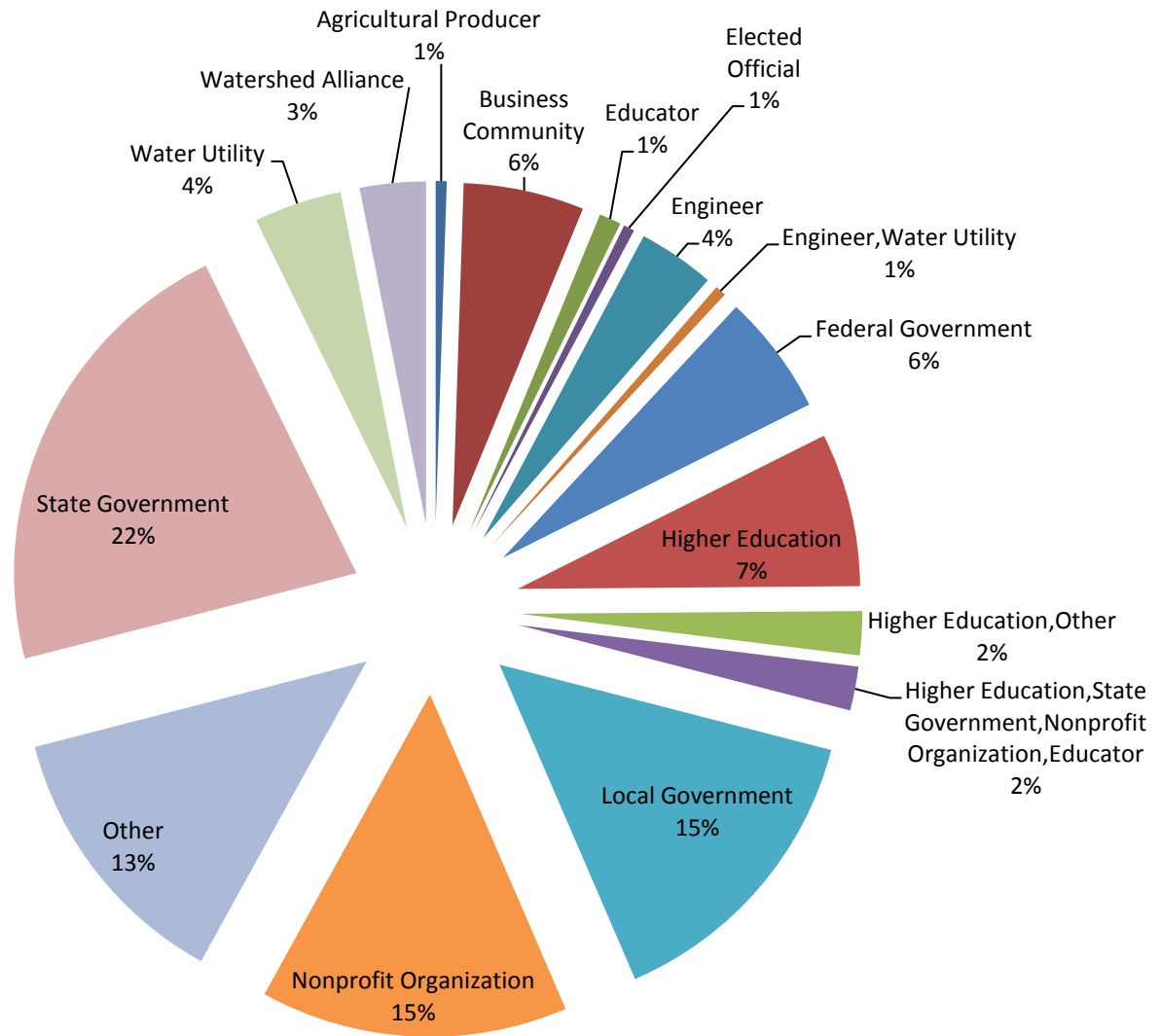


## **Blue-Green Algal Blooms and Nutrients that Cause Them: Exploring Indiana's Story**

A one-day free symposium was held on June 17<sup>th</sup>, 2010 focused on blue-green algae. The event was hosted by IUPUI Center for Earth and Environmental Science, Veolia Water Indianapolis, the Eagle Creek Watershed Alliance, and the Upper White River Watershed Alliance. The general session presentations offered a comprehensive overview of blue-green algal bloom issues, which included environmental factors, innovative research, policy implementations, and outreach solutions. The Symposium concluded with a panel discussion focused on the topic of "Approaches to Limiting Phosphorus in Indiana Waterways" with expert panelists representing elected officials, government agencies, corporations, non-profit organizations, and universities.

Attendance exceeded 200 people. As a way to gauge participants understanding of the subject matter, they were asked to complete a pre-participation and post-participation survey on blue-green algae and water quality. The following report illustrates the findings of those participating in the workshop.

# Attendance Distribution

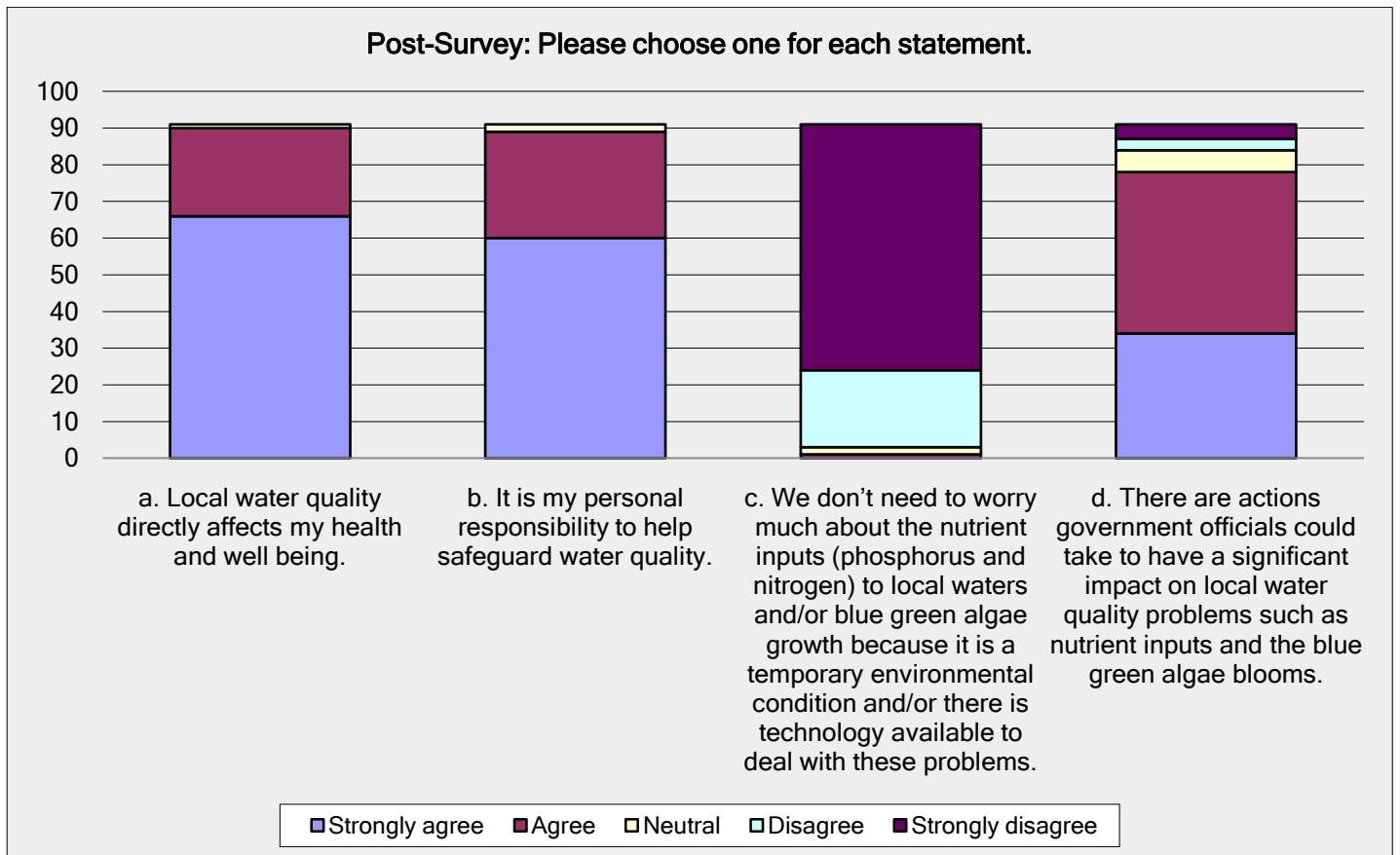
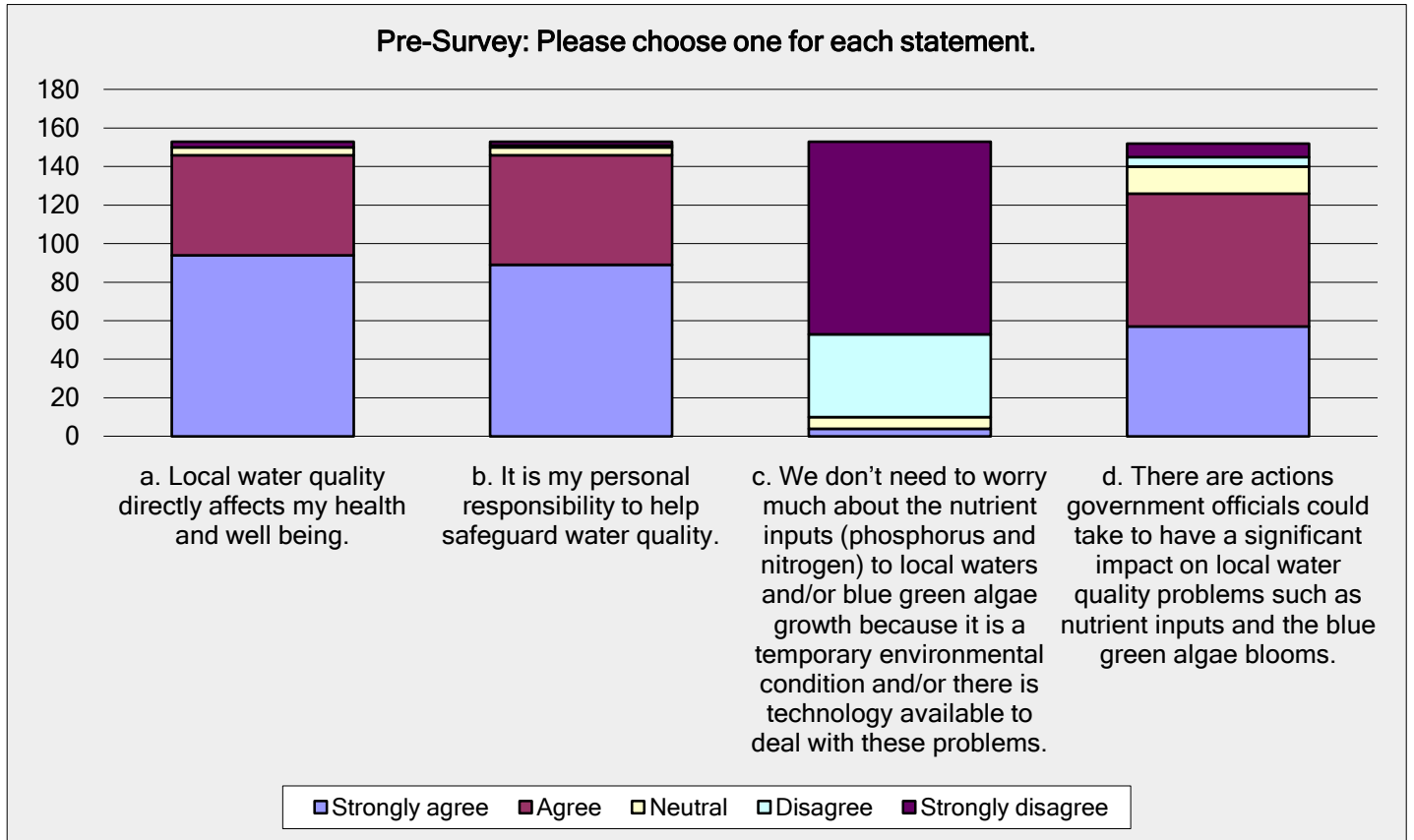


## Question 1 – Unique Identifier Information

### Question 2

| Please choose one for each statement.   | Pre-Participation |          |         |       |                |                | Post-Participation |          |         |       |                |                |
|---|-------------------|----------|---------|-------|----------------|----------------|--------------------|----------|---------|-------|----------------|----------------|
| Answer Options  | Strongly disagree | Disagree | Neutral | Agree | Strongly agree | Response Count | Strongly disagree  | Disagree | Neutral | Agree | Strongly agree | Response Count |
| a. Local water quality directly affects my health and well being.   | 3                 | 0        | 4       | 52    | 94             | 153            | 0                  | 0        | 1       | 24    | 66             | 91             |
| b. It is my personal responsibility to help safeguard water quality.  | 2                 | 1        | 4       | 57    | 89             | 153            | 0                  | 0        | 2       | 29    | 60             | 91             |
| c. We don't need to worry much about the nutrient inputs (phosphorus and nitrogen) to local waters and/or blue green algae growth because it is a temporary environmental condition and/or there is technology available to deal with these problems. | 100               | 43       | 6       | 0     | 4              | 153            | 67                 | 21       | 2       | 1     | 0              | 91             |
| d. There are actions government officials could take to have a significant impact on local water quality problems such as nutrient inputs and the blue green algae blooms.  | 7                 | 5        | 14      | 69    | 57             | 152            | 4                  | 3        | 6       | 44    | 34             | 91             |

## Question 2 Charts

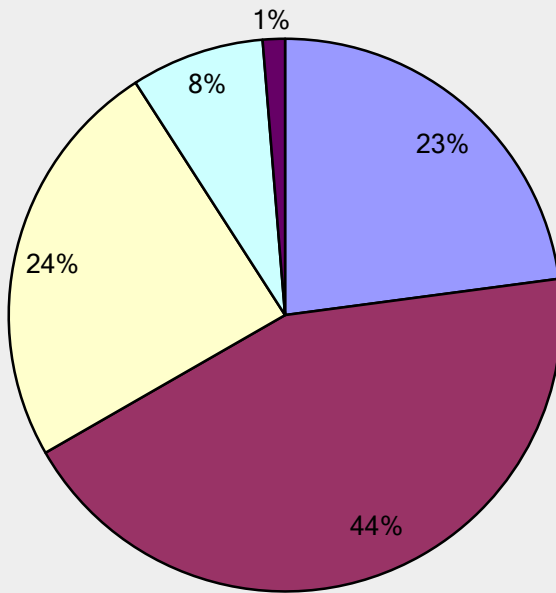


### Question 3

| How would you describe the overall quality of the streams, rivers, and reservoirs in Central Indiana? | Pre-Participation |                | Post-Participation |                |
|---|-------------------|----------------|--------------------|----------------|
| Answer Options  | Response Percent  | Response Count | Response Percent   | Response Count |
| a. Very bad, most DO NOT meet State water quality standards.  | 22.9%             | 35             | 40.7%              | 37             |
| b. Somewhat bad, more than 50%, but less than 75% DO NOT meet State water quality standards.          | 43.8%             | 67             | 39.6%              | 36             |
| c. Neither good nor bad, many meet State water quality standards, many do not.                        | 24.2%             | 37             | 15.4%              | 14             |
| d. Somewhat good, more than 50%, but less than 75% DO meet State water quality standards.             | 7.8%              | 12             | 4.4%               | 4              |
| e. Very good, most DO meet State water quality standards.   | 1.3%              | 2              | 0.0%               | 0              |

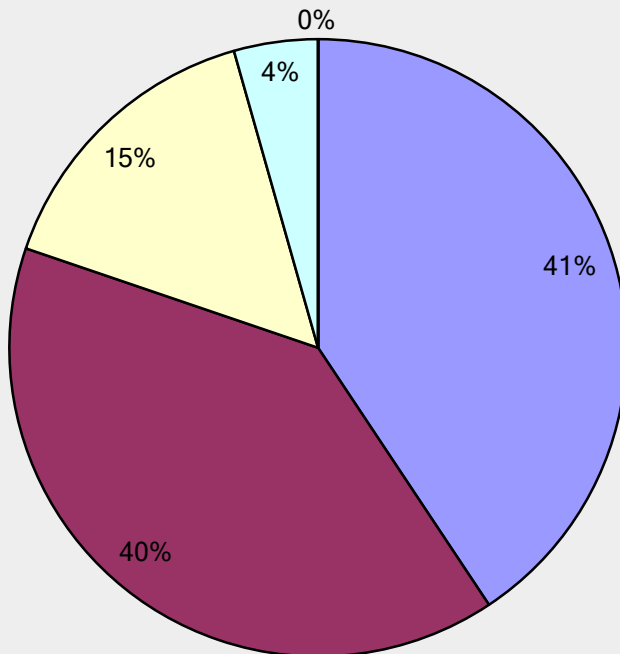
### Question 3 Charts

Pre-Survey: How would you describe the overall quality of the streams, rivers, and reservoirs in Central Indiana?



- a. Very bad, most DO NOT meet State water quality standards.
- b. Somewhat bad, more than 50%, but less than 75% DO NOT meet State water quality standards.
- c. Neither good nor bad, many meet State water quality standards, many do not.
- d. Somewhat good, more than 50%, but less than 75% DO meet State water quality standards.
- e. Very good, most DO meet State water quality standards.

Post-Survey: How would you describe the overall quality of the streams, rivers, and reservoirs in Central Indiana?



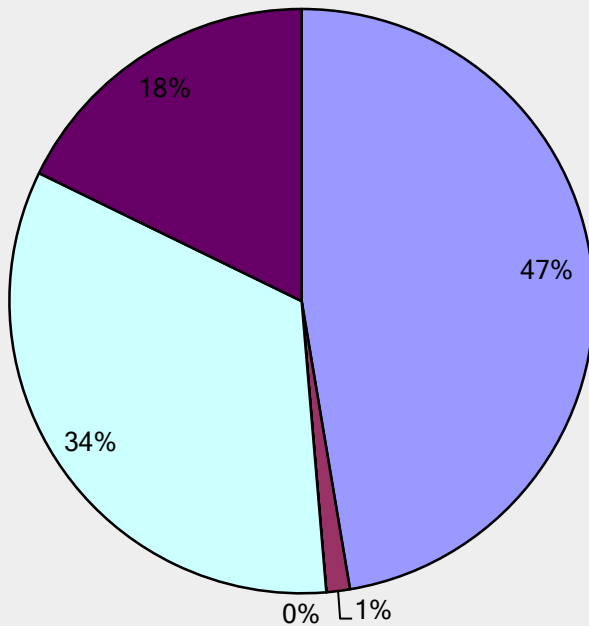
- a. Very bad, most DO NOT meet State water quality standards.
- b. Somewhat bad, more than 50%, but less than 75% DO NOT meet State water quality standards.
- c. Neither good nor bad, many meet State water quality standards, many do not.
- d. Somewhat good, more than 50%, but less than 75% DO meet State water quality standards.
- e. Very good, most DO meet State water quality standards.

## Question 4

| Which statement best describes nutrient inputs, particularly phosphorus, to Indiana lakes and streams?                                     | Pre-Participation |                | Post-Participation |                |
|--|-------------------|----------------|--------------------|----------------|
| Answer Options   | Response Percent  | Response Count | Response Percent   | Response Count |
| a. Most phosphorus inputs in central Indiana come from agricultural fertilizers and manure management.                                     | 47.4%             | 72             | 20.9%              | 19             |
| b. Most phosphorus inputs reach streams in regular patterns and amounts and are only slightly impacted by rain events.                     | 1.3%              | 2              | 5.5%               | 5              |
| c. More phosphorus reaches the streams in areas where there are trees and plants than in paved areas.                                      | 0.0%              | 0              | 1.1%               | 1              |
| d. Phosphorus inputs from urban areas are rarely treated in wastewater treatment facilities before being released into streams and rivers. | 33.6%             | 51             | 65.9%              | 60             |
| e. I don't know.   | 17.8%             | 27             | 6.6%               | 6              |

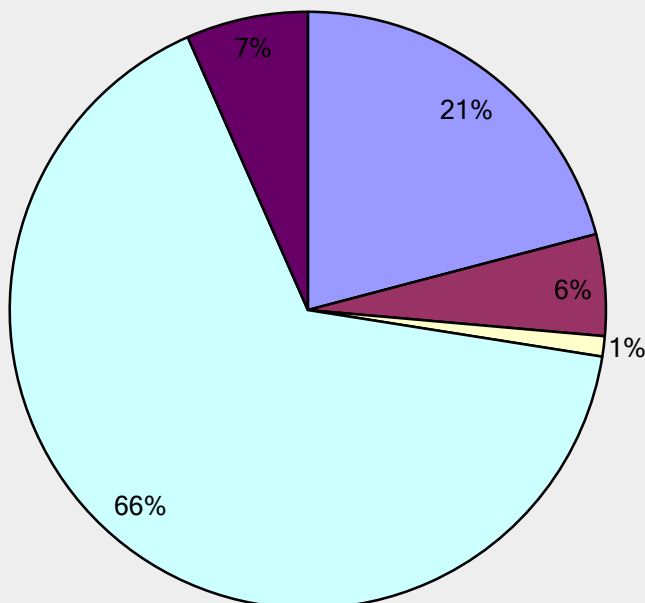
## Question 4 Charts

Pre-Survey: Which statement best describes nutrient inputs, particularly phosphorus, to Indiana lakes and streams?



- a. Most phosphorus inputs in central Indiana come from agricultural fertilizers and manure management.
- b. Most phosphorus inputs reach streams in regular patterns and amounts and are only slightly impacted by rain events.
- c. More phosphorus reaches the streams in areas where there are trees and plants than in paved areas.
- d. Phosphorus inputs from urban areas are rarely treated in wastewater treatment facilities before being released into streams and rivers.
- e. I don't know.

Post-Survey: Which statement best describes nutrient inputs, particularly phosphorus, to Indiana lakes and streams?



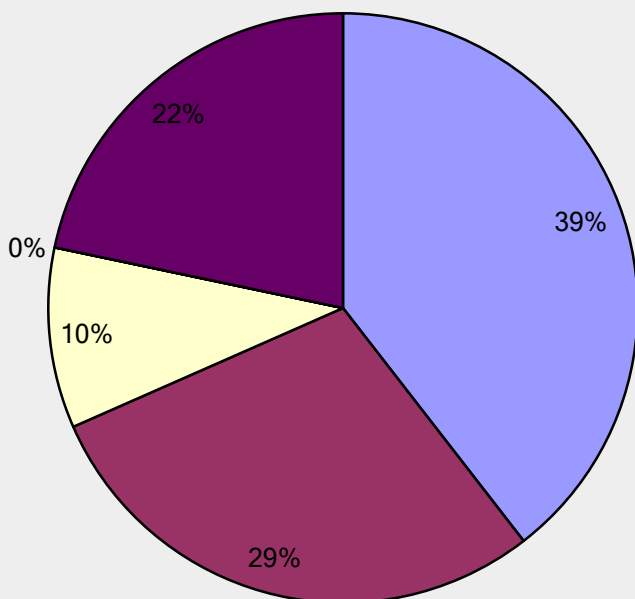
- a. Most phosphorus inputs in central Indiana come from agricultural fertilizers and manure management.
- b. Most phosphorus inputs reach streams in regular patterns and amounts and are only slightly impacted by rain events.
- c. More phosphorus reaches the streams in areas where there are trees and plants than in paved areas.
- d. Phosphorus inputs from urban areas are rarely treated in wastewater treatment facilities before being released into streams and rivers.
- e. I don't know.

## Question 5

| Which statement best describes what controls or affects blue-green algal populations?   | Pre-Participation |                | Post-Participation |                |
|---|-------------------|----------------|--------------------|----------------|
| Answer Options  | Response Percent  | Response Count | Response Percent   | Response Count |
| a. They are mostly controlled by the amount of nutrient inputs (concentrations) in the water.   | 39.5%             | 60             | 23.1%              | 21             |
| b. They are mostly controlled by the combination of chemical factors present in the water including the ratios of various nutrients relative to each other. | 28.9%             | 44             | 13.2%              | 12             |
| c. They are mostly controlled by physical factors like sunlight, flow, and temperature.   | 9.9%              | 15             | 14.3%              | 13             |
| d. They are mostly controlled by competition among different algal species.   | 0.0%              | 0              | 4.4%               | 4              |
| e. Scientists do not know exactly what factors control them.  | 21.7%             | 33             | 45.1%              | 41             |

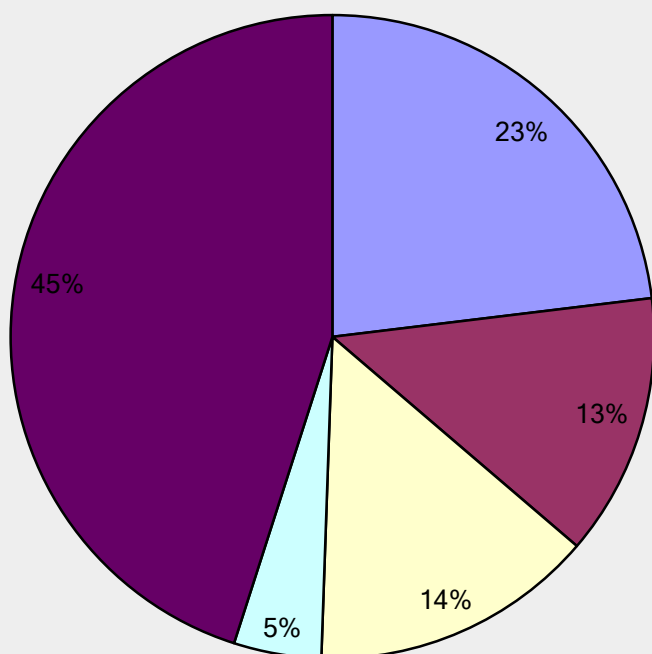
## Question 5 Charts

Pre-Survey: Which statement best describes what controls or affects blue-green algal populations?



- a. They are mostly controlled by the amount of nutrient inputs (concentrations) in the water.
- b. They are mostly controlled by the combination of chemical factors present in the water including the ratios of various nutrients relative to each other.
- c. They are mostly controlled by physical factors like sunlight, flow, and temperature.
- d. They are mostly controlled by competition among different algal species.
- e. Scientists do not know exactly what factors control them.

Post-Survey: Which statement best describes what controls or affects blue-green algal populations?



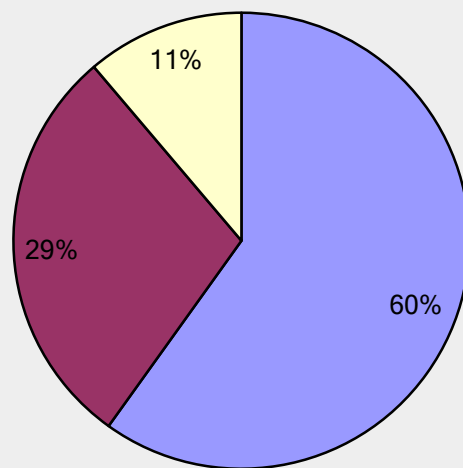
- a. They are mostly controlled by the amount of nutrient inputs (concentrations) in the water.
- b. They are mostly controlled by the combination of chemical factors present in the water including the ratios of various nutrients relative to each other.
- c. They are mostly controlled by physical factors like sunlight, flow, and temperature.
- d. They are mostly controlled by competition among different algal species.
- e. Scientists do not know exactly what factors control them.

## Question 6

| Algae species are aquatic plants? | Pre-Participation |                | Post-Participation |                |
|-----------------------------------|-------------------|----------------|--------------------|----------------|
| Answer Options                    | Response Percent  | Response Count | Response Percent   | Response Count |
| a. True.                          | 59.9%             | 91             | 54.9%              | 50             |
| b. False.                         | 28.9%             | 44             | 34.1%              | 31             |
| c. I don't know.                  | 11.2%             | 17             | 11.0%              | 10             |

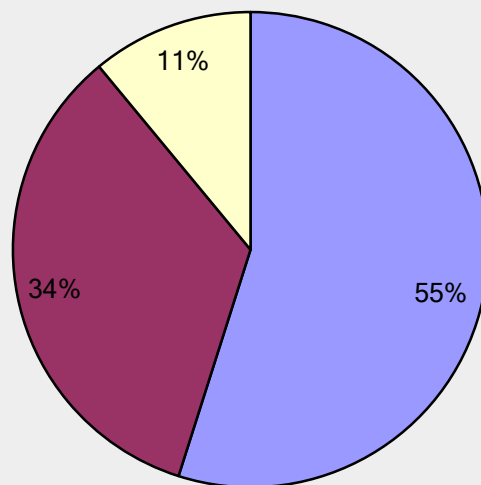
## Question 6 Charts

Pre-Survey: Algae species are aquatic plants?



■ a. True.  
■ b. False.  
■ c. I don't know.

Post-Survey: Algae species are aquatic plants?



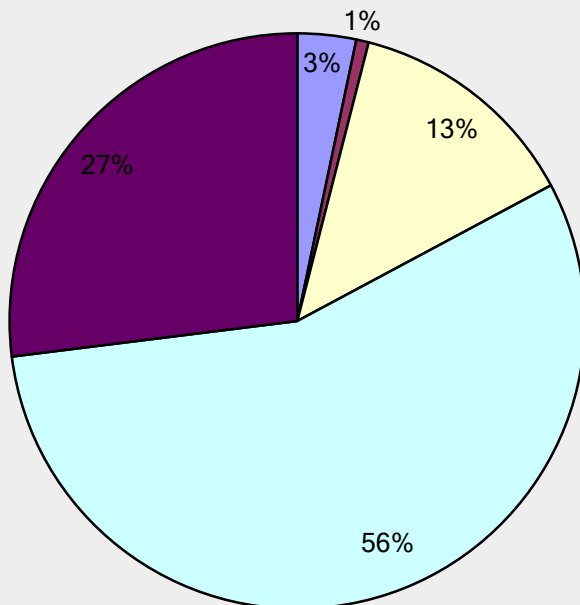
■ a. True.  
■ b. False.  
■ c. I don't know.

## Question 7

| Have you heard of concerns about health risks associated with blue-green algae in Indiana?                         | Pre-Participation |                | Post-Participation |                |
|--|-------------------|----------------|--------------------|----------------|
| Answer Options   | Response Percent  | Response Count | Response Percent   | Response Count |
| a. Not aware that this is an issue.  | 3.3%              | 5              | 0.0%               | 0              |
| b. I know this is an issue, but I am not at all concerned.   | 0.7%              | 1              | 2.2%               | 2              |
| c. Only a little concerned, the risks are minor health annoyances and acceptable at this point.                    | 13.2%             | 20             | 3.3%               | 3              |
| d. Moderately concerned, I've seen some news headlines and hope something will be done.                            | 55.9%             | 85             | 48.4%              | 44             |
| e. Extremely concerned, I regularly take precautions when recreating and/or have changed by behaviors as a result. | 27.0%             | 41             | 46.2%              | 42             |

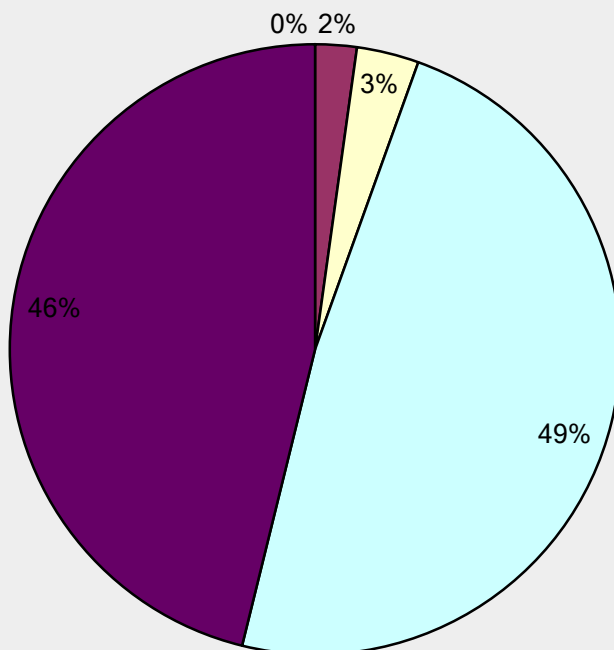
## Question 7 Charts

Pre-Survey: Have you heard of concerns about health risks associated with blue-green algae in Indiana?



- a. Not aware that this is an issue.
- b. I know this is an issue, but I am not at all concerned.
- c. Only a little concerned, the risks are minor health annoyances and acceptable at this point.
- d. Moderately concerned, I've seen some news headlines and hope something will be done.
- e. Extremely concerned, I regularly take precautions when recreating and/or have changed by behaviors as a result.

Post-Survey: Which statement best describes your awareness and opinion about health risks associated with blue-green algae in Indiana?



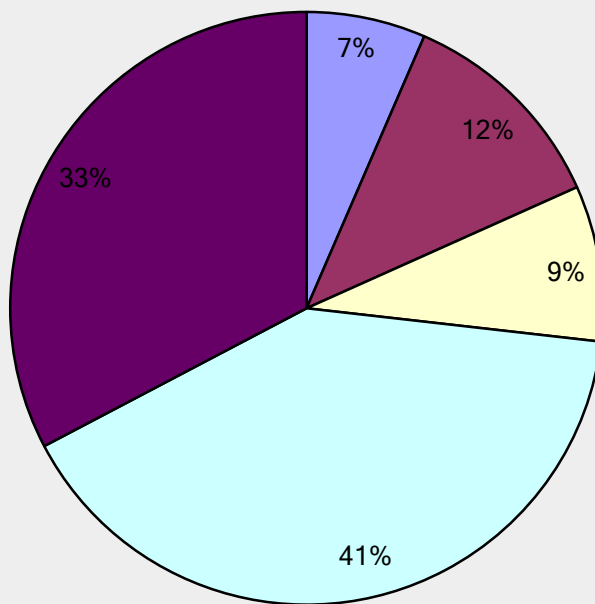
- a. Not aware that this is an issue.
- b. I know this is an issue, but I am not at all concerned.
- c. Only a little concerned, the risks are minor health annoyances and acceptable at this point.
- d. Moderately concerned, I've seen some news headlines and hope something will be done.
- e. Extremely concerned, I regularly take precautions when recreating and/or have changed by behaviors as a result.

## Question 8

| Some species of blue-green algae have the following health risks? | Pre-Participation |                | Post-Participation |                |
|---|-------------------|----------------|--------------------|----------------|
| Answer Options  | Response Percent  | Response Count | Response Percent   | Response Count |
| a. The most extreme health risk is dermatitis (skin irritation).  | 6.5%              | 10             | 6.6%               | 6              |
| b. The most extreme health risk is neurological problems.         | 11.8%             | 18             | 1.1%               | 1              |
| c. The most extreme health risk is liver damage or failure.       | 8.5%              | 13             | 5.5%               | 5              |
| d. The most extreme health risk is death.                         | 40.5%             | 62             | 82.4%              | 75             |
| e. I don't know.  | 32.7%             | 50             | 4.4%               | 4              |

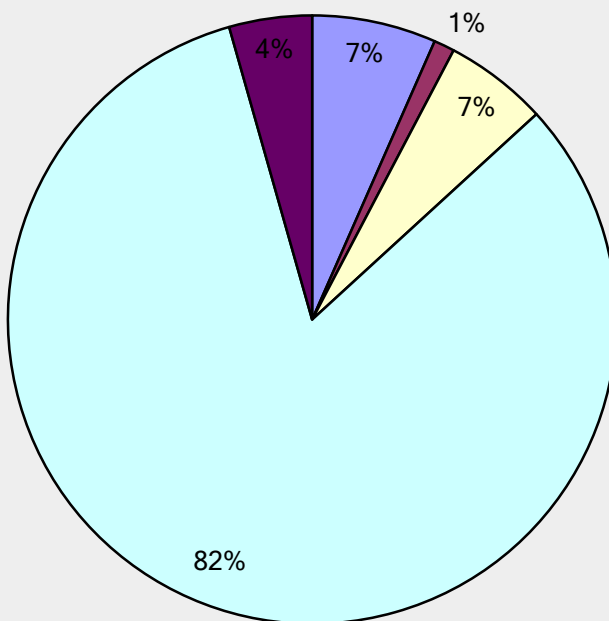
## Question 8 Charts

Pre-Survey: Some species of blue-green algae have the following health risks?



- a. The most extreme health risk is dermatitis (skin irritation).
- b. The most extreme health risk is neurological problems.
- c. The most extreme health risk is liver damage or failure.
- d. The most extreme health risk is death.
- e. I don't know.

Post-Survey: Some species of blue-green algae have the following health risks?



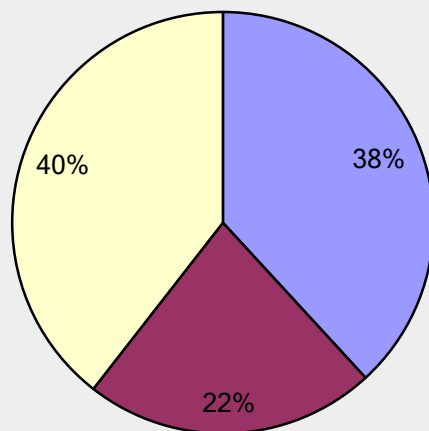
- a. The most extreme health risk is dermatitis (skin irritation).
- b. The most extreme health risk is neurological problems.
- c. The most extreme health risk is liver damage or failure.
- d. The most extreme health risk is death.
- e. I don't know.

## Question 9

| In the next year, I intend to join a watershed group to help improve Indiana environmental quality. | Pre-Participation |                | Post-Participation |                |
|---|-------------------|----------------|--------------------|----------------|
|   | Response Percent  | Response Count | Response Percent   | Response Count |
| a. Unlikely   | 38.2%             | 58             | 35.2%              | 32             |
| b. Likely   | 22.4%             | 34             | 28.6%              | 26             |
| c. I am already a member of a watershed group   | 39.5%             | 60             | 36.3%              | 33             |

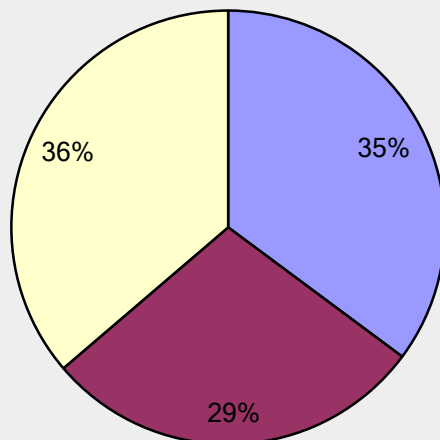
## Question 9 Charts

Pre-Survey: In the next year, I intend to join a watershed group to help improve Indiana environmental quality.



- a. Unlikely
- b. Likely
- c. I am already a member of a watershed group

Post-Survey: In the next year, I intend to join a watershed group to help improve Indiana environmental quality.



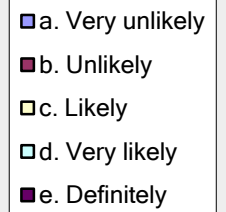
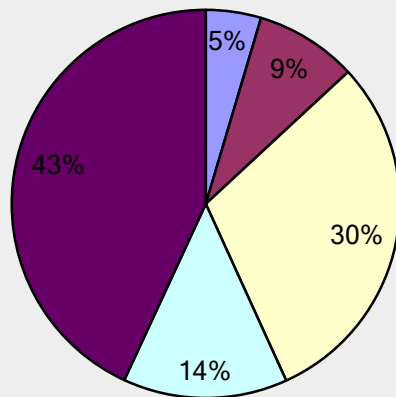
- a. Unlikely
- b. Likely
- c. I am already a member of a watershed group

### Question 10

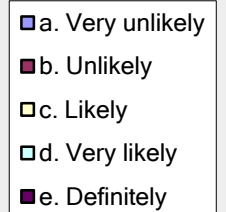
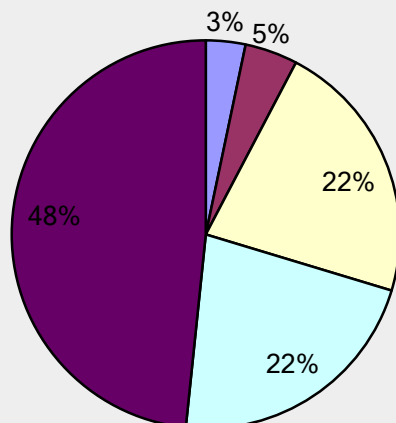
| In the next year, I intend to reduce my use of lawn and garden chemicals or share this message with family/friends. | Pre-Participation |                | Post-Participation |                |
|---|-------------------|----------------|--------------------|----------------|
|   | Response Percent  | Response Count | Response Percent   | Response Count |
| a. Very unlikely  | 4.6%              | 7              | 3.3%               | 3              |
| b. Unlikely   | 8.5%              | 13             | 4.4%               | 4              |
| c. Likely   | 30.1%             | 46             | 22.0%              | 20             |
| d. Very likely  | 13.7%             | 21             | 22.0%              | 20             |
| e. Definitely   | 43.1%             | 66             | 48.4%              | 44             |

### Question 10 Charts

Pre-Survey: In the next year, I intend to reduce my use of lawn and garden chemicals or share this message with family/friends.



Post-Survey: In the next year, I intend to reduce my use of lawn and garden chemicals or share this message with family/friends.

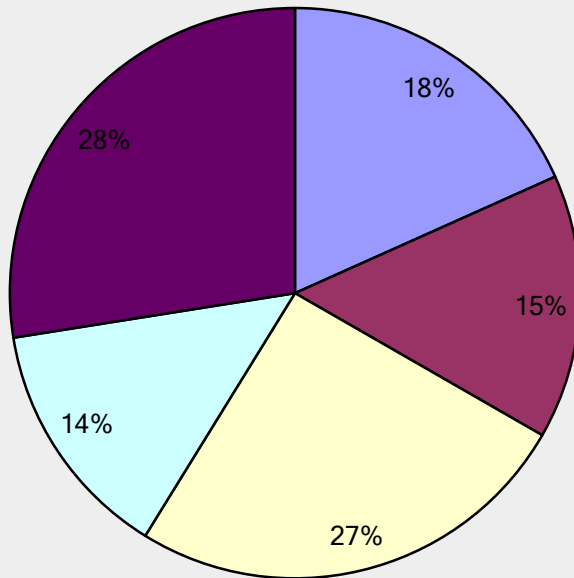


## Question 11

| Which of the following goals is most important to achieve through your attendance at this symposium/workshop?              | Pre-Participation |                | Post-Participation |                |
|--|-------------------|----------------|--------------------|----------------|
| Answer Options   | Response Percent  | Response Count | Response Percent   | Response Count |
| a. Having opportunities to interact and network with other professionals or people in my position.                         | 18.3%             | 28             | 24.2%              | 22             |
| b. Developing relationships with experts that may extend beyond symposium time.  | 15.0%             | 23             | 7.7%               | 7              |
| c. Having an opportunity to learn about technical topics and issues that are important to my life in an interactive forum. | 25.5%             | 39             | 20.9%              | 19             |
| d. Learning how to address complex, real world problems such as nutrient and algae management.                             | 13.7%             | 21             | 19.8%              | 18             |
| e. Learning how to protect local water quality through my actions and/or professional initiatives.                         | 27.5%             | 42             | 27.5%              | 25             |

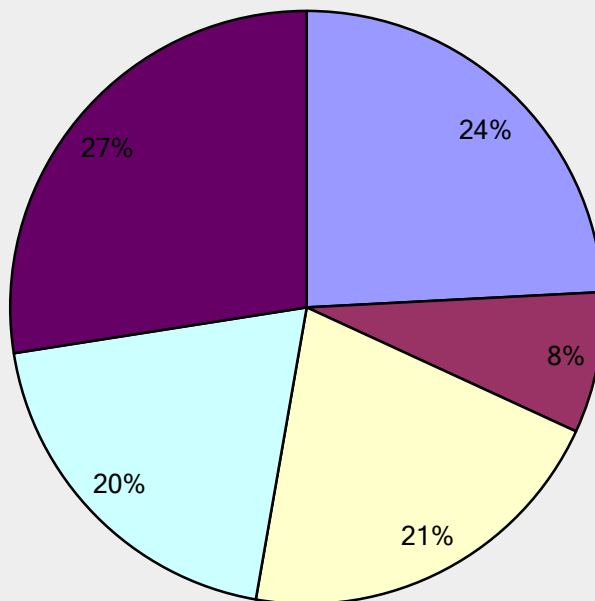
## Question 11 Charts

Pre-Survey: Which of the following goals is most important to achieve through your attendance at this symposium/workshop?



- a. Having opportunities to interact and network with other professionals or people in my position.
- b. Developing relationships with experts that may extend beyond symposium time.
- c. Having an opportunity to learn about technical topics and issues that are important to my life in an interactive forum.
- d. Learning how to address complex, real world problems such as nutrient and algae management.
- e. Learning how to protect local water quality through my actions and/or professional initiatives.

Post-Survey: Which of the following goals was the most important thing you accomplished by your attendance at the symposium/workshop?



- a. Having opportunities to interact and network with other professionals or people in my position.
- b. Developing relationships with experts that may extend beyond symposium time.
- c. Having an opportunity to learn about technical topics and issues that are important to my life in an interactive forum.
- d. Learning how to address complex, real world problems such as nutrient and algae management.
- e. Learning how to protect local water quality through my actions and/or professional initiatives.

## Summary

The results of the pre-participation and post-participation surveys show that the participants did walk away with a new perspective on blue-green algae. Several of the survey questions had surprising results between the pre and post surveys. Those questions are listed below.

- Question 4: The pre-participation survey showed that nearly 50% thought that nutrient inputs, mainly phosphorus, in central Indiana came from agricultural fertilizers and manure management. The post-participation survey indicated that participant's viewpoints had been changed and now only 21% believed that inputs came from the agriculture sector. Post results show that 66% of participants are now aware that phosphorus inputs from urban areas are rarely treated in wastewater treatment facilities before being released into streams and rivers.
- Question 8: Most participants either did not know or thought that the most extreme health risk of blue-green algae was death. These percentages were reported as 33% and 41% respectively. Post symposium results show that 82% now know that death is the most extreme health risk and only 4% still don't know.
- Question 9: Before the symposium, participant responses were fairly even (~33% for each option) in regards to joining a watershed group to help improve Indiana environmental quality. After the symposium, the results remained relatively unchanged. A few participants were (are) more likely to join a watershed group, but for the most part the results remained the same.

Even with some of the surprising survey results, participants walked away with some new insight and information about blue-green, nutrients, and general water quality in Indiana.