Common Name</b>	<b>Number of Occurrences</b>		
		<b>Total</b>	<b>Viable</b>	<b>Priority<sup>1</sup></b>

<b>Animals-Vertebrates</b>				
<i>Acipenser brevirostrum</i>	Shortnose Sturgeon	3	0	0
<i>Acipenser oxyrinchus</i>	Atlantic Sturgeon	1	0	0
<i>Aimophila aestivalis</i>	Bachman's Sparrow	1	1	1
<i>Caretta caretta</i>	Loggerhead	4	4	4
<i>Charadrius melodus</i>	Piping Plover	22	13	13
<i>Clemmys muhlenbergii</i>	Bog Turtle	4	1	1
<i>Corynorhinus rafinesqui</i>	Rafinesque's Big-Eared Bat	0	0	0
<i>Melospiza georgiana nigrescens</i>	Coastal Plain Swamp Sparrow	0	0	0
<i>Picoides borealis</i>	Red-Cockaded Woodpecker	0	0	0
<i>Sciurus niger cinereus</i>	Delmarva Fox Squirrel	30	30	13
<b>Total</b>		<b>65</b>	<b>49</b>	<b>32</b>
<b>Animals-Invertebrates</b>				
<i>Aeshna mutata</i>	Spatterdock Darner	1	1	1
<i>Alasmidonta heterodon</i>	Dwarf Wedgemussel	5	3	2
<i>Callophrys hesseli</i>	Hessel's Hairstreak	4	3	2
<i>Callophrys irus</i>	Frosted Elfin	7	4	4
<i>Cicindela dorsalis dorsalis</i>	Northeastern Beach Tiger Beetle	33	23	14
<i>Cicindela puritana</i>	Puritan Tiger Beetle	16	14	14
<i>Epitheca spinosa</i>	Robust Baskettail	3	2	2
<i>Hydrochus sp 1</i>	Seth Forest Water Scavenger Beetle	1	1	1
<i>Photuris bethaniensis</i>	A Lampyrid Firefly	7	7	7
<i>Poanes massasoit chermocki</i>	Chermock's Mulberry Wing	1	1	1
<i>Problema bulenta</i>	Rare Skipper	5	5	4
<i>Satyrium kingi</i>	King's Hairstreak	5	4	2
<i>Somatochlora provocans</i>	Treetop Emerald	4	3	3
<i>Stygobromus araeus</i>	Tidewater Interstitial Amphipod	8	2	0
<i>Stygobromus indentatus</i>	Tidewater Amphipod	3	2	1
<i>Stygobromus phreaticus</i>	Northern Virginia Well Amphipod	1	1	0_
<b>Total</b>		<b>104</b>	<b>76</b>	<b>58</b>
<b>Total – Animals</b>		<b>169</b>	<b>125</b>	<b>90</b>
<b>Plants</b>				
<i>Aeschynomene virginica</i>	Sensitive Joint-Vetch	23	15	14
<i>Agalinis acuta</i>	Sandplain Gerardia	1	0	0
<i>Agalinis auriculata</i>	Earleaf Foxglove	1	1	1
<i>Agalinis skinneriana</i>	Pale False Foxglove	2	2	2
<i>Amaranthus pumilus</i>	Seabeach Amaranth	7	7	7

<i>Carex decomposita</i>	Cypress-Knee Sedge	0	0	0
<i>Carex lupuliformis</i>	False Hop Sedge	13	5	3
<i>Chamaecrista fasciculata</i> var <i>macrosperma</i>	Large-seeded marsh senna	2	2	1
<i>Chelone cuthbertii</i>	Cuthbert Turtlehead	5	2	2
<i>Coreopsis rosea</i>	Rose Coreopsis	3	3	1
<i>Cypripedium kentuckiense</i>	Southern Lady's-Slipper	1	1	1
<i>Desmodium ochroleucum</i>	Creamflower Tick-Trefoil	1	1	1
<i>Euphorbia purpurea</i>	Glade Spurge	1	1	1
<i>Fimbristylis perpusilla</i>	Harper's Fimbristylis	34	34	27
<i>Gaylussacia brachycera</i>	Box Huckleberry	6	5	4
<i>Helonias bullata</i>	Swamp-Pink	51	36	19
<i>Hypericum adpressum</i>	Creeping St. John's-Wort	14	10	5
<i>Isotria medeoloides</i>	Small Whorled Pogonia	13	2	1
<i>Juncus caesariensis</i>	New Jersey Rush	20	10	8
<i>Litsea aestivalis</i>	Pondspice	2	1	1
<i>Monotropsis odorata</i>	Sweet Pinesap	4	2	1
<i>Muhlenbergia torreyana</i>	Torrey's Dropseed	1	1	1
<i>Nuphar lutea</i> ssp <i>sagittifolia</i>	Cape Fear Spatterdock	5	3	0
<i>Oxypolis canbyi</i>	Canby's Dropwort	1	1	1
<i>Panicum hirstii</i>	Hirsts' Panic Grass	1	1	1
<i>Polygonum glaucum</i>	Sea-Beach Knotweed	15	8	8
<i>Pycnanthemum torrei</i>	Torrey's Mountain Mint	4	1	1
<i>Rhexia aristosa</i>	Awned Meadowbeauty	7	2	2
<i>Rhynchospora inundata</i>	Drowned Hornedrush	7	5	4
<i>Schizaea pusilla</i>	Curly-Grass Fern	1	1	1
<i>Scirpus etuberculatus</i>	Canby Bulrush	4	3	3
<i>Trillium pusillum</i> var. <i>virginianum</i>	Virginia Least Trillium	18	12	5
<b>Total – Plants</b>		<b>268</b>	<b>178</b>	<b>127</b>
<b>Total – All species</b>		<b>437</b>	<b>303</b>	<b>217</b>

<sup>1</sup>Occurrences at 10Year Action and Partner Lead sites.

At the other end of the scale, four animal targets and nine plant targets have more than 10 known occurrences in the ecoregion, and for all of those species except one plant (False hop sedge), at least 10 of their populations were included in the portfolio as viable (Table spr6). All four of these animal targets had more than 20 total occurrences, and two (Delmarva fox squirrel, Northeastern beach tiger beetle) also had at least 20 occurrences that were viable. Among the abundant plant targets, four species also had more than 20 known occurrences, but for only two

of those were 20 or more of their respective populations viable. Forty two targets had fewer than the average number of known occurrences (7.5 for 58 species, or 8.1 if species with no occurrences in CBY are excluded) and 45 had fewer than the average number of viable occurrences (5.2 for 58 species, or 5.6 for 54 species). The average number of occurrences per species for plant targets in CBY (8.4) was higher than the average for animal targets (6.5) if all species are included, but less so if species without occurrences are excluded (8.6 for plants vs. 7.3 for animals).

The proportion of known occurrences that were viable and included in the portfolio was slightly higher for animals as a group (74%) than for plants (66%). Among species, proportional viability varied considerably, for both rarer and more common species (Table sp6). For nine animal targets and 13 plant targets, all known occurrences in the ecoregion were judged to be viable and included in the portfolio.

Conservation focus on both animal and plant species targets in CBY is high; separately by group or combined, 72% of the viable occurrences known in CBY occur at sites identified as 10Year Action or Partner Lead sites (Table sp6). Many of these populations are at current Conservancy preserves, state-owned natural areas, forests or parks, or on federal lands (parks, national seashores, military bases). Fully half (26) of all species with occurrences in CBY have all of their viable populations identified as conservation priorities in the next 10 years, and nine other species have all but one viable population already protected or targeted for conservation.

### **Secondary Targets**

For the 46 Secondary species targets in CBY, there were 376 known occurrences (i.e., in state BCD's) of which 294 (78%) were judged to be viable (Table sp7). Eight Secondary animal targets (4 birds, a tiger beetle and 3 odonates) and one plant target (Water loosestrife) had no occurrences recorded in BCD in the ecoregion. One Secondary species (Cypress sphinx) had no viable occurrences, and seven additional species (5 animals, 2 plants) had only one viable occurrence in the ecoregion. Thus the overall proportion of Secondary species which had two or more viable occurrences in CBY (65%) was similar to that for Primary species (60%).

As with Primary targets, the distribution of numbers of occurrences per species for Secondary targets was strikingly bimodal; only nine species (6 vertebrates, 3 plants) had more than 10 total occurrences each, and only six of those (3 animals, 3 plants) had more than 20 (Table sp7) in the ecoregion. Only a single animal Secondary target (Carpenter frog) had more than 20 viable occurrences (3 others had more than 10), while all three plant Secondary targets with more than 20 total occurrences also had more than 20 viable occurrences. Thirty six Secondary species – including all of the invertebrates – had fewer than the average number of total occurrences (8.2 for 46 species, 10.2 if species without occurrences are excluded). Thirty six species also had less than the average number of viable occurrences (6.4 for 46 species, 7.9 for 37 species). Secondary plant targets had strikingly higher average numbers of total and viable occurrences per species (20.5 and 16.1, respectively) than did Secondary animal targets (5.6 for total, 4.3 for viable only), and these differences remained if species without occurrences were excluded from the calculations. As expected, the average number of total and viable occurrences was higher for Secondary than for Primary species, both within plants and animals and for all species combined. And while overall proportional viability of occurrences was higher for Secondary than Primary targets, animal (78%) and plant (79%) Secondary targets did not differ.

Slightly more than half of all viable occurrences of Secondary targets were captured at sites included in the portfolio for viable occurrences of Primary species or natural communities (Table sp7). Secondary animal targets were captured at a higher rate (64%) than plant targets (47%), and within animals, proportional capture of invertebrates (78%) was higher than for vertebrates (58%). Many of the sites where Secondary targets were captured were also identified as 10Year Action or Partner Lead sites, so 79% of all Secondary species occurrences (73% of plants, 82% of animals) captured in the portfolio are found at sites currently protected or targeted for conservation activity in the near future. Overall, 44% of the known populations of Secondary targets (34% of plants, 52% of animals) occur at priority conservation sites in the ecoregion.

**Table sp7. Total, viable, portfolio, and priority occurrences of Secondary species conservation targets.**

Scientific Name	Common Name	Number of Occurrences			
		Total	Viable	Portfolio <sup>1</sup>	Priority <sup>2</sup>
<i>Animals-Vertebrates</i>					
<i>Ambystoma mabeei</i>	Mabee's Salamander	7	5	2	2
<i>Ambystoma tigrinum</i>	Tiger Salamander	21	16	8	6
<i>Anas rubripes</i>	American Black Duck	0	0	0	0
<i>Botaurus lentiginosus</i>	American Bittern	7	6	1	0
<i>Certhia americana</i>	Brown Creeper	4	4	1	1
<i>Circus cyaneus</i>	Northern Harrier	25	16	3	3
<i>Haematopus palliatus</i>	American Oystercatcher	9	9	9	9
<i>Helmitheros vermivorus</i>	Worm-Eating Warbler	0	0	0	0
<i>Hyla gratiosa</i>	Barking Treefrog	14	13	10	7
<i>Laterallus jamaicensis</i>	Black Rail	10	7	1	0
<i>Limnothlypis swainsonii</i>	Swainson's Warbler	4	3	2	1
<i>Oporornis formosus</i>	Kentucky Warbler	0	0	0	0
<i>Protonotaria citrea</i>	Prothonotary Warbler	0	0	0	0
<i>Rana virgatipes</i>	Carpenter Frog	26	25	20	16
<i>Rynchops niger</i>	Black Skimmer	15	5	5	4
<i>Sitta pusilla</i>	Brown-Headed Nuthatch	2	2	2	2
<i>Wilsonia citrina</i>	Hooded Warbler	7	5	3	3
<b>Total</b>		<b>151</b>	<b>116</b>	<b>67</b>	<b>54</b>
<i>Animals-Invertebrates</i>					
<i>Alasmidonta undulata</i>	Triangle Floater	1	1	1	0
<i>Anax longipes</i>	Comet Darner	4	2	2	2
<i>Argia bipunctulata</i>	Seepage Dancer	5	5	3	3
<i>Atlides halesus</i>	Great Purple Hairstreak	8	3	3	2
<i>Cicindela abdominalis</i>	A Tiger Beetle	1	1	0	0

<i>Cicindela dorsalis media</i>	White Tiger Beetle	2	1	1	1
<i>Cicindela gratiosa</i>	A Tiger Beetle	0	0	0	0
<i>Cicindela lepida</i>	Little White Tiger Beetle		6	6	6
<i>Cordulegaster erronea</i>	Tiger Spiketail	0	0	0	0
<i>Enallagma dubium</i>	Burgundy Bluet	6	5	5	5
<i>Enallagma pallidum</i>	Pale Bluet	2	2	2	2
<i>Enallagma weewa</i>	Blackwater Bluet	5	5	4	3
<i>Gomphus rogersi</i>	Sable Clubtail	3	2	1	1
<i>Isoparce cupressi</i>	Cypress Sphinx	1	0	0	0
<i>Leptodea ochracea</i>	Tidewater Mucket	5	5	3	1
<i>Libellula flavida</i>	Yellow-Sided Skimmer	0	0	0	0
<i>Ligumia nasuta</i>	Eastern Pondmussel	2	1	0	0
<i>Nannothemis bella</i>	Elfin Skimmer	7	7	5	4
<i>Nehalennia irene</i>	Sedge Sprite	1	1	1	1
<i>Stylurus laurae</i>	Laura's Clubtail	0	0	0	0
<i>Tachopteryx thoreyi</i>	Gray Petaltail	2	2	1	1
<b>Total</b>		<b>61</b>	<b>49</b>	<b>38</b>	<b>32</b>
<b>Total – Animals</b>		<b>212</b>	<b>165</b>	<b>105</b>	<b>86</b>
<b>Plants</b>					
<i>Alnus maritima</i>	Seaside Alder	66	60	40	27
<i>Bidens bidentoides</i> var. <i>mariana</i>	Maryland Bur-marigold	30	21	1	1
<i>Carex vesicaria</i>	Inflated Sedge	4	2	1	1
<i>Eriocaulon parkeri</i>	Parker's Pipewort	55	39	14	10
<i>Lysimachia thyrsoiflora</i>	Water Loosestrife	0	0	0	0
<i>Minuartia caroliniana</i>	Pine-Barren Sandwort	1	1	1	1
<i>Rhynchospora harperi</i>	Harper Beakrush	7	5	3	3
<i>Rhynchospora oligantha</i>	Few-Flowered Beaked-Rush	1	1	1	1
<b>Total – Plants</b>		<b>164</b>	<b>129</b>	<b>60</b>	<b>44</b>
<b>Total – All Species</b>		<b>376</b>	<b>294</b>	<b>165</b>	<b>130</b>

<sup>1</sup>Occurrences found at sites included in portfolio for viable Primary species targets and/or natural communities.

<sup>2</sup>Occurrences at 10Year Action and Partner Lead sites.

## Progress Towards Conservation Goals

The 303 viable occurrences of Primary species targets in CBY represented 38 percent of the maximum conservation goal for species in the ecoregion (Table sp8). Achievement of goals among species varied dramatically, from as low as zero (5 vertebrates, 2 plants) to as high as 200% (1 plant). Conservation goals were met or exceeded for only three animal and five plant species, while 22 animal and 20 plant targets fell below 50% of their individual maximum

conservation goals (Table sp8). This in spite of the fact that conservation goals for 38 of the 58 species were set at 10 or fewer occurrences in the ecoregion.

Among groups, vertebrates and invertebrates had similar success rates, but both were notably lower than plants as a group (Table sp8). If the four target species (3 animals, 1 plant) which had no occurrences at all in the ecoregion are omitted, the average achievement of goals increases to 41% for vertebrates, to 31% for all animals as a group, and to 41% for all species targets together. Since 69% of all known occurrences of species targets in the ecoregion were judged to be viable (above), the overall “deficit” in reaching goals is due primarily to insufficient records of species occurrences, and less to poor viability of the known populations.

**Table sp8. Total number of viable occurrences, conservation goal, and percent of goal for Primary species conservation targets in the ecoregion.**

Scientific Name	Common Name	Viable	Goal	% <sup>1</sup>
<b>Animals-Vertebrates</b>				
<i>Acipenser brevirostrum</i>	Shortnose Sturgeon	0	5–10	0
<i>Acipenser oxyrinchus</i>	Atlantic Sturgeon	0	5–10	0
<i>Aimophila aestivalis</i>	Bachman's Sparrow	1	5–10	10
<i>Caretta caretta</i>	Loggerhead	4	5–10	40
<i>Charadrius melodus</i>	Piping Plover	13	5–10	130
<i>Clemmys muhlenbergii</i>	Bog Turtle	1	5–10	10
<i>Corynorhinus rafinesqui</i>	Rafinesque's Big-Eared Bat	---	5–10	0
<i>Melospiza georgiana nigrescens</i>	Coastal Plain Swamp Sparrow	---	10–20	0
<i>Picoides borealis</i>	Red-Cockaded Woodpecker	---	5–10	0
<i>Sciurus niger cinereus</i>	Delmarva Fox Squirrel	30	30	100
<b>Total</b>		<b>49</b>	<b>80–130</b>	<b>29</b>
<b>Animals-Invertebrates</b>				
<i>Aeshna mutata</i>	Spatterdock Darner	1	5–10	10
<i>Alasmidonta heterodon</i>	Dwarf Wedgemussel	3	5–10	30
<i>Callophrys hesseli</i>	Hessel's Hairstreak	3	10–20	15
<i>Callophrys irus</i>	Frosted Elfin	4	10–20	20
<i>Cicindela dorsalis dorsalis</i>	Northeastern Beach Tiger Beetle	23	10–20	115
<i>Cicindela puritana</i>	Puritan Tiger Beetle	14	10–20	70
<i>Epithea spinosa</i>	Robust Baskettail	2	5–10	20
<i>Hydrochus sp 1</i>	Seth Forest Water Scavenger Beetle	1	20	5
<i>Photuris bethaniensis</i>	A Lampyrid Firefly	7	20	35
<i>Poanes massasoit chermocki</i>	Chermock's Mulberry Wing	1	20	5
<i>Problema bulenta</i>	Rare Skipper	510–20	25	
<i>Satyrium kingi</i>	King's Hairstreak	45–10	40	
<i>Somatochlora provocans</i>	Treetop Emerald	310–20	15	

<i>Stylobromus araeus</i>	Tidewater Interstitial Amphipod	2	20	10
<i>Stylobromus indentatus</i>	Tidewater Amphipod	2	30	7
<i>Stylobromus phreaticus</i>	Northern Virginia Well Amphipod	1	20	5
<b>Total</b>		<b>76</b>	<b>210–290</b>	<b>27</b>
<b>Total – Animals</b>		<b>125</b>	<b>290–420</b>	<b>28</b>
<b>Plants</b>				
<i>Aeschynomene virginica</i>	Sensitive Joint-Vetch	15	10–20	75
<i>Agalinis acuta</i>	Sandplain Gerardia	0	5	0
<i>Agalinis auriculata</i>	Earleaf Foxglove	1	5–10	10
<i>Agalinis skinneriana</i>	Pale False Foxglove	2	5–10	20
<i>Amaranthus pumilus</i>	Seabeach Amaranth	7	5	140
<i>Carex decomposita</i>	Cypress-Knee Sedge	---	5–10	0
<i>Carex lupuliformis</i>	False Hop Sedge	5	5–10	50
<i>Chamaecrista fasciculata</i> var <i>macrosperma</i>	Large-seeded marsh senna	2	30	7
<i>Chelone cuthbertii</i>	Cuthbert Turtlehead	2	5–10	20
<i>Coreopsis rosea</i>	Rose Coreopsis	3	5–10	30
<i>Cypripedium kentuckiense</i>	Southern Lady's-Slipper	1	5–10	10
<i>Desmodium ochroleucum</i>	Creamflower Tick-Trefoil	1	5	20
<i>Euphorbia purpurea</i>	Glade Spurge	1	5–10	10
<i>Fimbristylis perpusilla</i>	Harper's Fimbristylis	34	10–20	170
<i>Gaylussacia brachycera</i>	Box Huckleberry	5	5–10	50
<i>Helonias bullata</i>	Swamp-Pink	36	10–20	180
<i>Hypericum adpressum</i>	Creeping St. John's-Wort	10	5–10	100
<i>Isotria medeoloides</i>	Small Whorled Pogonia	2	5–10	20
<i>Juncus caesariensis</i>	New Jersey Rush	10	5	200
<i>Litsea aestivalis</i>	Pondspice	1	5–10	10
<i>Monotropsis odorata</i>	Sweet Pinesap	2	5–10	20
<i>Muhlenbergia torreyana</i>	Torrey's Dropseed	1	5–10	10
<i>Nuphar lutea</i> ssp <i>sagittifolia</i>	Cape Fear Spatterdock	3	5	60
<i>Oxypolis canbyi</i>	Canby's Dropwort	1	5	20
<i>Panicum hirstii</i>	Hirsts' Panic Grass	1	10–20	5
<i>Polygonum glaucum</i>	Sea-Beach Knotweed	8	5–10	80
<i>Pycnanthemum torrei</i>	Torrey's Mountain Mint	1	5–10	10
<i>Rhexia aristosa</i>	Awed Meadowbeauty	2	5–10	20
<i>Rhynchospora inundata</i>	Drowned Hornedrush	5	5–10	50
<i>Schizaea pusilla</i>	Curly-Grass Fern	1	5–10	10

<i>Scirpus etuberculatus</i>	Canby Bulrush	3	5–10	30
<i>Trillium pusillum</i> var. <i>virginianum</i>	Virginia Least Trillium	12	10–20	60
<b>Total – Plants</b>		<b>178</b>	<b>210–360</b>	<b>47</b>
<b>Total – All species</b>		<b>303</b>	<b>500–780</b>	<b>38</b>

<sup>1</sup>For goals given as ranges, percent calculated based on maximum value in range.

### Natural Heritage Sites for Species and Natural Community Targets

The 536 natural community and Primary species target occurrences in the CBY portfolio (above; Map 1) are found at 274 different named Natural Heritage Program sites in the three states (Table sp9; see Appendix sp1 for details). Almost every Heritage site in the portfolio has at least one viable occurrence of a Primary species target (data not shown), and 99 Heritage sites had at least one viable occurrence of a natural community target.

The number of natural community types in Maryland included in the ecoregional portfolio is low - though with good field sampling effort per type – reflecting the incomplete status of the natural community classification in that state (Table sp9). While Delaware has the most diverse natural community portfolio, Virginia has a greater number of documented occurrences (especially per type) and the largest number of Heritage sites for viable natural communities. Details of occurrences of natural community targets by site are available in the state-specific Excel spreadsheets used for portfolio review, and which have been provided to each state Chapter and Natural Heritage Program.

Unlike with natural communities, Maryland had the largest number of Primary species captured at portfolio sites (Table sp9), perhaps reflecting both the amount of land area in CBY and the landscape and habitat heterogeneity provided by having lands on both the western and eastern shores of the Chesapeake Bay. Documentation of Primary species occurrences, relative to the number of target species, was similar across states. Somewhat surprisingly, Delaware had the largest number of Secondary species captured at portfolio sites, and by far the largest total number of occurrences of Secondary species. Details on the numbers of occurrences of each Primary and Secondary species target state by state are provided in Appendix sp2.

**Table sp9. State-by-state summary of Natural Heritage sites, natural communities, and Primary and Secondary species in the ecoregional portfolio.**

<b>Total Number</b>	<b>DE</b>	<b>MD</b>	<b>VA</b>
Natural Heritage Sites	54	117	103
Natural Community Types	37	16	31
Natural Community Occurrences (Sites)	68 (36)	53(19)	95(44)
Primary Species Targets	23	34	20
Primary Species Occurrences	79	128	96
Secondary Species Targets <sup>1</sup>	26	22	17
Secondary Species Occurrences <sup>1</sup>	98	47	21

<sup>1</sup>Only those captured at portfolio sites.