



Managing ROWs for pollinators: Patterns of bee and butterfly diversity in Idaho roadsides

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Study Overview: Research Questions

- What qualities make roadsides good habitat for pollinators?
- How does road class (highway type) and NDVI relate to pollinator abundance and diversity?
- Where are roadside hotspots for bee and butterfly diversity?
- How can we manage roadsides to benefit pollinators?
 - Timing / Extent of Mowing
 - Herbicide / Weed Control
 - Targeted Restoration / Plantings
- What conditions predict monarch and milkweed habitat suitability along roadsides? How can roadsides support threatened monarch populations?

Study Design – Data Collected

Milkweed Rapid Assessment

Along 600+ miles of highway:

- Location of all milkweed observed in rights-of-way (1,363 patches)
- For milkweed patches larger than 50 stems:
- Size and density of milkweed patch
- Other floral resources
- Adjacent land use
- Dominant species in right-of-way

Stratified Plot Surveys

At 63 transects:

- Butterfly species & number
- Flowering plant spp. & flower number
- Adjacent land use
- Dominant species in right-of-way
- Presence of milkweed in ROW

At 27 (of 63) transects:

- Bee specimens (species and number)
from 6 pan traps

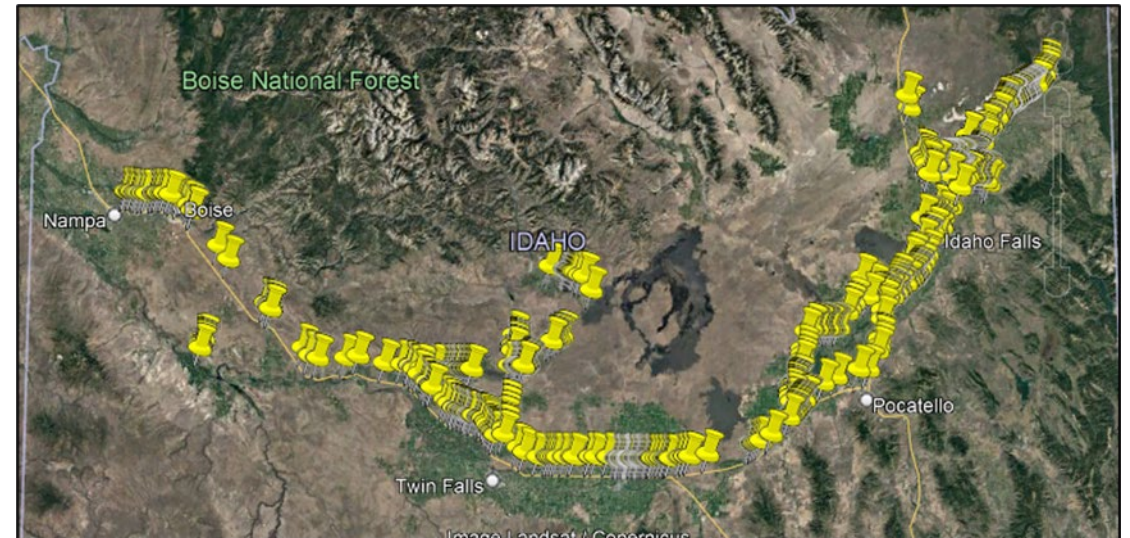
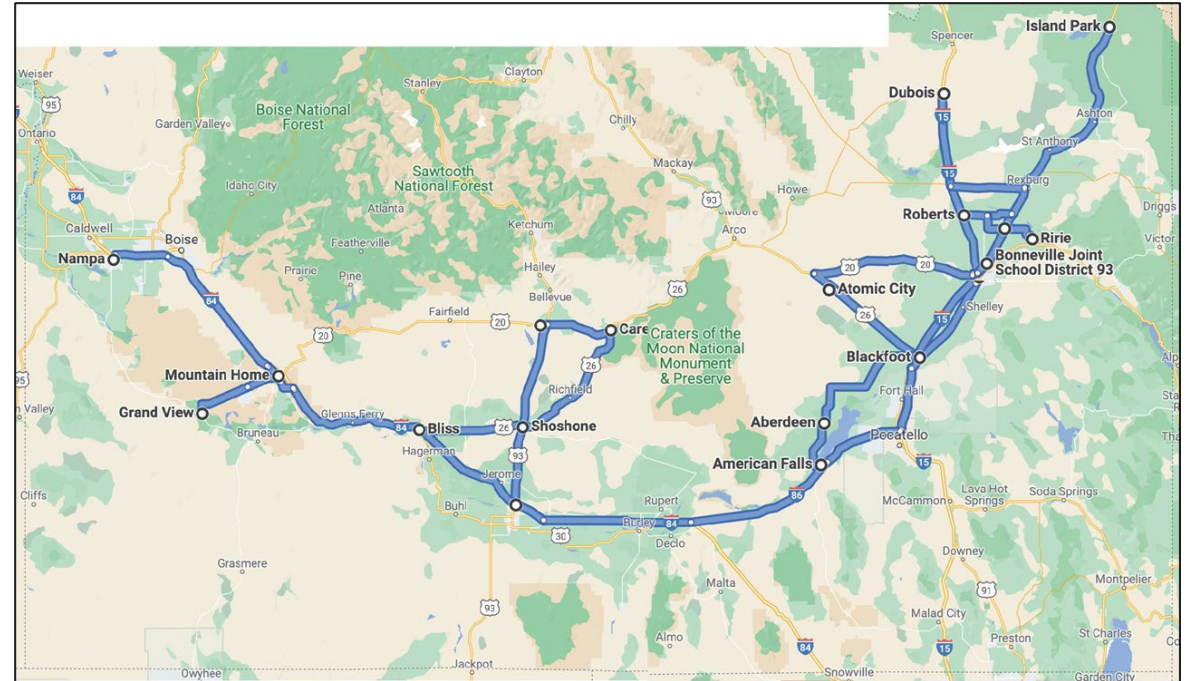
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Results: Assessing Bee Diversity and Abundance

- Least Squares Model suggests that **NDVI, Highway Class, floral abundance, and floral richness** are all important variables in explaining bee richness *and* bee abundance.

Effect Tests					
Bee Richness					
Source	Nparm	DF	Sum of Squares	F Ratio	Prob > F
AdjLandCategory	3	3	69.32306	2.4213	0.0783
log(flora abundance)	1	1	136.82288	14.3370	0.0005*
log(flora richness)	1	1	115.04887	12.0554	0.0012*
NDVI	1	1	75.28378	7.8886	0.0073*
Predictor Variables-HwyClass	2	2	125.97722	6.6003	0.0031*

- Larger, more intensively managed highways (e.g. **Interstates**) had significantly **fewer bees** and fewer bee species than smaller highways in our study area.
- Sites with **lower NDVI** (typically drier, less lush areas) had **more bees** and more bee species than sites with high NDVI.

Results: Assessing Butterfly Diversity and Abundance

- Least Squares modeling suggests that **floral abundance** (but not NDVI or highway class) is significantly associated with butterfly richness and abundance.

Effect Summary		
Source	LogWorth	PValue
log(flora abundance)	2.117	0.00764
AdjLandCategory	0.728	0.18712
HwyClass	0.308	0.49207
NDVI	0.028	0.93701
log(flora richness)	0.024	0.94710

- Other factors, like the presence of specific host plants, may explain much of the variation in butterfly richness and abundance.
- A PERMANOVA test revealed that butterfly species composition differs with NDVI class ($p = 0.001$) and floral richness ($p = 0.027$).

Best Management Practices for ROW Mowing to Protect Idaho Pollinators

- Potential negative impacts:
 - Reduction of floral resource + host plant availability
 - Disturbing or killing of nesting/developing pollinators
 - Benefit to disturbance-prone (often invasive) species
- To reduce these negative impacts:
 - Mow only clear zones (1-3 m next to pavement), never to fenceline!
 - Keep narrower clear zones for smaller, less trafficked roads.
 - Outside of clear zones, if needed, mow road verges only very early and/or late in the growing season (e.g. April or September, not May-August)
 - Where possible, leave perennial shrubs and standing woody stems for nesting bees



Best Management Practices for ROW Spraying to Protect Idaho Pollinators

- Potential negative impacts:
 - Killing or sublethal effects on adult pollinators
 - Killing or sublethal effects on eggs and larvae
 - Reduction of floral resources + host plant availability
- To reduce these negative impacts:
 - Spot-treat weed patches rather than blanket spraying
 - Avoid spraying while weeds or adjacent plants are in flower
 - Avoid spraying on windy days
 - Spray early in season, before flowering begins
 - Limit use of broad-spectrum herbicides and do not spray insecticides
 - Please don't spray milkweed!*



Larsen 2010
Hopwood *et al.* 2015
Cullen *et al.* 2019
Haan & Landis 2010

Best Practices for ROW Planting to Protect Idaho Pollinators

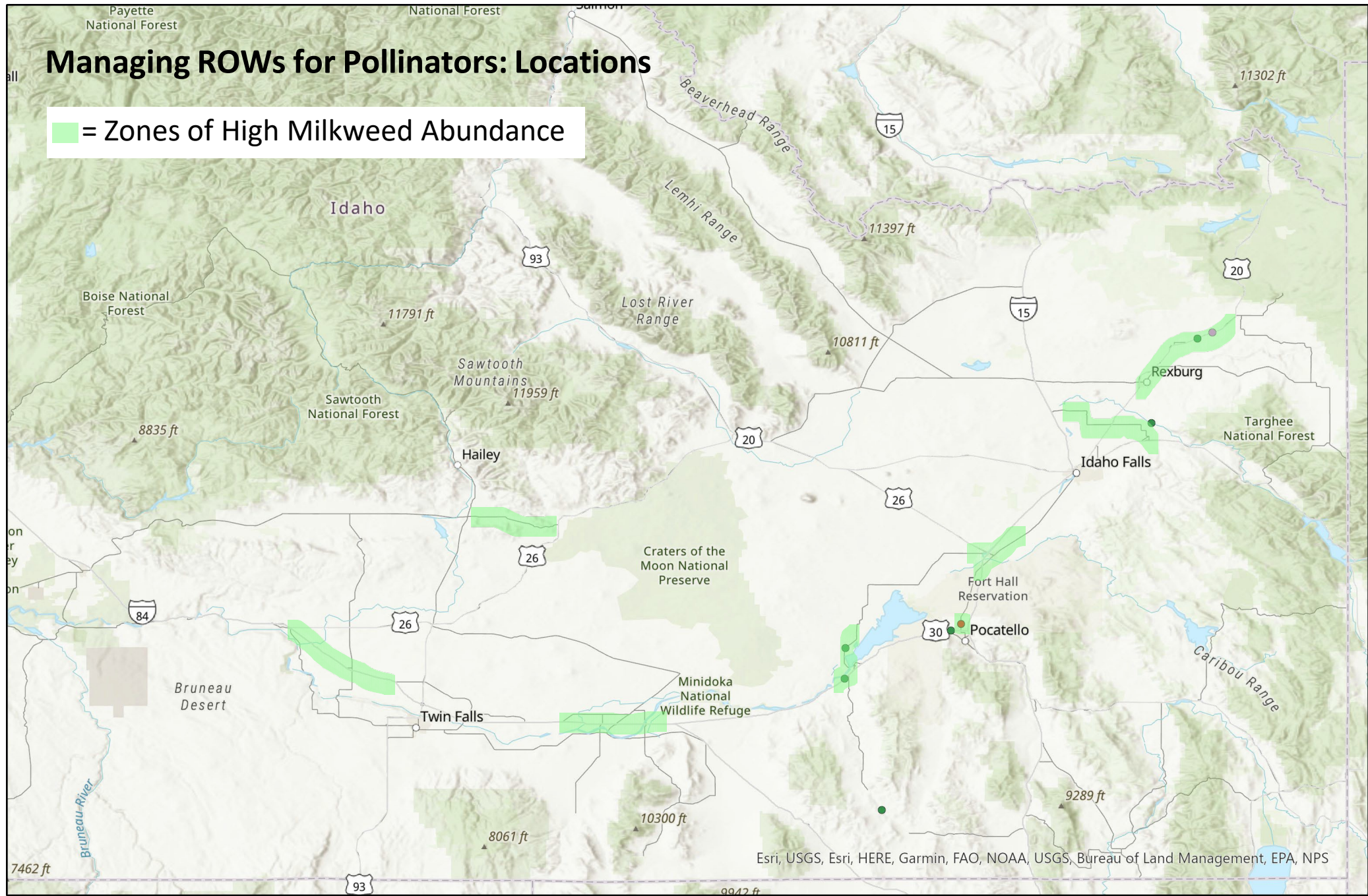
- Prioritize plantings in areas farthest from road, in wider ROWs, and/or along less-trafficked roads
 - *Not in medians!*
- Consider planting in areas at periphery of native habitat rather than amidst invasive species
- Whenever possible, seed with native forbs and bunchgrasses rather than non-natives (e.g. NOT crested or intermediate wheatgrasses)



Skórka *et al.* 2013
Keilsohn *et al.* 2018
Villemey *et al.* 2018


Managing ROWs for Pollinators: Locations

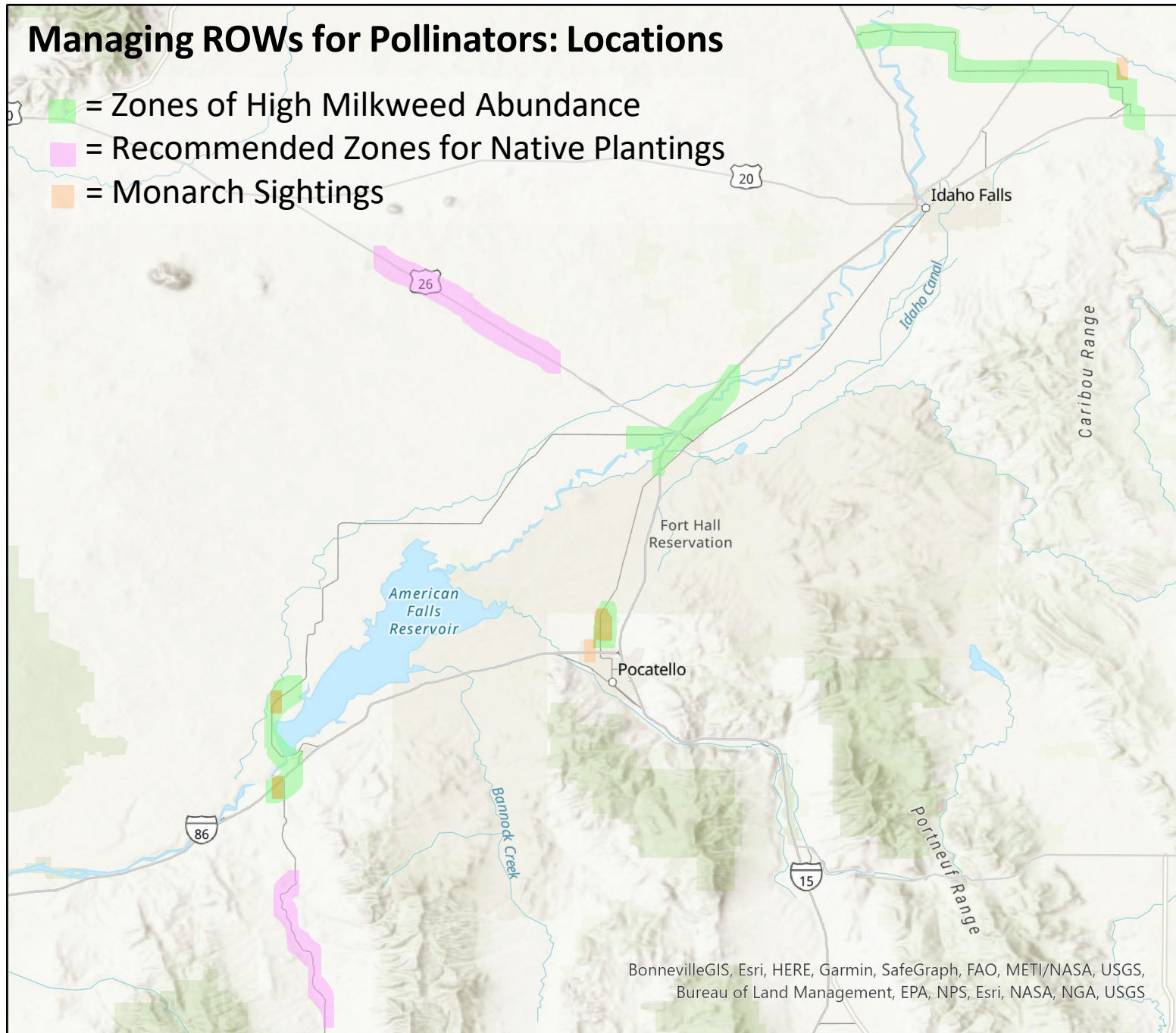
 = Zones of High Milkweed Abundance



Esri, USGS, Esri, HERE, Garmin, FAO, NOAA, USGS, Bureau of Land Management, EPA, NPS

Managing ROWs for Pollinators: Locations

-  = Zones of High Milkweed Abundance
-  = Recommended Zones for Native Plantings
-  = Monarch Sightings



Thank you!


S I T K A



- All of you for listening!
- Cathy Ford, ITD
- Dr. Diane Debinski, MSU
- Dr. Laura Burkle, MSU
- Rob Ament, WTI
- Field Techs: Alyson East & Lulu McMahan
- Processing: Cindy Elston & Dalton Spencer
- Leona Svancara, IDFG